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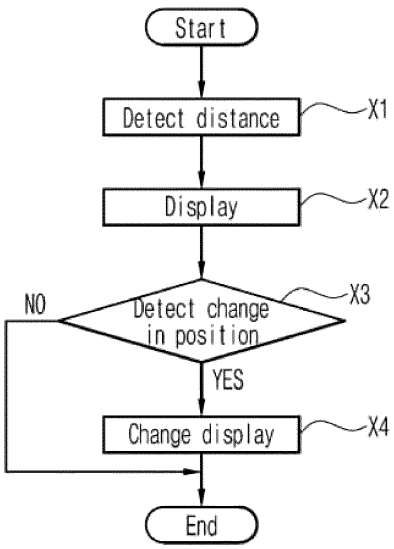
(54) CLOTHING TREATMENT APPARATUS AND CONTROL METHOD THEREFOR

(57) The present disclosure relates to a clothing treatment apparatus, which differs in content from a method for providing visual information according to the location of a person, and relates to a clothing treatment apparatus which concisely provides current washing/drying information in a large size when a person is far therefrom, and which transmits details in relatively small print when the person is detected to be close thereto.

【FIG 5】



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Description

TECHNICAL FIELD

[0001] The present disclosure relates to a clothing treatment apparatus. More specifically, the present disclosure relates to a method of changing and controlling an interface of a display that externally displays a signal generated from a clothing treatment apparatus to a user.

BACKGROUND ART

[0002] In general, a clothing treatment apparatus refers to an apparatus that can perform washing, drying, or washing and drying of clothing and the like. Here, the clothing treatment apparatus can perform only washing or drying or can perform both washing and drying.

[0003] Such a clothing treatment apparatus is equipped with a display that displays various types of information currently generated or received to a user.

[0004] The aforementioned information may include functional information regarding functions provided by the clothing treatment apparatus, such as courses/options, performance information regarding the performance status of a course or option, guidance information received by the clothing treatment apparatus from a controller or a server/external terminal and provided to the user, recommendation information for recommending user actions, etc.

[0005] Such a display may be configured as a liquid crystal display to provide the aforementioned information as visual information to the user and may include a speaker to provide the aforementioned information as audio information to the user.

[0006] Such a display has a limitation in that information transmission is deteriorated when the user is far away from the clothing treatment apparatus.

[0007] To solve such a problem, a clothing treatment apparatus that can change a display status of a display by recognizing the distance from the user has recently appeared.
(Refer to Korean Patent Publication No. 10-2175295)

[0008] This clothing treatment apparatus recognizes the distance from the user, transmits more detailed information through a sound signal using a speaker when the distance is close, and transmits brief information when the distance is far.

[0009] In this manner, the conventional clothing treatment apparatus displays information differently depending on the distance from the user such that the user can effectively receive necessary information even if the user is far away from the clothing treatment apparatus.

[0010] However, the conventional clothing treatment apparatus only focuses on adjusting the display status of the speaker that outputs notification sound to the outside depending on the distance from the user, and the display that conveys visual information does not provide separate information other than changing the brightness.

[0011] That is, the conventional clothing treatment apparatus has a problem in that the liquid crystal display that conveys visual information rather than audio information cannot provide information for effectively conveying information to a nearby user and a distant user.

[0012] Therefore, the conventional clothing treatment apparatus cannot provide information differently when the user approaches or moves away from the clothing treatment apparatus other than changing the brightness.

[0013] **In** other words, the conventional clothing treatment apparatus does not have any way to effectively convey information visually depending on the distance from the user.

[0014] **In** addition, the conventional clothing treatment apparatus has a problem in that the display that conveys information visually and a weight detection function of the clothing treatment apparatus are not closely connected, resulting in deterioration of UX/UI usability.

TECHNICAL TASK

[0015] An object of the present disclosure is to provide a clothing treatment apparatus that can provide visual information in a different way and in different content depending on the distance between the user and the clothing treatment apparatus.

[0016] An object of the present disclosure is to provide a clothing treatment apparatus that can deliver intuitive visual information to a user who is far away and deliver detailed visual information to a user who is close.

[0017] An object of the present disclosure is to provide a clothing treatment apparatus that can deliver key information or important information as visual information to a user who is far away and deliver one or more of additional information, guidance information, and recommendation information in addition to key information to a user who is close, thereby changing the type and number of pieces of information.

[0018] An object of the present disclosure is to provide a clothing treatment apparatus that can deliver visual information

in a larger size to a user who is far away.

[0019] An object of the present disclosure is to provide a clothing treatment apparatus that can deliver optimal information to a user who is far away and a user who is close by changing the color of displayed visual information.

[0020] An object of the present disclosure is to provide a clothing treatment apparatus that can maximize the usability of the clothing treatment apparatus by combining the functions of the clothing treatment apparatus with change in display of visual information.

TECHNICAL SOLUTIONS

[0021] To achieve the aforementioned objects, the present disclosure provides a clothing treatment apparatus that provides information in a different way and in a different format depending on the location of a person.

[0022] The clothing treatment apparatus of the present disclosure may provide current washing/drying information in a large and concise manner when a person is far away, and provide detailed information in relatively small letters when a person is detected to be nearby.

[0023] The clothing treatment apparatus of the present disclosure may provide information by reducing the amount of information and minimizing the number of letters when a person is far away, and additionally provide detailed information and currently selectable option buttons when a person is detected to be nearby.

[0024] The clothing treatment apparatus of the present disclosure may provide concise information in the form of an image or animation such that the information can be intuitively confirmed when a person is far away, and provide additional information in the form of text when a person is detected to be nearby.

[0025] Detection of the distance may consider whether a user is located at a close distance (second distance) or a long distance (third distance) based on a reference distance (first distance) for a reference time, or may comprehensively consider whether the user is staring at the display.

[0026] The display may always display information corresponding to a distance from the user such that information can be intuitively conveyed when the user looks at the display, regardless of whether the user is positioned or staring at the display for the reference.

[0027] To achieve the aforementioned objects, the present disclosure provides a clothing treatment apparatus including a cabinet, a drum rotatably accommodated in the cabinet to accommodate laundry, a controller for performing an arbitrary course capable of rotating the drum, a display provided in the cabinet to externally display information provided by the controller, and a proximity sensor provided on the front of the cabinet to detect a gap or a distance between the cabinet and a user and transmit the gap or the distance to the controller.

[0028] The display may be controlled such that at least one of a display size of information, a number of pieces of displayed information, or a form of the displayed information changes when the distance between the proximity sensor and the user changes.

[0029] The display may display the information in smaller letters when the distance between the user and the proximity sensor is equal to or less than a first distance than when the distance is equal to or greater than the first distance.

[0030] The display may be controlled to display the information in more words or numbers when the distance between the user and the proximity sensor is equal to or less than the first distance than when the distance is equal to or greater than the first distance.

[0031] The display may be controlled to display the information as text excluding a predicate when the distance between the user and the proximity sensor is equal to or greater than the first distance, and to display the information as text including a predicate when the distance between the user and the proximity sensor is equal to or less than the first distance.

[0032] The display may include a liquid crystal display displaying the information, and the display may be controlled to display the information by partitioning the liquid crystal display into a larger number of areas when the distance between the user and the proximity sensor is equal to or less than the first distance than when the distance between the user and the proximity sensor is equal to or greater than the first distance.

[0033] The display may be controlled to display different contents in the partitioned areas of the liquid crystal display.

[0034] The display may be controlled such that a display color of the information changes when the distance between the user and the proximity sensor is equal to or greater than the first distance and when the distance between the user and the proximity sensor is equal to or less than the first distance.

[0035] The display may be controlled to display the information using a larger number of colors when the distance between the user and the proximity sensor is equal to or less than the first distance than when the distance between the user and the proximity sensor is equal to or greater than the first distance.

[0036] The display may be controlled to display the information as an image or pictogram when the distance between the user and the proximity sensor is equal to or greater than the first distance, and to display the information as one or more of letters and numbers when the distance between the user and the proximity sensor is equal to or less than the first distance.

[0037] The display may be controlled to additionally display the letters and numbers on the image or pictogram as the information when the distance between the user and the proximity sensor is equal to or less than the first distance.

[0038] The controller may be configured to detect a load of laundry by rotating the drum or through a separate sensor, and the display may be controlled to display load information differently depending on change in the load of laundry.

[0039] The load information may include at least one of an estimated time for processing the laundry, an amount of detergent required for processing the laundry, or an amount of water required for processing the laundry.

[0040] The display may be controlled to display request information for requesting checking of whether laundry exceeds a weight limit when a load of laundry equal to or greater than a reference value is put into the drum.

[0041] The display may be controlled to display information for inquiring about whether to perform a course for separately processing laundry exceeding the weight limit set in the controller when confirmation that the laundry exceeds the weight limit is input.

[0042] The display may have a width longer than a height.

ADVANTAGEOUS EFFECTS

[0043] According to the clothing treatment apparatus of the present disclosure, a customer can receive information in an appropriate form and content according to the current location of the customer and thus can check the current operating status at a glance from a distance. Therefore, the clothing treatment apparatus of the present disclosure can aid in reducing the inconvenience of the user having to get close to the clothing treatment apparatus to check the current operating status.

[0044] The clothing treatment apparatus of the present disclosure can change display content of the display to appropriately deliver information and menus suitable to the current situation to the user. As a result, the clothing treatment apparatus of the present disclosure can reduce the cognitive labor of finding a necessary menu and obtain more satisfactory laundry results through appropriately provided menus.

[0045] When the clothing treatment apparatus of the present disclosure detects that the user is nearby, it can provide detailed and friendly suggestions related to the current washing/drying as text.

[0046] The clothing treatment apparatus of the present disclosure can provide more intuitive and aesthetic effects by delivering information in the form of animation and images as well as text depending on the distance from the user.

DESCRIPTION OF DRAWINGS

[0047]

FIG. 1 illustrates the exterior of a clothing treatment apparatus of the present disclosure.

FIG. 2 illustrates a control panel structure of the clothing treatment apparatus of the present disclosure.

FIG. 3 illustrates another embodiment of the clothing treatment apparatus of the present disclosure.

FIG. 4 illustrates the internal structure of the clothing treatment apparatus of the present disclosure.

FIG. 5 illustrates a control method for changing a display state of a display depending on a distance from a user in the clothing treatment apparatus of the present disclosure.

FIG. 6 illustrates an embodiment to which a method of controlling the clothing treatment apparatus of the present disclosure is applied.

FIG. 7 illustrates an embodiment in which the control method is applied to another embodiment of the clothing treatment apparatus of the present disclosure.

FIG. 8 illustrates an embodiment to which the method of controlling the clothing treatment apparatus of the present disclosure is applied.

FIG. 9 illustrates an embodiment in which the control method of FIG. 8 is applied to another embodiment of the clothing treatment apparatus of the present disclosure.

FIG. 10 illustrates another embodiment to which the method of controlling the clothing treatment apparatus of the present disclosure is applied.

FIG. 11 illustrates an embodiment in which the control method of FIG. 10 is applied to another embodiment of the clothing treatment apparatus of the present disclosure.

FIG. 12 illustrates an embodiment in which an additional method of controlling the clothing treatment apparatus of the present disclosure is applied.

FIG. 13 illustrates an embodiment in which the control method of FIG. 12 is applied to another embodiment of the clothing treatment apparatus of the present disclosure.

FIG. 14 to FIG. 17 illustrate a basic structure and method for detecting a load of laundry in the clothing treatment apparatus of the present disclosure.

FIG. 18 illustrates a control method for detecting a load of laundry in the clothing treatment apparatus of the present disclosure before starting to perform a course or an option.

FIG. 19 illustrates a control method for changing a display state of a display according to detection of a load of laundry in the clothing treatment apparatus of the present disclosure.

FIG. 20 illustrates an embodiment to which the control method of FIG. 19 is applied.
FIG. 21 illustrates an embodiment in which the control method of FIG. 19 is applied to another embodiment of the clothing treatment apparatus of the present disclosure.
FIG. 22 illustrates a control method by which the clothing treatment apparatus of the present disclosure can recommend a course or an option through a display according to detection of a load of laundry.
FIG. 23 illustrates an embodiment to which the control method of FIG. 22 is applied.
FIG. 24 illustrates an additional embodiment in which the control panel of the clothing treatment apparatus of the present disclosure is provided in a different form.

BEST MODE FOR DISCLOSURE

[0048] Hereinafter, embodiments of the present disclosure will be described in detail with reference to the attached drawings. In this specification, identical or similar reference numerals are given to identical or similar components in different embodiments, and their descriptions are replaced with the first description. Singular expressions used in this specification include plural expressions unless the context clearly indicates otherwise. In addition, when describing the embodiments disclosed in this specification, if it is determined that a specific description of related known technology may obscure the gist of the embodiments disclosed in this specification, the detailed description thereof will be omitted. In addition, it should be noted that the attached drawings are only intended to facilitate easy understanding of the embodiments disclosed in this specification, and that the technical ideas disclosed in this specification should not be construed as being limited by the attached drawings.

[0049] FIG. 1 illustrates the exterior of a clothing treatment apparatus 100 of the present disclosure.

[0050] The clothing treatment apparatus of the present disclosure may include a cabinet 1 forming the exterior, and a control panel P provided in the cabinet 1.

[0051] The control panel P may include a device that enables communication between a user and the clothing treatment apparatus (including other electronic devices). Communication between the user and the clothing treatment apparatus means a process in which the user inputs a control command to the clothing treatment apparatus and a process in which the clothing treatment apparatus transmits information to the user.

[0052] The control panel P may be provided to receive, from the user, at least one of a power command for supplying or cutting off power to the clothing treatment apparatus, a selection command for selecting an arbitrary course or option for processing laundry, an execution command for executing the selected course or option, or a stop command for stopping the course or option being executed.

[0053] Treatment of clothing may include a washing cycle for removing foreign substances from the clothing using water and detergent, a drying cycle for drying water contained in the clothing, and a refreshing cycle for deodorizing and removing wrinkles from the clothing using hot air and steam.

[0054] The control panel P may include a first display portion P8 that displays the operating state of the clothing treatment apparatus or information on courses or options to the user.

[0055] The first display portion P8 may be provided to display a state in which at least one of the power command, selection command, execution command, execution command, or stop command has been input. In addition, the first display portion P8 may display error information indicating a problem that has occurred in the clothing treatment apparatus or guidance information for informing the user of an action to be taken by the user.

[0056] The first display portion P8 may be provided to visually display the information.

[0057] The first display portion P8 may include liquid crystal that radiates light to the outside.

[0058] In addition, the first display portion P8 may include at least one of a display panel capable of outputting text and figures or a speaker capable of outputting voice signals and sounds.

[0059] Hereinafter, the first display portion P8 will be described as a rotary knob having a liquid crystal display provided thereinside, but this is merely an example and the first display portion P8 may be provided in any configuration as long as it is exposed to the outside of the cabinet 1 and can display information, and may be installed at any location.

[0060] In the clothing treatment apparatus 100 of the present disclosure, the cabinet 1 may include a front panel 13 forming the front, and an upper panel 11 coupled to the upper portion of the front panel 13. The front panel 13 and the upper panel 11 may be formed of a metal material and may be provided in the shape of a steel plate.

[0061] The control panel P of the clothing treatment apparatus of the present disclosure may be combined with the front panel 13.

[0062] The control panel P may be attached to the back surface of the front panel 13 and partially exposed to the front surface of the front panel 13. The front panel 13 may be manufactured as a simple metal plate, and the control panel P may be simply attached to and fixed to the back surface of the front panel 13.

[0063] Therefore, the front panel 13 may form most of the front surface area of the cabinet 1. As a result, the unity of the front panel 13 may be strengthened, and thus the aesthetics may be maximized. In addition, the process of manufacturing the front panel 13 may be simplified, and the process of assembling or installing the front panel 13 and the control panel P

may be simplified. Furthermore, components such as a separate frame for fixing the control panel P to the front panel 13 may be omitted.

[0064] The control panel P of the clothing treatment apparatus of the present disclosure may include not only the first display portion P8 but also an operation part P7 that can receive a command from the user.

[0065] The operation part P7 may be provided in the form of a rotary knob, and the first display portion P8 may be provided as a display D including a liquid crystal display device. The first display portion P8 and a selection part R which will be described below may be included within the operation part P7.

[0066] The first display portion P8 may be provided entirely as a touch panel, or at least part thereof may be provided as a touch panel.

[0067] The first display portion P8 may be provided as a simple liquid crystal display that does not receive commands.

[0068] The operation part P7 may be provided to be rotated for selection of any course or option for processing clothing.

[0069] The first display portion P8 may be provided to display a corresponding course or option whenever the operation part P7 is rotated.

[0070] Accordingly, the control panel P of the clothing treatment apparatus of the present disclosure may prevent any course or option for rotating a drum, which will be described below, from being displayed as text, guidance text, or the like in a certain area.

[0071] Therefore, the area or area ratio occupied by the control panel P in the front panel 13 may be significantly reduced, and since no additional text or guidance text is displayed on the front panel 13, the aesthetics can be maximized.

[0072] The operation part P7 and the first display portion P8 may be provided to operate only when power is supplied. To this end, the control panel P of the clothing treatment apparatus of the present disclosure may further include a power supply part P46 for inputting a power command to the clothing treatment apparatus, in addition to the operation part P7 and the display.

[0073] The user may activate the operation part P7 by operating the power supply part P46.

[0074] In addition, the control panel P may further include an execution part P47 to which an execution command for executing or stopping a selected course or option is input. The execution part P47 may be provided separately from the operation part P7 and the first display portion P8 to receive a user's intent to execute or stop a selected course or option.

[0075] The execution part P47 may be provided separately from the operation part P7 to prevent the functions of the operation part P7 and the first display portion P8 from becoming overly complicated.

[0076] The control panel P may be configured as a control box for installation or accommodation of the power supply part P46, the execution part P47, the operation part P7, and the first display portion P8 and may be coupled to the front panel 13.

[0077] The control panel P may further include a setting part P19 by which options can be added to the courses or changed, provided on the front panel 13. The user can set options for changing the intensity, duration, and the like of a course through the setting part P19.

[0078] The setting part P19 may include a separate liquid crystal display device from the first display portion P8.

[0079] The setting part P19 may include a touch panel or physical buttons by which the options can be input.

[0080] The power supply part P46, the execution part P47, the operation part P7, and the setting part P19 may be collectively referred to as an input part in that they receive commands from the user.

[0081] As a result, the control panel P may include the input part that receives control commands from the user, and the first display portion P8 that outputs information such as control commands selectable by the user.

[0082] The control panel P may be provided with a controller that can operate the clothing treatment apparatus, and the controller may be provided in the form of a PCB accommodated in the control box.

[0083] The control panel P may be referred to as a controller, and the first display portion P8 and the input part may be installed in the controller.

[0084] The controller may be provided to not only communicate with the first display portion P8 and the input part, but also control all internal components of the clothing treatment apparatus or transmit signals for controlling the same.

[0085] The front panel 13 may include an inlet 111 that is provided to communicate with a drum accommodated in the cabinet 1 and a door 132 that is rotatably coupled to the cabinet and opens and closes the inlet 111.

[0086] The control panel P may be located above the door 132 to enhance user accessibility.

[0087] The front panel 13 may further include a locking member L that secures the door 132 to the front panel 11. When the clothing treatment apparatus operates in such a manner that the drum of the clothing treatment apparatus rotates, the locking member L may lock the door 132 to the front panel 13. This prevents safety incidents. The locking member L may unlock the door 132 when the operation of the clothing treatment apparatus ends.

[0088] The locking member L may be provided in any configuration as long as it can secure the door 132 to the cabinet 1. The locking member L may be provided as a fastening member that fastens a hook protruding from the door, and may also be provided as a solenoid valve that holds the hook.

[0089] The clothing treatment apparatus of the present disclosure may include a detergent box 24 in which detergent for washing laundry is stored, and the front panel 13 may include a detergent hole 131 through which the detergent box 24 is ejected.

[0090] The front panel 13 may be provided with a filter hole 24 through which a filter of the clothing treatment apparatus can be changed.

[0091] FIG. 2 illustrates an embodiment of the control panel P of the clothing treatment apparatus of the present disclosure.

[0092] In a status display area D1 of the first display portion P8, whether the door is locked, whether a communication module is activated, whether a course or option is underway, whether a guidance message is generated, and the like may be displayed in the form of icons. In addition, the status display area D1 may display the number of menu items that can appear when the operation part P7 is rotated. For example, a plurality of dots may be spaced apart and displayed and one of the dots may emit light to provide the number of menu items displayed in a content display area D2.

[0093] The status display area D1 may display a lock status D11 indicating whether the door 132 is locked to the cabinet, an activation status D12 of the communication module T, an execution status D13 of a course or option, and a notification status D14 indicating that there is notification information for the user.

[0094] The content display area D2 is an area having the largest area in the first display portion P8 and may display a selection status, an execution status, a stop status, and a completion status of a course or option and also display statuses of other home appliances which will be described later.

[0095] In addition, the control panel P may further include a selection part R through which the user inputs a decision command for determining information displayed on the first display portion P8. The selection part R may be provided inside the operation part to further reduce the area occupied by the control panel P.

[0096] The selection part R may be provided inside the first display portion P8 and may be disposed apart from the content display area D2. The selection part R may be provided as a physical button or a touch panel that detects contact with the user's body.

[0097] The display portion P8display portion P84 of the display may include an input area D3 for requesting an input to the selection part R, provided at a point corresponding to the selection part R.

[0098] The input area D3 may be provided to emit light when the selection part R is activated to receive a command from the user.

[0099] The content display area D2 may display the menu items of courses and options, execution statuses of the courses or options, and guidance text required for the user.

[0100] The content display area D2 may be provided with a wider area than the status display area D1. The input area D3 may emit light to request input from the user and may display guidance text for guiding user input.

[0101] The power supply part P46 may be provided on the left side of the first display portion P8, and the execution part P47 may be provided on the right side thereof.

[0102] The operation part P7 may be provided to be rotatable on the outer surface of the first display portion P8 and may be provided to rotate the drum 33.

[0103] The courses mentioned above may be a series of control methods for performing a washing cycle for washing laundry.

[0104] When the operation part P7 is rotated, the name of a corresponding course and a simple option name may be displayed in the content display area D2 of the first display portion P8 according to a set order, and a description of the course or option may be displayed.

[0105] The options may be selected by the setting part P19. The setting part P19 may be configured to receive a selection command for selecting one or more of the arbitrary options.

[0106] The arbitrary options may include setting additional conditions of the courses.

[0107] For example, an arbitrary option may be a set algorithm or control method for controlling at least one of the number of repetitions of each cycle for performing a course, the intensity at the time of performing each cycle, the rotation speed of the drum at the time of performing each cycle, the temperature of water, the amount of water, or the duration of each cycle.

[0108] The setting part P19 may be provided as a touch display through which the arbitrary option can be selected, and may include a plurality of lamps and a plurality of conductor switches capable of detecting the user's body.

[0109] For example, the setting part P19 may include an option selection part B for receiving a setting command for setting conditions for a course, and an option display B4 for displaying option information corresponding to the option selection part B.

[0110] For example, the option selection part B may include a rinsing part B1 for controlling rinsing power related to the rotation speed and duration of the drum, the amount of water, and the number of rinsing cycles when a course of a rinsing cycle is performed, a spin-drying part B2 for controlling spin-drying power related to the rotation speed and duration of the drum when a course of a spin-drying cycle is performed, and a temperature part B3 for controlling the temperature of water when a course of a washing cycle is performed.

[0111] The option display B4 may be provided to display the rinsing power, spin-drying power, and temperature in an objective and unified manner.

[0112] Meanwhile, the setting part P19 may include a utilization part C for receiving a utilization command for utilizing the

functions of the clothing treatment apparatus.

[0113] For example, the utilization part C may include a washing part C1 for receiving commands for special washing cycles such as functional clothing washing, soft clothing washing, and drum cleaning, a reservation part C2 for receiving a reservation command for performing a washing course at a specific time, a sterilization part C for sterilizing clothing by supplying steam to the clothing during the course cycle, and an additional function part C4 for utilizing additional functions such as pairing with other devices.

[0114] In addition, the setting part P19 may include a switching part E for receiving a connection command for communicating with a drying apparatus 20 or a mini apparatus 60.

[0115] Meanwhile, the setting part P19 may illuminate functions that are available at the present time or functions selected by the user, and turn off functions that cannot be executed or are not selected by the user.

[0116] The setting part P19 may display all of the above menu items through a display of an auxiliary setting part.

[0117] FIG. 3 illustrates another embodiment of the control panel P of the clothing treatment apparatus of the present disclosure.

[0118] The control panel P of the present disclosure may include a second display portion P81 that may display information externally and also receive user commands.

[0119] The second display portion P81 may be provided as a touch panel, may display information received by the controller, such as information related to clothing and information related to courses, and may also serve as an input part that receives, from the user, one or more of a power command for supplying power to each component of the clothing treatment apparatus, a selection command for selecting one or more of the courses and options, an execution command for performing the courses, and a stop command for stopping the courses.

[0120] If the control panel P of the present disclosure includes the second display portion P81, buttons pressed by physical force, and the like may be omitted. Accordingly, the aesthetics of the clothing treatment apparatus can be maximized.

[0121] The second display portion P81 may display content in various languages and may display information not only as text but also as icons, pictograms, images, etc. Accordingly, the display form of the second display portion P81 may be changed depending on the environment and region in which the clothing treatment apparatus of the present disclosure is installed, or a trend. As a result, the control panel P may be commonly used in all countries and regions where the clothing treatment apparatus is sold.

[0122] In addition, since a command input to the second display portion P81 is set differently as the content displayed on the second display portion P81 changes, other commands in addition to the above-mentioned commands may be input to the clothing treatment apparatus of the present disclosure through the second display portion P81 depending on the situation and need.

[0123] As a result, the second display portion P81 can be regarded as a component in which the operation part P7 and the first display portion P8 are integrated.

[0124] For example, the second display portion P81 may be regarded as a component in which the execution part P47, the power supply part P46, and the auxiliary display P19 are also integrated.

[0125] The control panel P of the clothing treatment apparatus of the present disclosure may further include an additional input part such as buttons in addition to the second display portion P81. For example, the power supply part P46 and the execution part P47 may be arranged outside the second display portion P81.

[0126] The second display portion P81 may be disposed above the door 14, and may be installed above the door 14. The second display portion P81 may be disposed on the upper side of the front surface of the cabinet 100.

[0127] The second display portion P81 may have a width W greater than a height H. As a result, the second display portion P81 may display a lot of information at the same time, or may display specific information in a large and wide manner.

[0128] For example, the second display portion P81 may be provided in a rectangular shape. Alternatively, the second display portion P81 may be provided in an oval shape or a track shape. When the second display portion P81 is provided in a track shape, it can display a variety of content while emphasizing aesthetics.

[0129] The width W of the second display portion P81 may be set to be greater than half the width of the cabinet.

[0130] For example, the second display portion P81 may include a straight portion a disposed at the upper and lower portions, and a curved portion b disposed at both ends of the straight portion a.

[0131] The curved portion b may be provided to connect the ends of the straight portions a disposed at the upper and lower portions, and may have a curvature formed in a direction away from the straight portions a to the outside.

[0132] For example, the curved portion b may be provided in a semicircular shape, and may have a curvature greater or smaller than the arc.

[0133] A proximity sensor S may be disposed on one side of the second display portion P81.

[0134] The proximity sensor S may be installed in the internal area of the second display portion P81.

[0135] The second display portion P81 may include a first area I that displays information.

[0136] The second display portion P81 may be provided as an area in which light is emitted. The first area I may be

defined as the entire area of the second display portion P81. The second display portion P81 may correspond to the first area I in which information is displayed.

[0137] The second display portion P81 may include at least one partitioned area obtained by partitioning the first area in the horizontal or vertical direction.

[0138] Partitioned areas II, III, IV, V, and VI may be defined as areas that partition the first area into multiple areas and have arbitrary areas. The total area of the partitioned areas may correspond to the first area I.

[0139] For example, the second display portion P81 may include a second area II and a third area III obtained by dividing the first area into left and right areas.

[0140] The second area II may be disposed on the left side in the first area I, and the third area III may be disposed on the right side of the second area II and may be disposed on the right side in the first area I.

[0141] The sum of the area of the second area II and the area of the third area III may correspond to the area of the first area I.

[0142] The second display portion P81 may display information provided by the controller on the first area corresponding to the entire area, or may display the same on at least one of two or more areas partitioned from the first area in the horizontal or vertical direction.

[0143] The partitioned areas may include the second area II disposed on the left side in the first area I and the third area III disposed on the right side of the second area.

[0144] The width of the second area II may be set to be the same as the width of the third area III.

[0145] In addition, the width of the second area II and the width of the third area III may be set to be different from each other as needed. In addition, the width of the second area II and the width of the third area III may be varied depending on the form and amount of information displayed thereon.

[0146] Unlike the drawing, the partitioned areas may include a second area II disposed on the left side in the first area I, a third area III disposed on the right side of the second area, and a fourth area IV disposed on the right side of the third area.

[0147] The information displayed on the second area II, the information displayed on the third area III, and the information displayed on the fourth area IV may be set differently.

[0148] Unlike the drawing, the partitioned areas may include an upper area or a fifth area V disposed on the upper side in the first area I, and a lower area or a sixth area VI disposed on the lower side of the upper area.

[0149] That is, the second display portion P81 may display information by dividing the first area I into one or more upper and lower areas instead of left and right areas. The information displayed in the upper area and the information displayed in the lower area may be set differently.

[0150] In addition, the second display portion P81 may display information by dividing the first area I into three or more upper and lower sections.

[0151] As a result, the second display portion P81 may display information by arbitrarily dividing the screen into any natural number of left, right, upper and lower sections depending on the situation.

[0152] The second display portion P81 may display information in the first area I and display additional information in each of the partitioned areas of the first area. In addition, the second display portion P81 may display different types of information in the first area I and the partitioned areas.

[0153] Accordingly, the second display portion P81 can be utilized in various ways.

[0154] For example, the information displayed in the first area and the information displayed in each partitioned area may be of different types, or even if the types are the same, the detailed menu items may be different.

[0155] Even if the information displayed in the first area and the information displayed in each partitioned area are of the same type or content, the display format and method may be different.

[0156] In addition, the information displayed in partitioned areas may be of different types, or even if the types are the same, the detailed menu items may be different. Even if the information displayed in the partitioned areas is of the same type or content, the display format and method may be different.

[0157] The display format of the first display portion P8 or the second display portion P81 may vary depending on various standards and methods of the clothing treatment apparatus.

[0158] For example, the display format or content of the second display portion P81 may vary depending on the elapsed time or operating status of the clothing treatment apparatus.

[0159] For example, the course name or condition, or weight information of laundry may be displayed first in the first area I of the second display portion P81. At this time, when the user operates the execution part P47, the second display portion P81 may partition the screen, display the name of a course in the second area II of the display portion P81, and display the progress status or remaining time of the course in the third area III. In addition, when the course ends, end status information may be displayed in the first area I.

[0160] As another example, when the user activates the power supply part P46, status information indicating control panel booting or detection of a load of laundry may be displayed in the first area I. Thereafter, when a load of laundry is detected, the first area I may be partitioned, information related to clothing may be displayed in the second area II, and course information related to the selected course may be displayed in the third area III.

[0161] As another example, the first area may display information related to clothing and a course, one of the partitioned areas may display letters related to the clothing or the course, and another partitioned area may display numbers related to the clothing or the course.

[0162] In this way, depending on the operating status of the clothing treatment apparatus, it is possible to display various types of information as characters, pictograms, icons, and images in the first area and the areas partitioned from the first area on the screen of the second display portion P81 by varying the form, color, and size of the displayed information.

[0163] The information to be displayed in the first area I and any of the partitioned areas on the second display portion P81 may be changed at any time according to a program stored in the control panel, and the program may be updated at any time by communicating with an installer, a server, or an external terminal.

[0164] As a result, the second display portion P81 may display information only in the first area I or display information in the partitioned areas in a distributed manner depending on the situation and need through the screen having a width greater than the height.

[0165] The size of information displayed in the first area may be different from the size of information displayed in one of the partitioned areas.

[0166] In addition, the color of information displayed in the first area may be different from the color of information displayed in one of the partitioned areas.

[0167] In addition, the partitioned areas may be obtained by dividing the first area I by any number and in any direction and area, and the partitioned areas may also be varied depending on the situation.

[0168] Accordingly, the second display portion P81 may be displayed in various manners depending on the situation and circumstances even after the clothing treatment apparatus is sold.

[0169] Although the second display portion P81 has been described as displaying information in the first area I and partitioned areas, this can be equally applied to the content display area D2 of the first display portion P8 displaying information in the entire area and partitioned areas.

[0170] Hereinafter, it will be described that the display form of the first display portion P8 or the second display portion P81 changes depending on the distance between the user and the clothing treatment apparatus using a proximity sensor, etc.

[0171] However, change in the position of the user is merely a criterion or example for changing the display form of the first display portion P8 or the second display portion P81, and is not the only criterion for changing the display form of the first display portion P8 or the second display portion P81, as stated above.

[0172] FIG. 4 illustrates the internal structure of the clothing treatment apparatus 100 of the present disclosure.

[0173] The internal structure of the clothing treatment apparatus may not change regardless of the form in which the control panel P of the clothing treatment apparatus of the present disclosure is provided.

[0174] The following description is based on the clothing treatment apparatus 100 of the present disclosure being a washing machine. However, this is merely an example, and the clothing treatment apparatus 100 of the present disclosure may be a clothing management apparatus as a dryer or a styler.

[0175] The clothing treatment apparatus 100 of the present disclosure may include a cabinet 1 forming the exterior, a tub 2 accommodated in the cabinet 1 to store water, a drum 3 rotatably provided in the tub 2 to store water, a driving unit 32 coupled to the tub 2 to rotate the drum 3, a water supply part 23 provided to supply water to the tub 2, and a drain part 25 provided to drain water from the tub 2.

[0176] The driving unit 32 may include a stator 321 coupled to the rear of the tub 2, a rotor 322 rotated by the stator 321, and a rotation shaft 323 coupled to the rotor 322 to rotate the drum 3.

[0177] The water supply part 23 may include a water supply pipe 231 that connects an external water source and the tub 2, and a water supply valve 233 that opens and closes the water supply pipe 231.

[0178] The water supply part 23 may further include a detergent box 234 that is provided to be ejectable from the cabinet 1 and is provided to put detergent into the tub 2, the water supply pipe 231 may communicate with the detergent box 234, and the detergent box 234 may be connected to the tub 2 by a supply pipe 232.

[0179] The drain part 25 may include a drain pipe 251 provided under the tub 2, a drain pump 252 that is coupled to the drain pipe 252 and provides power to discharge water, and a discharge pipe 253 that discharges water from the drain pump 252 to the outside.

[0180] The clothing treatment apparatus 100 of the present disclosure may further include a support part 22 that supports the tub 2 and the drum 3 within the cabinet 1.

[0181] The support part 22 may include a damper 222 or a spring that supports the tub 2, and a bearing housing module 221 that supports the load of the drum 3 and the driving unit 32.

[0182] The clothing treatment apparatus 100 of the present disclosure may further include a circulation part 26 that circulates water discharged through the drain part 25 back to the tub 2. The circulation part 26 may include a circulation pump 261 that communicates with the drain pipe 251, and a circulation pipe 262 that supplies water from the circulation pump 261 to the upper part of the tub 2.

[0183] The circulation pump 261 and the drain pump 252 may be provided as one body.

[0184] In addition, the control panel P may be provided to perform any washing course and washing option to remove foreign substances from laundry by operating at least one of the driving unit 32, the water supply valve 232, or the drain pump 252. The washing course and washing option may be configured as a series of control methods capable of performing all of the washing cycle, the rinsing cycle, and the spin-drying cycle.

[0185] Hereinafter, control of a display state of a display based on the above configuration in the clothing treatment apparatus of the present disclosure will be described.

[0186] Performing any course or option by the controller P of the clothing treatment apparatus of the present disclosure may correspond to performing a course for rotating the drum 3 by controlling the driving unit 32.

[0187] The controller P may be provided to transmit information including the state of the inside of the cabinet 1 as well as information corresponding to a command input through the input part to the first display portion P8 while performing a course.

[0188] The first display portion P8 may display the information transmitted from the controller P in various visual forms.

[0189] The clothing treatment apparatus of the present disclosure may further include a proximity sensor S capable of detecting the distance between the cabinet 1 and the user. It is preferable that the proximity sensor S be provided on the front panel 13 of the cabinet 1 to accurately detect the position of the user and the distance from the user.

[0190] The proximity sensor S may be provided to transmit information on the position of the user and the distance from the user to the controller P.

[0191] The proximity sensor S may detect not only the distance between the user and the cabinet 1 but also how long the user stays at a specific location. In addition, the proximity sensor S may be provided to check the user's pupil to detect whether the user is staring at the first display portion P8.

[0192] As described above, the first display portion P8 may display information related to the status of the clothing treatment apparatus transmitted from the controller P and may be provided as a liquid crystal display to display the information variably.

[0193] It may be desirable to display a larger amount of and more detailed information on the first display portion P8. However, if the user is located at a distance where the user cannot correctly identify the information displayed on the first display portion P8, the user may not easily recognize the information displayed on the first display portion P8 even if the information is displayed in detail.

[0194] In particular, if the display area of the first display portion P8 is limited, the more information and the more detailed the information displayed on the first display portion P8, the smaller the display size of the information becomes, and thus the user who is far away may not be able to recognize the information displayed on the first display portion P8.

[0195] On the other hand, desirably, as little information as possible should displayed on the first display portion P8 to maximize intuitiveness. However, if the user is at a position where the user can directly control the control panel P, the user may experience inconvenience when the information displayed on the first display portion P8 is not detailed or the amount of information is insufficient and thus the user cannot recognize necessary information at once.

[0196] In addition, when various colors are displayed on the first display portion P8, it may be more advantageous to recognize important information.

[0197] However, if the user is located at a distance where the user cannot correctly identify the information displayed on the first display portion P8, it may be difficult for the user to identify necessary information if the colors are diverse. In addition, although the user is at a position where the user cannot identify the information displayed on the first display portion P8, if various colors are displayed on the first display portion P8, the computational load of the controller P may increase or the energy consumed by the first display portion P8 may be wasted.

[0198] Further, if the user is located at a distance where the user cannot correctly identify the information displayed on the first display portion P8, the user may not be able to identify important information if the color displayed on the first display portion P8 is monotonous.

[0199] The clothing treatment apparatus 100 of the present disclosure may be provided to determine the form of information displayed on the first display portion P8 depending on the distance between the user and the cabinet 1 or the proximity sensor S.

[0200] Specifically, the controller P may perform control such that at least one of the amount of information displayed on the first display portion P8, the number of pieces of information displayed, or the form of information displayed is changed when the distance between the user and the proximity sensor S varies.

[0201] Accordingly, the clothing treatment apparatus 100 of the present disclosure may appropriately change the form and content of displayed information depending on the location of the user.

[0202] As a result, the user can intuitively ascertain the currently displayed information even from a distance, thereby reducing the effort of approaching.

[0203] In addition, the clothing treatment apparatus of the present disclosure can provide existing information as text to a nearby user in a friendly and detailed manner to enhance the user's ability to understand the information, and may suggest more detailed information and even recommended information to enhance the usability of the clothing treatment apparatus.

[0204] In addition, the clothing treatment apparatus of the present disclosure can display information and menus appropriate to the current situation of the user, thereby reducing the user's efforts to find necessary information or menus.

[0205] In addition, the clothing treatment apparatus of the present disclosure can convey information to the user intuitively and aesthetically through images, symbols, pictograms, icons, etc., as well as text.

[0206] FIG. 5 illustrates a method of controlling the clothing treatment apparatus of the present disclosure.

[0207] The clothing treatment apparatus of the present disclosure may perform a distance detection step X1 of detecting the distance between the proximity sensor S and the user.

[0208] When the distance detection step X1 is performed, the controller P may perform a display step X2 of determining a display state of the first display portion P8 depending on the distance from the user.

[0209] The proximity sensor S may perform a position change detection step X3 of determining whether the distance from the user has changed. The position change detection step X3 may be a step of detecting whether the user's position has changed enough to change the display state of the first display portion P8, rather than a step of detecting a simple change in the distance from the user.

[0210] For example, on the basis of a first distance L1, which is a distance at which the user can recognize details of the first display portion P8 or a distance at which the user can control the control panel P, the position change detection step X3 may be a step of detecting whether the user has moved beyond the first distance L1 or has moved within the first distance L1.

[0211] When the user's location changes based on the first distance L1, the controller P may perform a display change step X4 of changing the form of information displayed on the first display portion P8 accordingly.

[0212] The controller P may detect whether the user's location has changed based on not only the first distance, but also a second distance longer than the first distance or a third distance shorter than the first distance in the position change detection step X3, and the display change step X4 may include changing the display form depending on change in the user's location based on the first distance, the second distance, and the third distance.

[0213] Furthermore, the position change detection step X3 may include further segmenting the distance from the user and detecting the same, and the display change step X4 may include changing the display form depending on each of segmented distance criteria.

[0214] In any case, the clothing treatment apparatus of the present disclosure can display information in a smaller size as the user approaches the proximity sensor S or the cabinet 1.

[0215] In any case, the clothing treatment apparatus of the present disclosure can increase the number of pieces of information and the number of types of information and display the information as the user approaches the proximity sensor S or the cabinet 1.

[0216] In any case, the clothing treatment apparatus of the present disclosure can display a large amount of text as information displayed as the user approaches the proximity sensor S or the cabinet 1.

[0217] In any case, the clothing treatment apparatus of the present disclosure can display information including text as a sentence including predicates or verbs as the user approaches the proximity sensor S or the cabinet 1.

[0218] FIG. 6 illustrates an embodiment in which the method of controlling the clothing treatment apparatus of the present disclosure is applied.

[0219] The first display portion P8 may be partitioned into the status display area D1, the content display area D2, and the user selection area D3. At this time, information currently required by the user may be displayed in the content display area D2.

[0220] Referring to FIG. 6(a), the user may be located at a distance L3 farther away from the cabinet 1 than the first distance L1.

[0221] When the proximity sensor S recognize the distance from the user as the distance L3, the controller P may display status information in the content display area D2 such that the user at a distance can recognize the status of the clothing treatment apparatus.

[0222] The status information may indicate the operating state of the clothing treatment apparatus. The status information may include at least one of the progress status of a course or the remaining time when the clothing treatment apparatus is operating the course. For example, if the clothing treatment apparatus is in the process of drying laundry, the status information may include operation information D21 indicated by the text "drying" and the number "01:20".

[0223] The operation information D21 may be displayed such that it occupies the entire area of the content display area D2. As a result, even if the user located at a distance L3 does not approach the first display portion P8, the user can correctly recognize the status information D21 displayed on the first display portion P8.

[0224] Referring to FIG. 6(b), the user may be located at a short distance L2 closer than the first distance L1 from the cabinet 1.

[0225] When the proximity sensor S recognizes the distance from the user as a short distance L2, the controller P may provide various types of status information to the user or display status information in more detail. The controller P may partition the content display area D2 on the first display portion P8 and display status information for each partitioned area.

[0226] For example, the content display area D2 may be partitioned in the width direction. That is, the content display

area D2 may be partitioned into three areas in the width direction, and the operation information D21 may be displayed as it is in the middle area. Name information D211 of the course in progress may be displayed in the left area, and information D212 on the temperature at which laundry is currently dried may be displayed in the right area.

[0227] As a result, the closer the user is to the proximity sensor S, the more status information can be displayed in the content display area D2.

[0228] In addition, the operation information D21 displayed as the text "drying" and the number "01:20" may be displayed smaller than when the user is located at a long distance. For example, the operation information D21 may be displayed in a size corresponding to half the height of the content display area D2.

[0229] As a result, information can be displayed more densely in the content display area D2 in the first display portion P8.

[0230] FIG. 7 illustrates an embodiment when the control panel of the clothing treatment apparatus of the present disclosure is provided as a second display.

[0231] The first area I of the second display may display information currently required by the user. The second display portion P81 is provided to display the status information in a partitioned area obtained by partitioning the first area I.

[0232] Referring to FIG. 7(a), the user may be located at a distance L3 farther away from the cabinet 1 than the first distance L1.

[0233] When the proximity sensor S recognizes the distance from the user as the distance L3, the controller P may display status information on the second display portion P81 such that the user at a distance can recognize the status of the clothing treatment apparatus.

[0234] The status information may indicate the operating state of the clothing treatment apparatus. The status information may include at least one of the progress status of a course or the remaining time when the clothing treatment apparatus operates the course.

[0235] For example, if the clothing treatment apparatus is in the process of drying laundry, the status information may include operation information D21 displayed as the text "drying" and the number "01:20".

[0236] The operation information D21 may be displayed in the entirety of the first area I. Accordingly, even if the user located at the distance L3 does not come close to the second display portion P81, the user can correctly recognize the status information D21 displayed on the second display portion P81.

[0237] Referring to FIG. 7(b), the user may be located at a short distance L2 closer than the first distance L1 to the cabinet 1.

[0238] When the proximity sensor S recognizes the distance from the user as the short distance L2, the controller P may provide various types of status information to the user or display the status information in more detail.

[0239] The controller P may partition the first area I in the second display portion P81 and display status information in each of partitioned areas.

[0240] For example, the first area I of the second display portion P81 may be partitioned in the width direction. That is, the first area I may be partitioned into three areas in the width direction, and operation information D21 may be displayed as it is in the third area III. Name information D211 of the course in progress may be displayed in the second area II, and information D212 on the temperature at which laundry is currently dried may be displayed in the fourth area IV.

[0241] As a result, the second display portion P81 may be controlled such that more status information is displayed in a partitioned manner as the user approaches the proximity sensor S.

[0242] In addition, the operation information D21 displayed as the text "drying" and the number "01:20" may be displayed smaller when displayed in a partitioned area than when the user is located at a distance. For example, the operation information D21 may be displayed smaller when displayed in a partitioned area than when displayed in the first area I. As a result, sufficient status information may be displayed in a partitioned area even if each partitioned area is smaller than the first area I.

[0243] FIG. 8 illustrates another embodiment to which the method of controlling the clothing treatment apparatus of the present disclosure is applied.

[0244] Referring to FIG. 8(a), request information D23 for requesting the operation of the clothing treatment apparatus may be displayed in the content display area D2 of the first display portion P8.

[0245] When the proximity sensor S detects that the distance from the user is a long distance L3, the request information D23 may be displayed as a word or phrase excluding a predicate or verb.

[0246] For example, the request information D23 may be displayed as characters that contain a meaning, such as "Laundry break for seven days". In addition, the request information D23 may be displayed in a size that corresponds to the entire content display area D2.

[0247] As a result, the request information D23 may be displayed in a size that can be easily recognized by the user at a long distance L3 as a phrase with a necessary meaning. In this way, the user can check or recognize that laundry is piled up because the clothing treatment apparatus is not being used.

[0248] Meanwhile, the content display area D2 may be displayed in a different color such that the user located at the distance L3 can recognize that the request information D23 is important information unlike other information.

[0249] In this way, the user located at the long distance L3 may be induced to approach the first display portion P8 through the color displayed in the content display area D2 even if the user does not directly recognize the request information D23, and the user can recognize the request information D23 in a timely manner.

[0250] Referring to FIG. 8(b), when the proximity sensor S detects that the distance from the user is a short distance L2, the first display portion P8 may be partitioned and the request information D23 may be displayed in a partitioned area.

[0251] For example, the first display portion P8 may be partitioned in the width direction and the request information D23 may be displayed in one partitioned area. As a result, the request information D23 may be displayed in a small size.

[0252] The controller P may display the request information D23 as request sentence information D231 including a predicate or verb upon recognizing that the user is located at the short distance L2.

[0253] The request sentence information D231 expresses the meaning of the request information D23 that does not contain a predicate or verb using a predicate or verb.

[0254] For example, the request sentence information D231 may indicate the intent of the request information D23, such as "Isn't there a lot of laundry piled up?". Accordingly, the user may be induced to take direct action by understanding the exact meaning of the request information D23.

[0255] The controller P may display various types of information including status information on the first display portion P8 using more colors upon recognizing that the user is located at the short distance L2. Accordingly, the user located at a short distance can recognize that the information displayed on the first display portion P8 contains various types of information.

[0256] For example, the controller P may display different status information in another partitioned area of the first display portion P8. The controller P may display detailed information D232 that indicates information on the type of laundry that has been piled up so far. The detailed information D232 may store the history of the user's operation of the clothing treatment apparatus, and thus the user can recognize which laundry to process first through the detailed information D232.

[0257] The detailed information D232 may be displayed in a different color to cause the user to recognize that it is more important.

[0258] For example, the detailed information D232 may be displayed in a brighter or darker color than other areas.

[0259] FIG. 9 illustrates an embodiment of utilization when the control panel of the clothing treatment apparatus of the present disclosure includes the second display.

[0260] The second display portion P81 of the present disclosure may display the color displayed in the first area I or the color displayed in each of the partitioned areas differently depending on the content of information.

[0261] Referring to FIG. 9(a), the first area I of the second display portion P81 may display request information D23 for requesting operation of the clothing treatment apparatus.

[0262] When the proximity sensor S detects that the distance from the user is a long distance L3, the request information D23 may be displayed as a word or phrase excluding a predicate or verb.

[0263] For example, the request information D23 may be displayed as characters that contain a meaning, such as "Laundry break for seven days". In addition, the request information D22 may be displayed in a size that corresponds to the first area I.

[0264] As a result, the request information D23 may be displayed in a size that can be easily recognized by the user at the long distance L3 as a phrase with a necessary meaning. Accordingly, the user can check or recognize that a lot of laundry has piled up due to not using the clothing treatment apparatus.

[0265] The second display portion P81 may display the request information D23 in a different color such that the user at the distance L3 can recognize that the request information D23 is important information, unlike other information.

[0266] Accordingly, the user located at the distance L3 may be induced to approach the second display portion P81 through the color displayed in the first area I even if the user does not directly recognize the request information D23, and the user can recognize the request information D23 in a timely manner.

[0267] Referring to FIG. 9(b), when the proximity sensor S detects that the distance from the user is a short distance L2, the second display portion P81 may display the request information D23 in a partitioned area.

[0268] For example, the second display portion P81 may partition the first area I in the width direction and display the request information D23 in each partitioned area. As a result, the request information D23 may be displayed in a small size.

[0269] The controller P may display the request information D23 in the second area II as request sentence information D231 including a predicate or verb upon recognizing that the user is located at the distance L2.

[0270] The request sentence information D231 expresses the meaning of the request information D23 that does not contain a predicate or verb using a predicate or verb.

[0271] For example, the request sentence information D231 may indicate intent of the request information D23, such as "Isn't there a lot of laundry piled up?". As a result, the user may be induced to take direct action by understanding the exact meaning of the request information D23.

[0272] The controller P may display various types of information including status information using more colors in the second display portion P81 upon recognizing that the user is located at the distance L2. In this way, it is possible to cause the user located in close proximity to recognize that the information displayed on the second display portion P81 contains

various types of information.

[0273] For example, the controller P may display different status information in the third area II of the second display portion P81. The controller P may display detailed information D232 indicating information on the type of laundry that has been piled up so far. The detailed information D232 may store the history of the user's operation of the clothing treatment apparatus, and thus the user can recognize which laundry to process first through the detailed information D232.

[0274] The detailed information D232 may be displayed in a different color such that the user can recognize that it is more important.

[0275] For example, the detailed information D232 may be displayed in a brighter or darker color than other areas.

[0276] FIG. 10 illustrates another embodiment to which the method of controlling the clothing treatment apparatus of the present disclosure is applied.

[0277] Referring to FIG. 10(a), completion information D22 indicating the completion of a course or option may be displayed in the content display area D2 of the first display portion P8.

[0278] When the proximity sensor S detects that the distance from the user is a long distance L3, the completion information D22 may be displayed as a word or phrase excluding a predicate or verb.

[0279] For example, the completion information D22 may be displayed as characters containing a meaning such as "Laundry completed". In addition, the completion information D22 may be displayed in a size that corresponds to the entire content display area D2.

[0280] As a result, the completion information D22 may be displayed in a size that can be easily recognized by the user at the long distance L3 as a phrase with perfect meaning.

[0281] The content display area D2 may be displayed in a different color such that the user located at the distance L3 recognizes that the completion information D22 is important information, unlike other information. Accordingly, even if the user located at the distance L3 cannot directly recognize the completion information D22, the user may be induced to approach the first display portion P8 through the color displayed in the content display area D2, and the user can recognize the completion information D22 in a timely manner.

[0282] Referring to FIG. 10(b), when the proximity sensor S detects that the distance from the user is a short distance L2, the first display portion P8 may be partitioned and the completion information D22 may be displayed in a partitioned area.

[0283] For example, the first display portion P8 may be partitioned into upper and lower areas, and the completion information D22 may be displayed in a partitioned area. As a result, the completion information D22 may be displayed in a small size.

[0284] Upon recognizing that the user is located at the short distance L2, the controller P may display the completion information D22 as completion sentence information D221 including a predicate or verb.

[0285] The completion sentence information D221 may be additionally displayed along with the completion information D22 including no predicate or verb.

[0286] Upon recognizing through the proximity sensor S that the user has approached the first display portion P8 and is located at a distance L1, the controller P may change the content displayed on the first display portion P8 from the completion information D22 to the sentence information D221, or may add the sentence information D221.

[0287] The completion sentence information D221 may contain the meaning of the completion information D22, and may also contain the meaning of guidance or recommendations including the next action that the user needs to take upon recognizing the completion information D22.

[0288] For example, the completion sentence information D221 may be information for inducing the user to take a follow-up action, such "Keep it slightly open for internal drying", such that the user opens the door 132 after completion of the operation to dry the drum 3.

[0289] Therefore, when the user is located at the short distance L2, the controller P may not only transmit the status information, but also provide additional guidance information requesting a follow-up action.

[0290] Upon recognizing that the user is located at the short distance, the controller P may partition the first display portion P8 into upper and lower areas and display the status information in a partitioned area.

[0291] For example, the completion information D22 may be displayed in the upper area, and the sentence information D221 may be displayed in the lower area.

[0292] Therefore, although the display sizes of the completion information D22 and the sentence information D221 may be reduced, many types of status information including more guidance may be displayed in more detail.

[0293] FIG. 11 illustrates an embodiment of utilization when the control panel of the clothing treatment apparatus of the present disclosure includes the second display.

[0294] The second display portion P81 partition the first area I into upper and lower sections to create partitioned areas and display information in each partitioned area.

[0295] Referring to FIG. 11(a), the first area I of the first display portion P8 may display the completion information D22 indicating the completion of a course or option.

[0296] When the proximity sensor S detects that the distance from the user is a long distance L3, the completion information D22 may be displayed as a word or phrase excluding a predicate or verb.

[0297] For example, the completion information D22 may be displayed as characters that contain a meaning such as "Laundry completed". In addition, the completion information D22 may be displayed in a size that corresponds to the entire first area I.

[0298] As a result, the completion information D22 may be displayed in a size that even a user at the long distance L3 can easily recognize as a phrase with perfect meaning.

[0299] The content display area D2 may be displayed in a different color such that the user at the long distance L3 recognizes that the completion information D22 is important information, unlike other information. Accordingly, the user located at the distance L3 can be induced to approach the first display portion P8 through the color displayed in the first area I even if the user cannot directly recognize the completion information D22, and the user can recognize the completion information D22 in a timely manner.

[0300] Referring to FIG. 11(b), when the proximity sensor S detects that the distance from the user is a short distance L2, the second display portion P81 may be partitioned into a fifth area V and a sixth area V1 positioned below the fifth area V, and the completion information D22 may be displayed in a partitioned area.

[0301] For example, the completion information D22 may be displayed in the fifth area V. The completion information D22 may be displayed in a smaller size than when it is displayed in the first area I.

[0302] The completion information D22 may be displayed as the completion sentence information D221 including a predicate or verb in the sixth area VI. The completion sentence information D221 may be additionally displayed along with the completion information D22 having no predicate or verb.

[0303] Upon recognizing through the proximity sensor S that the user has approached the second display portion P81 and located a short distance L1, the controller P may move the completion information D22 displayed in the first area I of the second display portion P81 to the fifth area V and displays the sentence information D221 in the sixth area VI.

[0304] The completion sentence information D221 may contain the meaning of the completion information D22, and may also contain a meaning regarding guidance or recommendations including the next action that the user needs to take upon recognizing the completion information D22.

[0305] For example, the completion sentence information D221 may be information for inducing the user to take a follow-up action, such "Keep it slightly open for internal drying", such that the user opens the door 132 after completion of the operation to dry the drum 3.

[0306] Therefore, when the user is located at the short distance L2, the controller P may not only transmit the status information, but also provide additional guidance information requesting a follow-up action.

[0307] Upon recognizing that the user is located at the short distance, the controller P may partition the second display portion P81 into upper and lower areas and display the status information in a partitioned area.

[0308] For example, the completion information D22 may be displayed in the fifth area V, and the sentence information D221 may be displayed in the sixth area VI. As a result, the display sizes of the completion information D22 and sentence information D221 are reduced, but many types of status information including more guidance can be displayed in more detail.

[0309] FIG. 12 illustrates another embodiment to which the method of controlling the clothing treatment apparatus of the present disclosure is applied.

[0310] Referring to FIG. 12(a), the clothing treatment apparatus of the present disclosure may display a video, emoticon, symbol, pictogram, image, etc. containing information on the first display portion P8. That is, information containing non-text content may be displayed on the first display portion P8 to convey the content displayed on the first display portion P8 to users who use various languages or children.

[0311] In addition, the clothing treatment apparatus of the present disclosure may display non-text information on the first display portion P8 considering that a user located at a distance L3 has difficulty recognizing text displayed on the first display portion P8.

[0312] As a result, the user can recognize the current state of the clothing treatment apparatus 100 even if the user looks directly at the first display portion P8 from the distance L3.

[0313] Referring to FIG. 12(b), upon detecting that the user is located at a short distance L2, the controller P may display text information on the first display portion P8.

[0314] The text information may include words or phrases corresponding to the meaning of the aforementioned non-text information, and may also include numbers indicating the progress of the non-text information.

[0315] Therefore, even if the user does not understand the non-text information at the distance L3, the user can correctly understand the non-text information at the distance L2.

[0316] The first display portion P8 may be controlled such that a state in which the non-text information is displayed is changed to a state in which only the text information is displayed.

[0317] Further, the first display portion P8 may be controlled to additionally display the text information while the non-text information is displayed.

[0318] The text information may overlap the non-text information, or may be displayed separately from the non-text information.

[0319] When the text information is displayed, the non-text information may be changed to an achromatic color or have a lower brightness. As a result, delivery of the text information can become clear.

[0320] For example, the non-text information may include drainage image information D24, washing image information D25, and drying image information D26, and the text information may include drainage text information D241, washing course information D251, washing time information D252, drying course information D261, and drying time information D262.

[0321] When the text information is additionally displayed along with the non-text information or the non-text information is switched to the text information, the text information may be displayed in partitioned areas of the first display portion P8.

[0322] The amount of text information displayed may be greater than the amount of non-text information.

[0323] FIG. 13 illustrates an embodiment when the control panel of the clothing treatment apparatus of the present disclosure includes the second display.

[0324] When specific information is displayed in the first area I, additional information may be displayed in partitioned areas.

[0325] When additional information is displayed in the partitioned area, the information displayed in the first area I may be maintained. In this case, the brightness and saturation of the information displayed in the first area I may be lowered.

[0326] For example, referring to FIG. 13(a), the drainage image information D24 may be displayed in the first area I.

[0327] Referring to FIG. 13(b), drainage text information D241 may be additionally displayed in any one of the fifth area V and the sixth area VI. The drainage image information D24 may be displayed as it is in the first area I.

[0328] Referring to FIG. 13(c), the washing image information D25 may be displayed in the first area I.

[0329] Referring to FIG. 13(d), the washing course information D251 may be displayed in the second area, and the washing time information D252 may be displayed in the third area III. The washing image information D25 may be displayed as it is in the first area I.

[0330] Referring to FIG. 13(e), the drying image information D26 may be displayed in the first area I.

[0331] Referring to FIG. 13(f), the drying course information D261 may be displayed in the second area II, and the drying time information D262 may be displayed in the third area III. The drying image information D26 may be displayed as it is in the first area I.

[0332] Although changes in the shapes of the displays in relation to the proximity sensor have been described, this is merely an example of utilizing the displays, and the shapes of the displays do not always vary according to the detection result of the proximity sensor.

[0333] That is, the display form of the displays may vary depending on the state of the clothing treatment apparatus.

[0334] For example, the second display portion P81 may be controlled to display the aforementioned information in a partitioned area after displaying the same in the first area, or to display the information in the first area after displaying the same in the partitioned area.

[0335] The information displayed in the first area I and the information displayed in one or more of the partitioned areas II, III, IV, V, and VI may be set differently in at least one of content, form, and color.

[0336] The partitioned areas may include the second area II disposed on the left side in the first area I,

[0337] and the third area III disposed on the right side of the second area, and the information displayed in the second area and the information displayed in the third area may be set differently from each other.

[0338] Furthermore, the partitioned areas may include the second area disposed on the left side in the first area, the third area disposed on the right side of the second area, and the fourth area disposed on the right side of the third area. In this case, the information displayed in the second area, the information displayed in the third area, and the information displayed in the fourth area may also be set differently.

[0339] For example, the second area may display the name of a course, the third area may display the execution time of the course, and the fourth area may display the conditions for performing the course.

[0340] In addition, the partitioned areas may include an upper area located in the upper part of the first area, and a lower area located in the lower part of the upper area.

[0341] In this case, the information displayed in the upper area and the information displayed in the lower area may be set differently from each other.

[0342] The partitioned areas may include an upper area positioned in the upper part of the first area, a middle area positioned under the upper area, and a lower area positioned in the lower part of the middle area.

[0343] The information displayed in the upper area, the information displayed in the middle area, and the information displayed in the lower area may be set differently.

[0344] FIG. 14 illustrates an aspect in which the clothing treatment apparatus of the present disclosure detects a load of laundry on the basis of the configuration described above.

[0345] The clothing treatment apparatus of the present disclosure may detect a load of laundry before the execution part P47 is operated.

[0346] Specifically, the clothing treatment apparatus of the present disclosure may detect a load of laundry by rotating the drum 3 when the user operates the power supply part P46 or opening and closing of the door 132 is detected.

[0347] In addition, when laundry is put into the drum 3 and vibrations are transmitted to the driving unit 32, the drum 3 may be rotated less than one revolution immediately to detect the load of laundry.

[0348] As a result, since the drum 3 is rotated less than one revolution, even if the user puts laundry into the drum 3 with the door 132 open, the load of laundry can be detected without the possibility of the user being injured or the laundry being damaged.

[0349] Therefore, before selecting a course or option with the operation part P7 or executing a course or option with the execution part P47, the load of laundry can be detected, and an appropriate amount of detergent can be recommended, a suitable course can be recommended, or an estimated execution time or completion time of the course can be displayed directly while the user is looking at the display portion P8.

[0350] Accordingly, the usability of the clothing treatment apparatus can be improved, and the user can be informed of accurate time of collection of laundry.

[0351] The clothing treatment apparatus of the present disclosure may include a load sensor in the tub 2, the drum 3, or the driving unit 32 to immediately detect a load of laundry.

[0352] Hereinafter, an embodiment of the clothing treatment apparatus of the present disclosure in which a load of laundry is detected through the rotation of the drum 3 will be described.

[0353] Referring to FIG. 14(a), laundry can be placed on the bottom surface of the drum 3 due to gravity.

[0354] Referring to FIG. 14(b), when detecting a load of laundry, the clothing treatment apparatus of the present disclosure may rotate the drum 3 less than one revolution.

[0355] That is, the clothing treatment apparatus of the present disclosure may rotate the drum 3 to an angle less than an angle at which the laundry is separated from the inner wall of the drum or placement thereof is changed. As a result, unnecessary load or impact can be prevented from being transmitted to the driving unit 32 as the position of the laundry changes inside the drum 3.

[0356] As a result, the clothing treatment apparatus of the present disclosure can accurately transmit the current value applied or output to the driving unit 32 to the controller P and accurately calculate a load of laundry.

[0357] For example, the clothing treatment apparatus of the present disclosure may rotate the drum in a range from 0 degrees to 90 degrees when detecting a load of laundry.

[0358] Meanwhile, as the rotation angle of the drum 3 decreases, the time taken for the controller P to detect the load of laundry can decrease and the error in detecting the load of laundry can be reduced.

[0359] Therefore, the clothing treatment apparatus of the present disclosure can rotate the drum 3 in a range from 10 degrees to 45 degrees when detecting the load of laundry.

[0360] As a result, the clothing treatment apparatus of the present disclosure can rapidly and accurately detect the load of laundry.

[0361] Accordingly, when the user operates the power supply part P46 or opening and closing of the door 111 is detected before the user operates the execution part P47, the clothing treatment apparatus of the present disclosure can detect a load of laundry immediately and display information related to the load of laundry on the display portion P8 or the auxiliary display P19.

[0362] FIG. 15 illustrates a method of calculating a load of laundry in the clothing treatment apparatus of the present disclosure.

[0363] Referring to FIG. 15(a) and FIG. 15(b), the controller P may rotate the drum 3 less than one revolution, and measure the current value applied or output to the driving unit 32 during the process.

[0364] The controller P may calculate (process) the load of laundry on the basis of the current value.

[0365] Specifically, the controller P may use the formula $Te = Jdw/dt + Bw + mgr\sin\Theta$ to detect the load of laundry.

[0366] Te is a torque value applied to the driving unit 32 and corresponds to I (current value) $\times$ k (driving unit constant).

[0367] That is, since the driving unit constant k is a unique value of the driving unit 32, the controller P can calculate the torque value applied to the driving unit 32 when detecting the current value I.

[0368] At this time, since $\sin\Theta$ in $mgr\sin\Theta$ decreases exponentially as the rotation angle of the drum decreases, $\sin\Theta$ can be ignored if the rotation angle is between 15 degrees and 90 degrees or between 10 degrees and 45 degrees.

[0369] In addition, since Bw is a friction torque and considerably decreases when the drum 3 rotates, it can be ignored.

[0370] As a result, $Te = Jdw/dt$ remains.

[0371] Here, since dw/dt is the angular acceleration of the drum, the controller P can detect the angular acceleration in the process of rotating the drum when detecting the load of laundry. The angular acceleration can be directly calculated through the current value applied to the driving unit 32. The method of calculating the angular acceleration using the current value will be described later.

[0372] Therefore, by measuring the current value, both the torque value Te applied to the driving unit 32 and the angular acceleration dw/dt can be calculated, and thus the moment of inertia J can be calculated.

[0373] As a result, the clothing treatment apparatus of the present disclosure can immediately detect the load of laundry by ascertaining the moment of inertia J.

[0374] FIG. 16 illustrates a basic structure in which the controller P of the clothing treatment apparatus of the present

disclosure can measure the current value of the driving unit 32.

[0375] Referring to FIG. 16(a), the controller P may control the driving unit 32 by applying current to the driving unit 32 and detect the current output from the driving unit 32.

[0376] The controller P controls the driving unit 32 according to a preset course or option, and the driving unit 32 rotates the drum 3 according to a command from the controller P.

[0377] The controller P operates by receiving an operation signal or a control command from the operation part P7, the execution part P47, or the setting part P2. Washing courses and options for performing washing, rinsing, and spin-drying cycles may be selected through the operation part P7 or the setting part P2.

[0378] Accordingly, washing, rinsing, and spin-drying cycles can be performed. In addition, the controller P may control the display portion P8 to display washing courses, washing time, spin-drying time, rinsing time, current operation state, etc.

[0379] The controller P may control the driving unit 32 to rotate the drum 3 and may also vary the rotation speed of the drum 3. Specifically, the controller P may control the driving unit 32 through at least one of a current detector 225 that detects an output current flowing through the driving unit 32 or a position detector 235 that detects the position of the driving unit 320. For example, a current detected from the driving unit 32 or a detected position signal may be fed back to the controller P, and the controller P may generate a current signal for appropriately controlling the driving unit 32 according to the feedback signal.

[0380] The clothing treatment apparatus of the present disclosure may detect the position of the driving unit 32 through a separate algorithm by omitting the position detector 235 (so-called sensorless driving unit). The sensorless driving unit 32 may be provided such that the controller P can measure the current or voltage output from the driving unit 32 to ascertain the position of the rotor or stator in the driving unit 32.

[0381] Hereinafter, an embodiment in which the controller P controls the driving unit 32 will be described.

[0382] The driving unit may be provided as a three-phase motor such that the rotation speed can be controlled, and may be provided as, for example, a BLDC motor.

[0383] Referring to FIG. 16(b), the controller P may include an inverter 420 and an inverter controller 430 to control the aforementioned rotor and stator. In addition, the controller P may further include a converter 410 that supplies DC power input to the inverter 420.

[0384] That is, the controller P may also perform the function of the inverter controller 430. The inverter controller 430 may be provided separately from the controller P. When the inverter controller 430 outputs a pulse width modulation (PWM) switching control signal Sic to the inverter 420, the inverter 420 performs a high-speed switching operation to supply AC power of a predetermined frequency to the rotor 913 and the stator 911.

[0385] The clothing treatment apparatus of the present disclosure may further include a DC voltage detector B, a smoothing capacitor C, and an output current detector E in addition to the converter 410, the inverter 420, and the inverter controller 430. In addition, the clothing treatment apparatus of the present disclosure may further include an input current detector A and a reactor L.

[0386] The reactor L is disposed between a commercial AC power supply 405 and the converter 410 to perform power factor correction or boosting. In addition, the reactor L may perform a function of limiting harmonic current due to high-speed switching of the converter 410.

[0387] The input current detector A may detect an input current *is* input from the commercial AC power supply 405. To this end, a current transformer (CT), a shunt resistor, or the like may be used as the input current detector A. The detected input current *is* is a discrete signal in the form of pulses and may be input to the inverter controller 430.

[0388] The converter 410 converts the commercial AC power that has passed through the reactor L into DC power and outputs the DC power. Although the commercial AC power 405 is illustrated as single-phase AC power, but it may be three-phase AC power. The internal structure of the converter 410 also varies depending on the type of the commercial AC power 405.

[0389] The converter 410 may be composed of a diode without a switching element, and may perform a rectifying operation without a separate switching operation. For example, in the case of a single-phase AC power, four diodes may be used in a bridge form, and in the case of a three-phase AC power, six diodes may be used in a bridge form.

[0390] The converter 410 may be a half-bridge type converter with two switching elements and four diodes connected, and in the case of a three-phase AC power supply, six switching elements and six diodes may be used. If the converter 410 includes a switching element, a step-up operation, power factor improvement, and DC power conversion can be performed by the switching operation of the switching element.

[0391] The smoothing capacitor C smooths input power and stores the same. Although one element is illustrated as the smoothing capacitor C in the figure, multiple elements may be provided to secure element stability.

[0392] Although the converter 410 may be connected to the output terminal, DC power may be input directly. For example, DC power from a solar cell may be input directly to the smoothing capacitor C or may be converted and input thereto. Since the smoothing capacitor C stored DC power, both terminals thereof may be called DC terminals or DC link terminals.

[0393] The DC voltage detector B can detect the DC voltage Vdc across both terminals of the smoothing capacitor C. To

this end, the DC voltage detector B may include a resistance element, an amplifier, etc. The detected DC voltage Vdc may be input to the inverter controller 430 as a discrete signal in the form of pulses.

[0394] The inverter 420 may include a plurality of inverter switching elements, convert DC power Vdc smoothed by the on/off operation of the switching elements into three-phase AC power (va, vb, vc) of a predetermined frequency, and output the same to the driving unit 32. The inverter 420 includes pairs of upper-arm switching elements Sa, Sb, and Sc and lower-arm switching elements S'a, S'b, and S'c that are connected in series, and a total of three pairs of upper-arm and lower-arm switching elements may be connected in parallel (Sa & S'a, Sb & S'b, and Sc & S'c).

[0395] A diode is connected in anti-parallel to each of the switching elements Sa, S'a, Sb, S'b, Sc, and S'c.

[0396] The switching elements in the inverter 420 perform on/off operations of the switching elements on the basis of an inverter switching control signal Sic from the inverter controller 430. Accordingly, three-phase AC power having a predetermined frequency is output to the driving unit 32.

[0397] The inverter controller 430 may control the switching operation of the inverter 420. To this end, the inverter controller 430 may receive output current io detected by the output current detector E.

[0398] The inverter controller 430 outputs the inverter switching control signal Sic to the inverter 420 to control the switching operation of the inverter 420. The inverter switching control signal Sic is a PWM switching control signal and is generated and output based on the output current value io detected by the output current detector E.

[0399] The controller P may detect the state inside the drum by detecting the output current value io detected by the current detector 220. In addition, the controller P may detect the state inside the drum on the basis of a position signal H detected by the position detector 235. For example, while the drum 3 rotates, a load of laundry, a spin-drying rate, moisture content, etc. may be detected on the basis of the output current value io of the driving unit 32. In addition, the controller P can may detect the eccentricity of the drum 3, that is, the unbalance (UB) of the drum 3. This eccentricity detection may be performed based on the ripple component of the current io detected by the current detector 220 or the change in the rotation speed of the drum 3.

[0400] In addition, the controller P may detect the state inside the drum by detecting the input current value is input to the inverter controller. The process and calculation method for detecting the state inside the drum through the current value will be described later.

[0401] The output current detector E may be provided to detect the output current io flowing between the inverter 420 and the three-phase driving unit 32. The output current detector E detects the current flowing in the driving unit 32. The output current detector E may detect all of output currents ia, ib, and ic of the phases, and may also detect the output currents of two phases using three-phase balance.

[0402] The output current detector E may be located between the inverter 420 and the driving unit 32, and a current transformer (CT), a shunt resistor, or the like may be used to detect the current. When shunt resistors are used, three shunt resistors may be positioned between the inverter 420 and the driving unit 32, or one end of each of the shunt resistors may be connected to each of the three lower-arm switching elements S'a, S'b, and S'c of the inverter 420.

[0403] It is also possible to use two shunt resistors by using three-phase balance. Further, when a single shunt resistor is used, this shunt resistor may be disposed between the capacitor C and the inverter 420.

[0404] The detected output current io is a discrete signal in the form of pulses, which can be applied to the inverter controller 430, and the inverter switching control signal Sic is generated based on the detected output current io. Hereinafter, the detected output current io is described as the three-phase output current ia, ib, and ic.

[0405] The three-phase driving unit 32 includes a stator and a rotor, and each phase of AC power of a predetermined frequency is applied to the coil of the stator of each of the phases a, b, and c, and thus the rotor rotates.

[0406] The driving unit 32 may include a surface-mounted permanent magnet synchronous motor (SMPMSM), an interior permanent magnet synchronous motor (IPMSM), and a synchronous reluctance motor (Synrm). Among these, SMPMSM and IPMSM are permanent magnet synchronous motors (PMSM) using permanent magnets, and Synrm is characterized by not having a permanent magnet.

[0407] The inverter controller 430 may control the switching operation of switching elements in the converter 410 when the converter 410 includes the switching elements. To this end, the inverter controller 430 may receive an input current *is* detected by the input current detector A. In addition, the inverter controller 430 may output a converter switching control signal Scc to the converter 410 in order to control the switching operation of the converter 410. This converter switching control signal Scc is a PWM switching control signal, and may be generated and output based on the input current is detected from the input current detector A.

[0408] The position detector 235 may detect the rotor position of the driving unit 32. To this end, the position detector 235 may include a Hall sensor. The detected rotor position H is input to the inverter controller 430 and used as a basis for speed calculation, etc.

[0409] FIG. 16(c) illustrates an embodiment of a specific circuit structure in which the inverter controller 430 controls the driving unit 32. The inverter controller 430 may include an axis converter 510, a speed calculator 520, a current command generator 530, a voltage command generator 540, an axis converter 550, and a switching control signal output unit 560.

[0410] The axis convertor 510 receives the three-phase output current ia, ib, and ic detected by the output current

detector E and converts the same into two-phase current iα and iβ of the stationary coordinate system. The axis convertor 510 may convert the two-phase current iα and iβ of the stationary coordinate system into two-phase current id and iq of the rotating coordinate system.

[0411] The speed calculator 520 may calculate a speed on the basis of the rotor position signal H input from the position detector 235. That is, the speed can be calculated by dividing the position signal by time. The speed calculator 520 may output the position and the speed calculated on the basis of the input rotor position signal H.

[0412] The current command generator 530 generates a current command value i*q on the basis of the calculated speed w and a speed command value ω*r. For example, the current command generator 530 may perform PI control through a PI controller 535 on the basis of the difference between the calculated speed w and the speed command value ω*r, and may generate a current command value iq. Although a q-axis current command value i*q is illustrated as a current command value in the figure, unlike the drawing, it is also possible to generate a d-axis current command value i*d together. The value of the d-axis current command value i*d may be set to 0.

[0413] The current command generator 530 may further include a limiter (not shown) that restricts the level of the current command value i*q such that the current command value i*q does not exceed an allowable range. The voltage command generator 540 generates d-axis and q-axis voltage command values v*d and v*q on the basis of the d-axis and q-axis currents id and iq converted into a two-phase rotating coordinate system by the axis convertor and the current command values i*d and i*q generated by the current command generator 530. For example, the voltage command generator 540 may perform PI control through a PI controller 544 on the basis of the difference between the q-axis current iq and the q-axis current command value i*q, and generate the q-axis voltage command value v*q. In addition, the voltage command generator 540 may perform PI control through a PI controller 548 on the basis of the difference between the d-axis current id and the d-axis current command value i*d, and generate the d-axis voltage command value v*d. The value of the d-axis voltage command value v*d may be set to 0 in response to the case where the value of the d-axis current command value i*d is set to 0.

[0414] The voltage command generator 540 may further include a limiter (not shown) that limits the levels of the d-axis and q-axis voltage command values v*d and v*q such that they do not exceed an allowable range.

[0415] The generated d-axis and q-axis voltage command values v*d and v*q are input to the axis convertor 550.

[0416] The axis convertor 550 receives a position Θ calculated by the speed calculator 520 and the d-axis and q-axis voltage command values v*d and v*q and performs axis conversion. First, the axis convertor 550 performs conversion from a two-phase rotating coordinate system to a two-phase stationary coordinate system. Here, the position Θ calculated by the speed calculator 520 may be used.

[0417] In addition, the axis convertor 550 performs conversion from a two-phase stationary coordinate system to a three-phase stationary coordinate system. Through this conversion, the axis convertor 550 outputs three-phase output voltage command values v*a, v*b, and v*c.

[0418] The switching control signal output unit 560 generates and outputs a PWM switching control signal Sic for the inverter on the basis of three-phase output voltage command values v*a, v*b, and v*c.

[0419] The output inverter switching control signal Sic may be converted into a gate driving signal by a gate driving unit (not shown) and may be input to the gate of each switching element in the inverter 420. As a result, the switching elements Sa, S'a, Sb, S'b, Sc, and S'c in the inverter 420 perform switching operations.

[0420] The switching control signal output unit 560 may generate and output an inverter switching control signal Sic according to a mixture of two-phase pulse width modulation and three-phase pulse width modulation in relation to the embodiment of the present disclosure.

[0421] For example, an inverter switching control signal Sic according to three-phase pulse width modulation may be generated and output in an accelerated rotation interval which will be described below, and an inverter switching control signal Sic according to two-phase pulse width modulation may be generated and output in a constant-speed rotation interval in order to detect a counter electromotive force.

[0422] FIG. 17 illustrates an embodiment in which the controller P detects a load of laundry through acceleration and deceleration of the drum.

[0423] The clothing treatment apparatus of the present disclosure may perform a detection step F for detecting a load of laundry inside the drum 3 before performing a washing cycle, a rinsing cycle, and a spin-drying cycle.

[0424] To this end, the controller P may perform an acceleration step F1 for accelerating the drum 3, a deceleration step F2 for decelerating the drum 3, and a load detection step F3 for detecting a load of laundry in the drum through an acceleration measurement value of the driving unit 32 during the acceleration step and a deceleration measurement value of the driving unit during the deceleration step.

[0425] The clothing treatment apparatus of the present disclosure detects an acceleration measurement value measured from or applied to the driving unit 32 while accelerating the driving unit 32, and detects a deceleration measurement value measured from or applied to the driving unit 32 while decelerating the driving unit 32. Thereafter, the load of laundry in the drum 3 is detected from the acceleration measurement value and the deceleration measurement value.

[0426] The acceleration measurement value and the deceleration measurement value may be command values applied to the driving unit 32 during the operation of the driving unit 32, and may be measurement values measured from the driving unit 32 during the operation of the driving unit 32.

[0427] For example, the command values may be current command values or voltage command values derived from the PI controller 535 applied to drive the driving unit 32, and the measurement values may be current values or voltage values of the driving unit 32 measured by the position detector 235 or the current detector 225.

[0428] Accordingly, the clothing treatment apparatus of the present disclosure can considerably shorten the time required to detect a load of laundry by omitting the step of maintaining the driving unit 32 at a constant speed.

[0429] In addition, the clothing treatment apparatus of the present disclosure can save not only the process of maintaining the driving unit 32 at a constant speed, but also the energy and time required to maintain the constant speed. In addition, the clothing treatment apparatus of the present disclosure can completely ignore the frictional force of the driving unit 32 that must be overcome when maintaining the driving unit 32 at a constant speed in the calculation process.

[0430] If the controller P uses the command values when detecting a load of laundry, the controller P does not need to feed back the actual situation to the driving unit 32 or does not consider the actual driving situation of the driving unit 32. Therefore, it can be simple and easy for the controller P to calculate a load of laundry. In addition, since the calculation formula for calculating a load of laundry is simplified, the load of laundry can be obtained rapidly.

[0431] Specifically, the acceleration measurement value may include an acceleration current value Iq_Acc measured in the driving unit 32, and the deceleration measurement value may include a deceleration current value Iq_Dec measured in the driving unit 32.

[0432] The acceleration current value may include a current command value Iq*_Acc for rotating the driving unit 32 during the acceleration step, and the deceleration current value may include a current command value Iq*_Dec for rotating the driving unit 32 during the deceleration step.

[0433] If the controller P uses the measurement values when detecting a load of laundry, the actual situation is reflected in the driving unit 32, and thus the load of laundry can be correctly obtained.

[0434] In addition, the command values are generated only when the driving unit 32 operates or is actively controlled when power is applied thereto. Therefore, when the measurement values are used, data for detecting the load of laundry can be obtained even when the power supplied to the driving unit 32 is cut off or the driving unit 32 is not actively controlled.

[0435] The clothing treatment apparatus of the present disclosure may decelerate the driving unit 32 by power cut-off in the deceleration step F2 using a power braking method. Therefore, an algorithm for controlling the deceleration step F2 can be omitted, and energy for the deceleration step F2 can be saved.

[0436] Furthermore, since the power is cut off in the deceleration step F2, the voltage command value can be 0. Therefore, the present disclosure can detect a load of laundry using only current, excluding the voltage.

[0437] That is, the method of controlling the clothing treatment apparatus of the present disclosure can ignore or not use a voltage command value or a voltage value, and can have a very simple calculation formula for detecting a load of laundry because only current values are used. Since the calculation formula is simple, calculation can be fast and accurate, and thus a load of laundry can be accurately detected.

[0438] Specifically, the data and algorithm (hereinafter, calculation formula) for calculating the acceleration measurement value and the deceleration measurement value may be stored in the controller P. The calculation formula does not use a voltage value. Accordingly, since there is no need to calculate the counter electromotive force, the present disclosure may omit the step of constant rotation of the driving unit 32.

[0439] For example, the calculation formula of the present disclosure may be provided as follows.

[0440] A load value (inertia, Jm, Load_data) of the present disclosure

$$= \frac{3}{2}\frac{P}{2}K_e \frac{i_q^{Acc} - i_q^{Dec}}{\triangle\omega_m^{Acc}/\triangle t_{Acc} - \triangle\omega_m^{Dec}/\triangle t_{Dec}}$$

[0441] P and K_e are constant values of the driving unit 32, which can be measured by the controller P, and the denominator corresponds to the difference between a speed change amount in the acceleration step and a speed change amount in the deceleration step.

[0442] The speed change amount may be measured by the controller P according to the position detector 235, calculated by measuring the time required until the acceleration or deceleration, or immediately detected by measuring current, etc.

[0443] Therefore, the present disclosure can immediately calculate the load value by only measuring the acceleration output current value Iq_Acc at the time of acceleration and the deceleration output current value Iq_Dec at the time of deceleration. That is, the acceleration current value may be considered as including the acceleration output current value

Iq_Acc output from the driving unit during the acceleration step, and the deceleration current value may be considered as including the deceleration output current value Iq_Dec output from the driving unit during the deceleration step.

[0444] In addition, the average value Iqe_Acc of the current values measured by the driving unit during the acceleration step may be applied to the acceleration output current value, and the average value Iqe_Dec of the current values measured by the driving unit during the deceleration step may be applied to the deceleration output current value.

[0445] In either case, a load of laundry can be calculated with only one factor, i.e., the current value, and the factor of the voltage value can be omitted, and thus calculation of a load of laundry is simplified and the accuracy of the load value can be improved.

[0446] Therefore, even if the time of the acceleration step is very short or the time of the deceleration step is very short, a load of laundry can be accurately detected, and thus the time required to detect a load of laundry can be further reduced.

[0447] A load of laundry in the clothing treatment apparatus of the present disclosure is measured by decelerating immediately after acceleration. Therefore, the time required to measure a load of laundry is very short, and during this time, the laundry inside the drum 3 cannot move or flow. Accordingly, the accuracy of load calculation can be further increased because a load of laundry can be detected within a short period of time in which the condition of the laundry does not change.

[0448] Meanwhile, the calculation formula applied to load detection of the present disclosure uses the difference between the current value in the acceleration step and the current value in the deceleration step. Therefore, the frictional force of the driving unit in the acceleration step and the frictional force of the driving unit in the deceleration step are equal to each other, and thus current compensation formulas considering the frictional force cancel each other out. Therefore, the load detection control method of the clothing treatment apparatus of the present disclosure does not need to consider the frictional force of the driving unit 32, and thus the process of correcting or tuning the frictional force can be omitted. In addition, since load detection of the present disclosure does not use a voltage value, the process of compensating or tuning the error of the voltage value can be omitted, and since the constant speed process is omitted, the process of compensating or tuning the movement of laundry and the frictional force of the driving unit 32 can be omitted. As a result, according to the load detection control method of the clothing treatment apparatus of the present disclosure, a load of laundry is derived immediately after the current value is input, and since there is no procedure for compensating or tuning a load of laundry, the load of laundry can be detected very rapidly and accurately.

[0449] Accordingly, the load applied to the controller P can be reduced, the configuration of the controller P can be simplified, or the performance of the controller P can be utilized in other ways.

[0450] As can be seen from the above calculation formula, the acceleration measurement value may further include the speed change amount in the acceleration step F1, and the deceleration measurement value may further include the speed change amount in the deceleration step F2.

[0451] The speed change amount in the acceleration step F1 and the speed change amount in the deceleration step F2 are only necessary to obtain the difference between the inertia in the acceleration step F1 and the inertia in the deceleration step F2, and separate measurement of voltage values may not be necessary, and furthermore, no compensation or tuning process is necessary.

[0452] More specifically, the above calculation formula is derived by the following calculation formula.

$$\text{Acceleration inertia} = \frac{T_e^{Acc}}{D_m^{Acc} - D_m^{Dec}}, \quad \text{Deceleration inertia} = = \frac{T_e^{Dec}}{D_m^{Acc} - D_m^{Dec}} \text{ where}$$

$$D_m = \frac{d\omega_m}{dt} = \frac{\Delta\omega_m}{\Delta t}$$

[0453] Here, since the load of laundry is calculated using the difference between the acceleration inertia and the deceleration inertia, the change in the speed is required.

[0454] Therefore, if the acceleration measurement value and the deceleration measurement value are measured in the same RPM section of the drum, the range of speed change is the same, and thus calculation can become simpler. That is, it is preferable that the acceleration step F1 and the deceleration step F2 share the same speed band.

[0455] The method of controlling the clothing treatment apparatus of the present disclosure detects a load of laundry by performing the acceleration step F1 and the deceleration step F2 and using the current command value or the current value measured by the driving unit 32.

[0456] Here, since the calculation formula uses the current value, the deceleration step F2 is performed first, and then the acceleration step F1 is performed to measure the current value, and thus the load of laundry can be detected through the same calculation formula.

[0457] Meanwhile, a preparation step F0 for checking the position of the driving unit 32 may be performed to set a reference value for performing the acceleration step F1 and the deceleration step F2. In the preparation step F0, the drum 3 may be placed in a stationary state.

[0458] The drum that is stationary in the preparation step F0 may be additionally accelerated to the first rpm in the acceleration step F1, and the drum may be decelerated from the first rpm in the deceleration step F2. That is, the acceleration step F1 and the deceleration step F2 may be performed consecutively. Since the current command value for the driving unit 32 may be lowered in the acceleration step F1 or the voltage applied to the driving unit 32 may be cut off, there is no concern about damage to the controller P or the circuit in the deceleration step F2.

[0459] Here, the acceleration measurement value and the deceleration measurement value may be measured between the first rpm and the second rpm lower than the first rpm. That is, a load of laundry may be detected by measuring the current value in the period including the vertex in the aforementioned speed graph. This has the advantage of minimizing situations where errors may occur because a load of laundry is detected by measuring the current value in a continuous situation.

[0460] The acceleration measurement value and the deceleration measurement value may be measured between the second rpm lower than the first rpm and the third rpm higher than the second rpm and lower than the first rpm. That is, a load of laundry may be detected by measuring the current value in the same speed period although it is not a period including the vertex. This has the advantage of improving the accuracy of load calculation by measuring a stabilized current value since the speed change is the largest at the vertex.

[0461] The first rpm may be set to a lower rpm than a fixed rpm at which laundry inside the drum 3 is attached to the inner wall of the drum 3. That is, the first rpm may be relatively lower than the rpm applied in the washing, rinsing, and spin-drying cycles.

[0462] In this case, the process of the controller P to directly calculate the moment of inertia or the process of comparing the moment of inertia with load data of laundry stored in the storage P2 and extracting data may be omitted.

[0463] The amount of current applied in the acceleration step F1 may be defined as a first current amount, and the amount of current applied in the deceleration step F2 may be defined as a second current amount. The controller P may detect a load of laundry through the first current amount and the second current amount.

[0464] FIG. 18 illustrates an embodiment in which the clothing treatment apparatus of the present disclosure utilizes the load detection method based on the structure and method described above.

[0465] FIG. 18(a) illustrates an embodiment in which the above-described load detection method is basically utilized.

[0466] When the user operates the power supply part P46 of the clothing treatment apparatus of the present disclosure, power can be supplied to the water supply unit 23, the driving unit 32, the drain unit 25, and the controller P.

[0467] The controller P may detect a load of laundry when the power is supplied through the power supply part P46.

[0468] That is, the essential condition for detecting a load of laundry in the clothing treatment apparatus of the present disclosure may be input applied to the power supply part P46.

[0469] Therefore, if the user opens the door 132 before operating the power supply part P46, puts laundry into the drum 3, and then closes the door 132, the controller P can immediately detect the load of laundry.

[0470] The controller P may calculate an estimated time for performing a specific course or option depending on the load of laundry.

[0471] To this end, the controller P may recognize the estimated time in association with the load of laundry.

[0472] The amount of detergent required when performing any course or option for the load of laundry may be stored as data. The controller P may calculate the amount of detergent required when performing washing of the laundry through the course or option.

[0473] For example, the clothing treatment apparatus of the present disclosure may perform a power supply step A1 of supplying power by operating the power supply part P46 of the clothing treatment apparatus, and a load detection step A2 of detecting a load of laundry received in the drum 3 when the power supply step A1 is performed.

[0474] In other words, the clothing treatment apparatus of the present disclosure may detect a load of laundry before the user operates the execution part P47, rather than detecting the load of laundry when the user operates the execution part P47.

[0475] Upon detection of a load of laundry in the load detection step A2, an information display step A3 in which at least one of the load of laundry, the estimated execution time of the course or option for washing the laundry, or the amount of detergent required for the course or option is displayed on the display portion P8 may be performed.

[0476] In the information display step A3, an execution time corresponding to a preset standard course or standard option corresponding to the load of laundry may be displayed.

[0477] The user may check the load of laundry and the execution time of the preset course or option displayed in the information display step A3, compare the same with his or her schedule, and check the amount of detergent.

[0478] In other words, the clothing treatment apparatus of the present disclosure may check information related to the load of laundry before the user operates the execution part P47, select a desired course and option, and perform the course when the execution part P47 is operated. That is, if the user is satisfied with the information displayed in the information display step A3, the user can operate the execution part P47. The controller P can perform an execution step A6 for detecting operation of the execution part P47.

[0479] When the execution step A6 is performed, the controller P may control the locking member to lock the door 132 to

the cabinet 10 to prevent the door 132 from being opened arbitrarily.

[0480] When the execution step A6 is performed, the controller P may perform one or more of the washing cycle, rinsing cycle, and spin-drying cycle according to settings of the course or option.

[0481] After the user checks at least one of the load of laundry, the execution time of the preset course or option, or the amount of detergent in the information display step A3, a course setting step A4 for selecting a course and option through the operation part P7 and the selection part P2 may be further performed.

[0482] That is, the user may select any course or option instead of the standard course that is performed by default.

[0483] For example, the user may apply input to at least one of the operation part P7 or the setting part P2 after checking the load of laundry through the course setting step A4, check the execution time associated with the load of laundry, and then apply input to at least one of the operation part P7 or the setting part P2 to change the course or option.

[0484] When the course setting step A4 is performed, the controller P may perform a change display step A5 in which the controller P recalculates the estimated execution time of the changed course or option or the amount of detergent corresponding to the load of laundry and transmits the same to the display portion P8.

[0485] In the change display step A5, at least one of the estimated execution time of the changed course or option or the changed amount of detergent may be displayed on the display portion P8.

[0486] If the user determines that the estimated execution time or amount of detergent is appropriate, the user can operate the execution part P47, and if the user determines that the estimated execution time or the amount of detergent is not appropriate, the user can re-apply input to at least one of the operation part P7 or the setting part P2.

[0487] The controller P may perform the execution step A6 for detecting operation of the execution part P47.

[0488] However, when re-input applied to at least one of the operation part P7 or the setting part P2 is detected, the course setting step A4 and the change display step A5 may performed again.

[0489] As a result, the clothing treatment apparatus of the present disclosure can complete detection of a load of laundry before the user selects and performs a final course and option. Furthermore, by calculating a load of laundry within three seconds by rotating the drum less than one revolution, information on the load of laundry can be provided before input is applied to at least one of the operation part P7 of the setting part P2.

[0490] For example, when the user operates the power supply part P46 and the display portion P8 is activated, detection of a load of laundry can be completed and information on the load of laundry can be provided to the user.

[0491] Therefore, the user can check an estimated time of a currently optimal course and option while checking the information on the load of laundry and set the optimal course and option, or supply an optimal amount of detergent.

[0492] FIG. 18(b) illustrates an extended embodiment of the control method of FIG. 18(a).

[0493] The clothing treatment apparatus of the present disclosure may perform a power input step A1 of supplying power to at least one of the controller P, the driving unit 32, the water supply unit 23, the drain unit 25, or the control panel 16 upon receiving a command from the power supply part P46.

[0494] When the power input step A1 is performed, the clothing treatment apparatus may perform a load detection step A2 of detecting a load of laundry.

[0495] The method of detecting a load of laundry in the load detection step A2 is a method of rotating the drum less than one revolution as described above.

[0496] At this time, the controller P may also perform a laundry detection step A2-1 of detecting whether there is laundry in the drum 3. If there is laundry in the drum 3 in the laundry detection step A2-1, the aforementioned control method can be performed.

[0497] However, if there is no laundry in the drum 3, the controller P may perform a door opening/closing detection step A2-2 or wait until the door 132 is opened and closed.

[0498] That is, if the controller P does not detect a load of laundry, the controller P can wait until opening/closing of the door is detected.

[0499] If the door opening/closing detection step A2-2 is performed, the controller P may perform the load detection step A2 again to additionally detect a load of laundry.

[0500] Accordingly, the clothing treatment apparatus of the present disclosure can immediately detect a load of laundry if the laundry is received in the drum 3 before the user operates the power supply part P46. However, if laundry is not received in the drum 3 before the user operates the power supply part P46, the controller P may wait for laundry to be put into the drum 3 and detect a load of laundry.

[0501] In other words, the clothing treatment apparatus of the present disclosure can immediately perform load detection when the user operates the power supply part P46 and thus power is supplied to the controller P.

[0502] Therefore, if the user first puts laundry into the drum 3, and then operates the power supply part P46, the controller P may detect a load of laundry.

[0503] However, if there is no laundry inside the drum 3 before the user operates the power supply part P46, the controller P may wait for the door to open and close and perform load detection. Whether or not there is laundry in the drum 3 may be detected by the load detection method. At this time, if there is no detected load of laundry, the load of laundry may not be displayed on the display portion P8.

[0504] Upon detection of opening and closing of the door 132 after the user operates the power supply part P46, the controller P may determine that laundry has been put in and perform load detection. If there is no detected load of laundry, a load of laundry may not be displayed on the display portion P8 or information indicating that there is no laundry may be displayed.

[0505] If there is a detected load of laundry, the clothing treatment apparatus of the present disclosure may display at least one of the weight information of the laundry, an execution time of a course and option corresponding to the load of laundry, or a required amount of detergent on the display portion P8.

[0506] As a result, the clothing treatment apparatus of the present disclosure can detect a load of laundry before the user operates the execution part P47 and transmit information such as an execution time of a course or option, a required amount of detergent, etc. to the user.

[0507] FIG. 19 illustrates a method of controlling the clothing treatment apparatus of the present disclosure using the load detection method.

[0508] The clothing treatment apparatus of the present disclosure may perform a load detection step Y1 of detecting a load of laundry before the user operates the execution part P47 when the user operates the power supply part P46, the door is opened and closed, or putting of laundry into the drum 3 is detected, and a display step Y2 of displaying information on the load of laundry on the display portion P8.

[0509] Upon detecting that the user additionally puts laundry into the drum 3 or detecting that the user takes out laundry, a re-detection step Y3 for re-detecting a load of laundry is performed immediately.

[0510] The load detection step Y1 and the re-detection step Y3 may be performed while rotating the drum less than one revolution.

[0511] If a re-detected load of laundry is changed, a change step Y4 for changing and displaying information on the load of laundry on the display portion P8 may be performed.

[0512] The information on the load of laundry may include the weight of laundry, the amount of detergent corresponding to the load of laundry, an estimated execution time of the course corresponding to the load of laundry, etc.

[0513] The clothing treatment apparatus of the present disclosure may perform an input step Y5 in which the user selects a course through the operation part P7, and an execution step Y7 of performing a course input through the execution part P47 or a course selected in advance.

[0514] FIG. 20 illustrates an embodiment to which the above-described control method is applied.

[0515] Referring to FIG. 20(a), the user may put first laundry T1 into the drum 3. The controller P may detect a load of the first laundry T1 by rotating the drum less than one revolution and display load information D27 regarding the load of the first laundry T1.

[0516] The load information D27 may be displayed on the display portion P8 before the user operates the execution part P47.

[0517] The load information D27 may include an estimated execution time D271 of a course selected for the load of the first laundry T1 and a required amount D272 including an amount of detergent or an amount of water required when the course is performed.

[0518] The estimated execution time D271 and the required amount D272 may be displayed in partitioned areas of the display portion P8.

[0519] Referring to FIG. 20(b), the user may additionally put second laundry T2 into the drum 3.

[0520] When the controller P detects that the second laundry T2 has been inserted through vibration detected by the driving unit 32 or using a load sensor, the controller P may additionally rotate the drum by less than one rotation to detect a load of laundry including the second laundry T2 and change and display load information D27a regarding the changed load of laundry.

[0521] The changed load information D27a may be displayed on the display portion P8 before the user operates the execution part P47.

[0522] The changed load information D27a may include an estimated execution time D2711 of a course selected for the load of laundry including the second laundry T2, and a required amount D2721 including an amount of detergent or an amount of water required when the selected course is performed.

[0523] That is, the display portion P8 may be controlled to display information on a load of laundry and information on a changed load of laundry to the user in real time. As a result, the user can obtain necessary information before operating the execution part P47 and can recognize that he or she communicates with the clothing treatment apparatus.

[0524] FIG. 21 illustrates an embodiment in which the control method of FIG. 19 is applied to another embodiment of the clothing treatment apparatus of the present disclosure.

[0525] Referring to FIG. 21(a), the user may put the first laundry T1 into the drum 3. The controller P may detect a load of the first laundry T1 by rotating the drum less than one revolution and display load information D27 regarding the load of laundry.

[0526] The load information D27 may be displayed on the second display portion P81 before the user operates the execution part P47.

[0527] The load information D27 may include an estimated execution time D271 of a course selected for the load of the first laundry T1, and a required amount D272 including an amount of detergent or an amount of water required when the selected course is performed.

[0528] Here, the estimated execution time D271 may be displayed in the second area II, and the required amount D272 may be displayed in the third area III. The estimated execution time D271 and the required amount D272 may be displayed in partitioned areas of the first area I of the second display portion P81.

[0529] Referring to FIG. 21(b), the user may additionally put the second laundry T2 into the drum 3.

[0530] When the controller P detects that the second laundry T2 has been inserted through vibration detected by the driving unit 32 or using a load sensor, the controller P may additionally rotate the drum by less than one rotation to detect a load of laundry including the second laundry T2 and change and display load information D27a regarding the changed load of laundry.

[0531] The changed load information D27a may be displayed on the second display portion P81 before the user operates the execution part P47.

[0532] The changed load information D27a may include an estimated execution time D2711 of a course selected for the load of laundry including the second laundry T2, and a required amount D2721 including an amount of detergent or an amount of water required when the selected course is performed.

[0533] The estimated execution time D2711 may be displayed in the second area II and the required amount D2721 may be displayed in the third area III.

[0534] That is, if the load of laundry changes, the second display portion P81 may display the changed load of laundry. The information displayed in the second area II and the information displayed in the third area III may vary in real time according to change in the load of laundry.

[0535] That is, the display portion P8 may be controlled to display information on a load of laundry and information on a changed load of laundry to the user in real time. As a result, the user can obtain necessary information before operating the execution part P47 and recognize that he or she communicates with the clothing treatment apparatus.

[0536] FIG. 22 illustrates an additional control method of the clothing treatment apparatus of the present disclosure.

[0537] Since the clothing treatment apparatus of the present disclosure detects a load of laundry before operating the execution part P47, the clothing treatment apparatus can recommend a course corresponding to the load of laundry before operating the execution part P47.

[0538] To this end, the clothing treatment apparatus of the present disclosure may perform a load detection step Z1 for detecting a load of laundry, and a recommendation step Z2 for determining a course or option corresponding to the load of laundry and displaying the determined course or option on the display portion P8.

[0539] The clothing treatment apparatus of the present disclosure may perform a determination step Z3 for determining whether the user checks the course or option displayed on the display portion P8 and whether the user operates the execution part P47.

[0540] If the user operates the execution part P47 in the determination step Z3, an execution step Z5 for executing the recommended course may be performed.

[0541] However, in the determination step Z3, the user may directly input a course or option by operating the operation part P7. When an input step Z4 in which the user directly inputs a course or option is performed, the controller P may cancel display of the recommended course or option, display the input course or option on the display portion P8, and then execute the input course or option in an execution step Z5.

[0542] FIG. 23 illustrates an embodiment in which the control method of FIG. 22 is applied.

[0543] Referring to FIG. 23(a), when the door 132 of the clothing treatment apparatus of the present disclosure is opened or the power supply part P46 is operated, guidance information D28 guiding a user's action may be displayed on the display portion P8.

[0544] The guidance information D28 may be information for inducing the input of laundry, such as "Please put in laundry".

[0545] Referring to FIG. 23(b), the user may put laundry B exceeding a weight limit, such as a blanket, into the drum 3. The laundry B exceeding the weight limit may be an amount of laundry that is 70 percent or more of the rated load of laundry allowed by the clothing treatment apparatus of the present disclosure.

[0546] When the input of laundry is detected or the door 132 is closed, the controller P may detect the overweight by rotating the drum 3 to detect the load of laundry.

[0547] The controller P may display confirmation information requesting checking of overweight on the display portion P8.

[0548] The controller P may recognize a small amount of laundry as laundry exceeding the weight limit when the laundry contains water. Therefore, the controller P may request that the user check whether the laundry is a small amount of laundry instead of immediately determining the laundry as laundry exceeding the weight limit such as a blanket.

[0549] The confirmation information may include inquiry information D281 for inquiring about whether laundry exceeding the weight limit has been put in and determination information D282 for requesting confirmation from the user on the

display portion P8.

[0550] The inquiry information D281 and the decision information (D282) may be displayed in partitioned upper and lower areas of the display portion P8.

[0551] The inquiry information D281 may be displayed as text such as "Did you put in a blanket?"

[0552] The decision information D282 may be displayed as text such as "Yes" and "No". The decision information D282 may be displayed in a different color from the inquiry information D281.

[0553] If the user confirms that the laundry does not exceed a weight limit and inputs the confirmation through the selection part R, the controller P may determine that the laundry is wet laundry containing water, calculate a load of laundry in a dry state, and perform a course or option corresponding thereto. As a result, the course or option can be performed with less water, less detergent, and for a shorter duration than when the weight of laundry is excessive.

[0554] Alternatively, the controller P may re-detect a load of laundry after supplying water, detect whether the laundry is wet or dry, and then perform a course or option depending on the re-detected load of laundry.

[0555] If the user confirms that the laundry exceeds the weight limit and inputs the confirmation through the selection part R, the controller P may display recommendation information 2811 for inquiring about whether to start an overweight course on the display portion P8.

[0556] The display portion P8 may also display recommendation confirmation information 2821.

[0557] The recommendation confirmation information 2821 may display a course recommended based on load detection as text such as "Do you want to start with blanket washing mode?"

[0558] The display portion P8 may display confirmation information 2821 requesting confirmation of the recommendation confirmation information.

[0559] The confirmation information 2821 may include information requesting selection of an approval command represented as text such as "Yes" and a disapproval command represented as text such as "No".

[0560] If the user inputs the approval command for approving recommended information in the recommendation confirmation information 2821, the recommended overweight course can be performed.

[0561] Therefore, even if the user does not select the overweight course, the controller P may recommend the overweight course through the display portion P8 depending on the detected load of laundry.

[0562] On the other hand, if the user inputs the disapproval command that does not approve the recommended information 2821 or inputs another course through the operation part P7, the controller P may perform the input course.

[0563] The embodiment of FIG. 23 may also be applied to the second display portion P81.

[0564] FIG. 23 illustrates an embodiment in which the content display area D2 of the above display P8 or the first area I of the second display portion P81 is not selectively partitioned into upper and lower areas or left and right areas, but the first area I is partitioned into upper and lower areas and at least one thereof is partitioned into left and right areas, or the first area I is partitioned into left and right areas and at least one thereof is partitioned into upper and lower areas, regardless of the proximity sensor.

[0565] FIG. 24 illustrates an additional embodiment in which the control panel of the clothing treatment apparatus of the present disclosure is provided in a different form.

[0566] The display portion P8 may be provided to display information transmitted from the controller P.

[0567] The information may include status information of the clothing treatment apparatus, request information for requesting confirmation from the user, guidance information for guiding utilization of the clothing treatment apparatus, information received by the clothing treatment apparatus from a server or an external terminal, etc.

[0568] The display portion P8 is provided to display the information in written language or as graphical information and to vary the display state depending on the distance between the user and the control panel P.

[0569] For example, the display portion P8 may display more types of information to the user, display various types of information, display detailed information, or display text including video, images, and predicates to the user when the user is in close proximity L2.

[0570] The display portion P8 may be provided with a width R2 greater than the height R1 in order to display the information without difficulty.

[0571] The display portion P8 may be provided in an oval shape or a rectangular shape.

[0572] In addition, the area occupied by the display portion P8 in the control panel P may be set larger than when it is circular.

[0573] Therefore, the display portion P8 may display various types of information in detail to the user.

[0574] The present disclosure may be implemented in various modified forms, and the scope of the rights is not limited to the above-described embodiments. Therefore, if a modified embodiment includes the elements of the claims of the present disclosure, it should be considered to fall within the scope of the present disclosure.

Claims

1. A clothing treatment apparatus, comprising:

   a cabinet;
   a drum rotatably accommodated in the cabinet to accommodate laundry;
   a controller for performing an arbitrary course capable of rotating the drum;
   a display portion provided in the cabinet to externally display information provided by the controller; and
   a proximity sensor provided on the front of the cabinet to detect a gap or a distance between the cabinet and a user and transmit the gap or the distance to the controller,
   wherein the display potion is controlled such that at least one of a display size of information, a number of pieces of displayed information, or a form of the displayed information changes in case that the distance between the proximity sensor and the user changes.

2. The clothing treatment apparatus of claim 1, wherein the display portion is controlled to display the information in smaller letters in case that the distance between the user and the proximity sensor is equal to or less than a first distance than in case that the distance is equal to or greater than the first distance.

3. The clothing treatment apparatus of claim 1, wherein the display portion is controlled to display the information in more words or numbers in case that the distance between the user and the proximity sensor is equal to or less than the first distance than in case that the distance is equal to or greater than the first distance.

4. The clothing treatment apparatus of claim 1, wherein the display portion is controlled to display the information as text excluding a predicate in case that the distance between the user and the proximity sensor is equal to or greater than the first distance, and to display the information as text including a predicate in case that the distance between the user and the proximity sensor is equal to or less than the first distance.

5. The clothing treatment apparatus of claim 1, wherein the display portion includes a liquid crystal display displaying the information,
   wherein the display portion is controlled to display the information by partitioning the liquid crystal display into a larger number of areas in case that the distance between the user and the proximity sensor is equal to or less than the first distance than in case that the distance between the user and the proximity sensor is equal to or greater than the first distance.

6. The clothing treatment apparatus of claim 5, wherein the display portion is controlled to display different contents in the partitioned areas of the liquid crystal display.

7. The clothing treatment apparatus of claim 1, wherein the display portion is controlled such that a display color of the information changes in case that the distance between the user and the proximity sensor is equal to or greater than the first distance and in case that the distance between the user and the proximity sensor is equal to or less than the first distance.

8. The clothing treatment apparatus of claim 1, wherein the display portion is controlled to display the information using a larger number of colors in case that the distance between the user and the proximity sensor is equal to or less than the first distance than in case that the distance between the user and the proximity sensor is equal to or greater than the first distance.

9. The clothing treatment apparatus of claim 1, wherein the display portion is controlled to display the information as an image or pictogram in case that the distance between the user and the proximity sensor is equal to or greater than the first distance, and to display the information as one or more of letters and numbers in case that the distance between the user and the proximity sensor is equal to or less than the first distance.

10. The clothing treatment apparatus of claim 9, wherein the display portion is controlled to additionally display the letters and numbers on the image or pictogram as the information in case that the distance between the user and the proximity sensor is equal to or less than the first distance.

11. The clothing treatment apparatus of claim 1, wherein the controller is configured to detect a load of laundry by rotating the drum or through a separate sensor, and

wherein the display portion is controlled to display load information differently depending on change in the load of laundry.

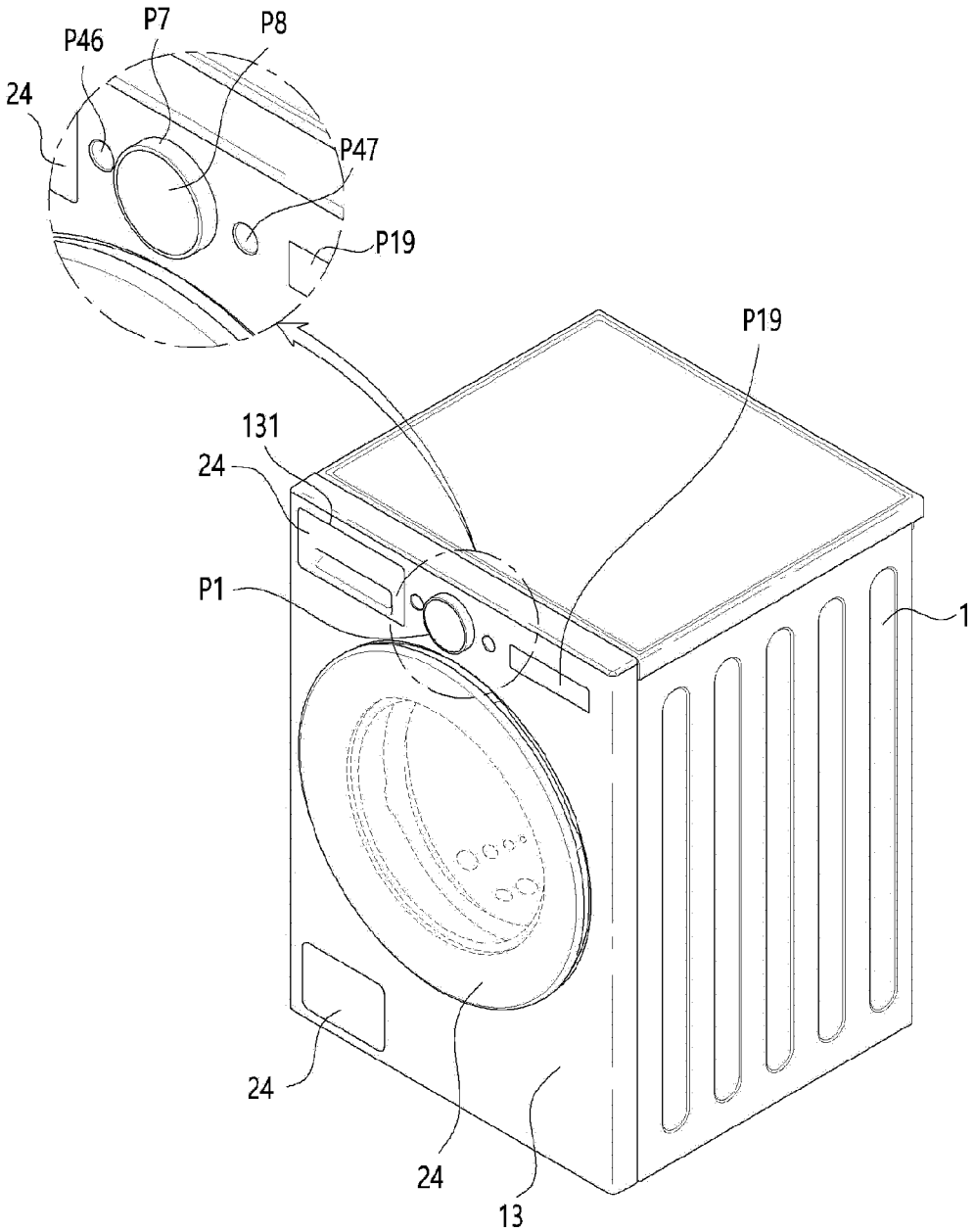
12. The clothing treatment apparatus of claim 11, wherein the load information includes at least one of an estimated time for processing the laundry, an amount of detergent required for processing the laundry, or an amount of water required for processing the laundry.

13. The clothing treatment apparatus of claim of 11, wherein the display portion is controlled to display request information for requesting checking of whether laundry exceeds a weight limit in case that a load of laundry equal to or greater than a reference value is put into the drum.

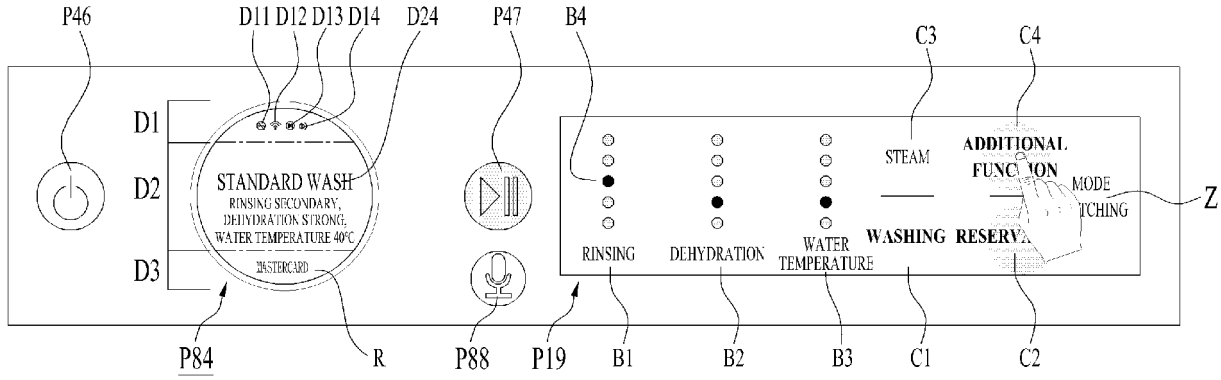
14. The clothing treatment apparatus of claim 13, wherein the display portion is controlled to display information for inquiring about whether to perform a course for separately processing laundry exceeding the weight limit set in the controller in case that confirmation that the laundry exceeds the weight limit is input.

15. The clothing treatment apparatus of claim 1, wherein the display portion has a width longer than a height.

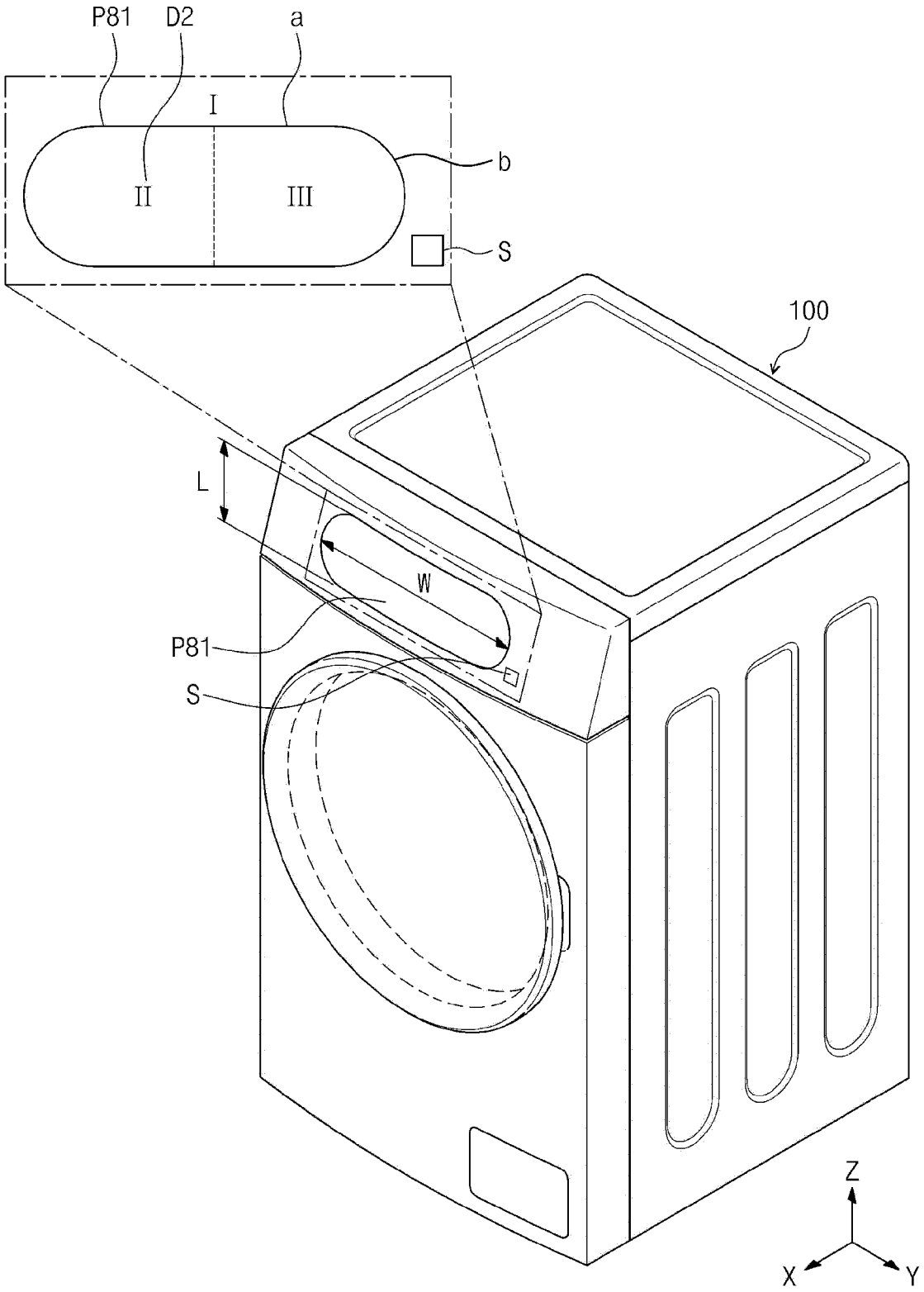
【FIG 1】



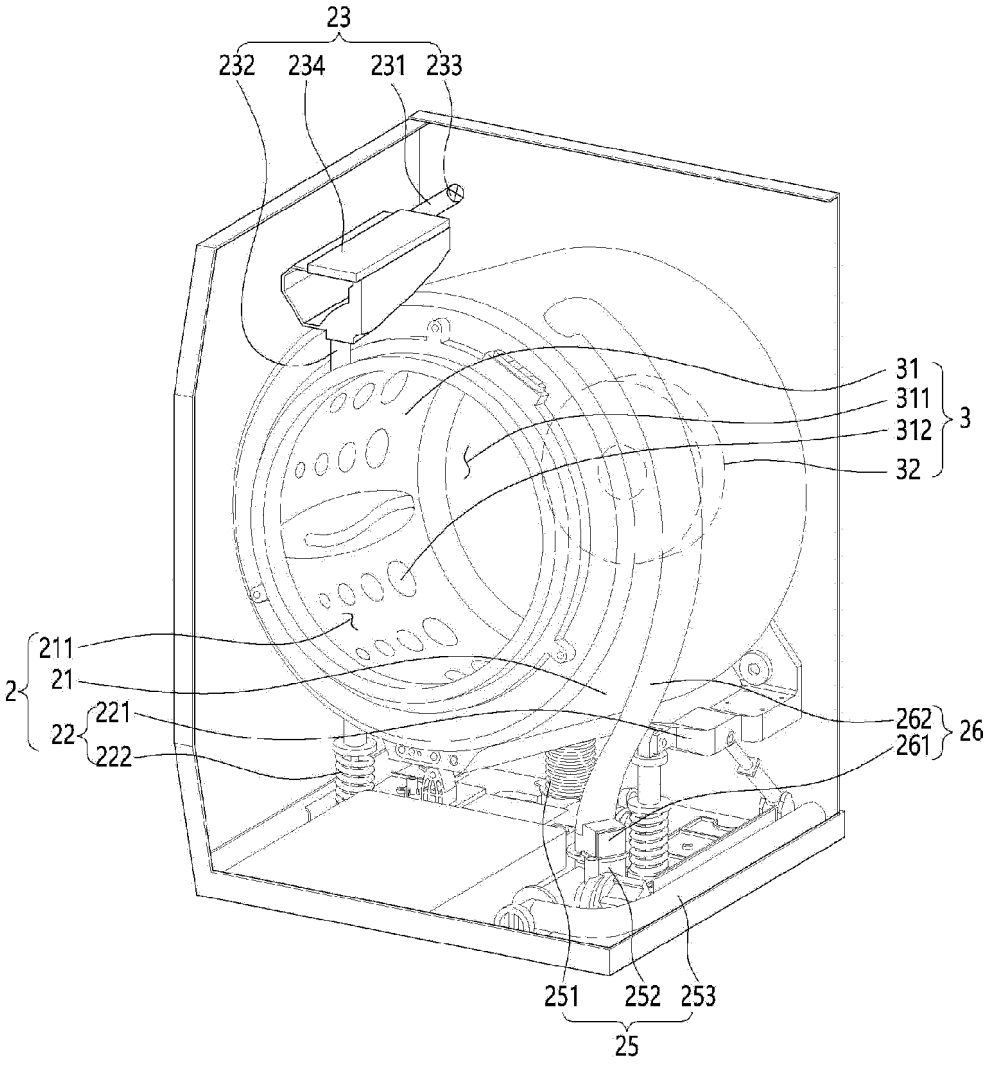
【FIG 2】


P46
D11 D12 D13 D14
D24
P47
B4
C3
C4
D1
D2
D3
STANDARD WASH
RINSING SECONDARY,
DEHYDRATION STRONG,
WATER TEMPERATURE 40°C
STEAM
ADDITIONAL
MODE
Z
RINSING
DEHYDRATION
WATER
TEMPERATURE
P84
R
P88
P19
B1
B2
B3
C1
C2

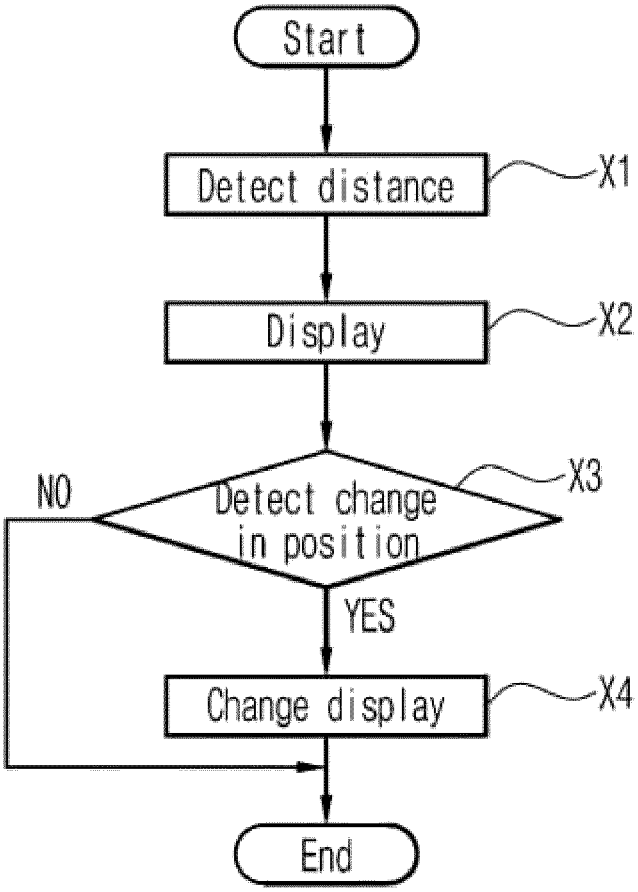
【FIG 3】



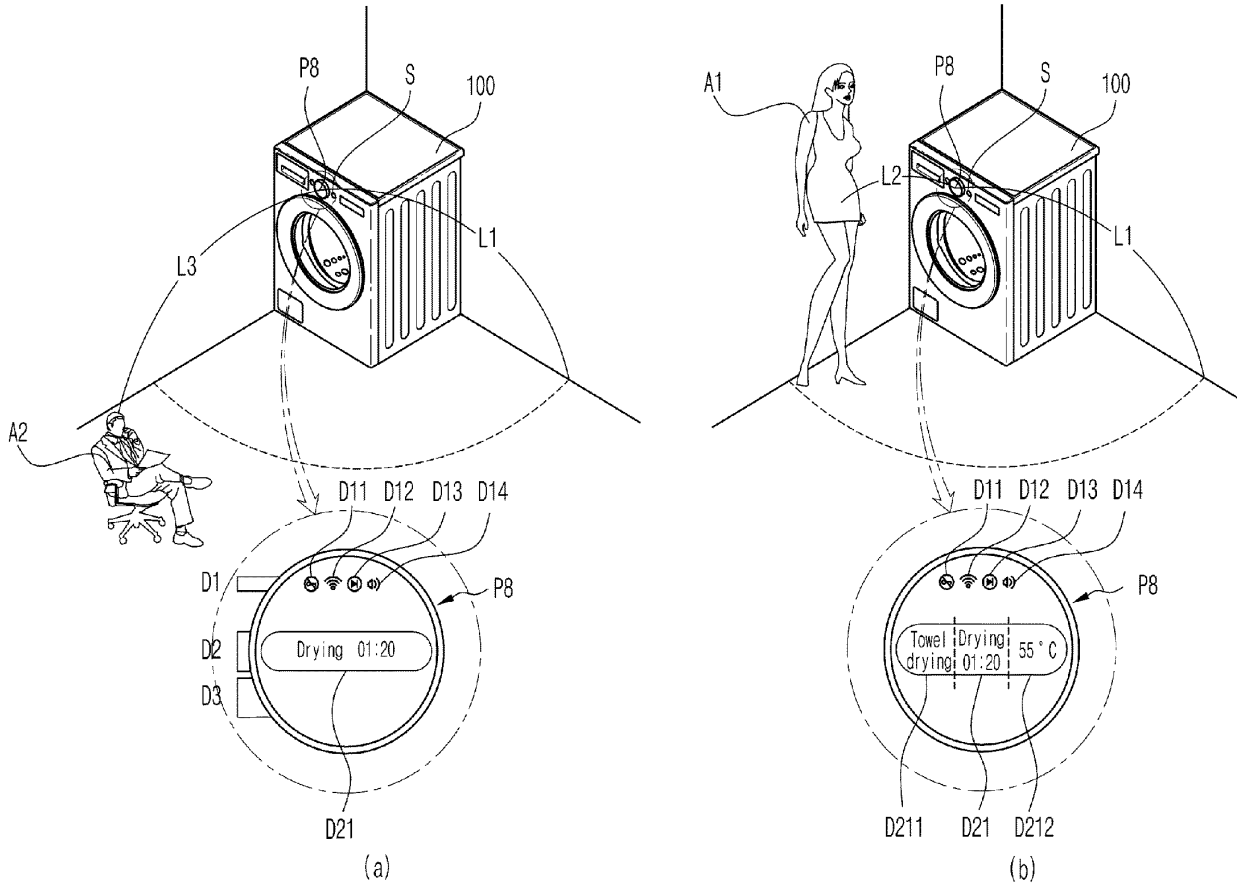
【FIG 4】


23
232
234
231
233
31
311
312
3
32
211
21
2
221
22
222
262
261
26
251
252
253
25

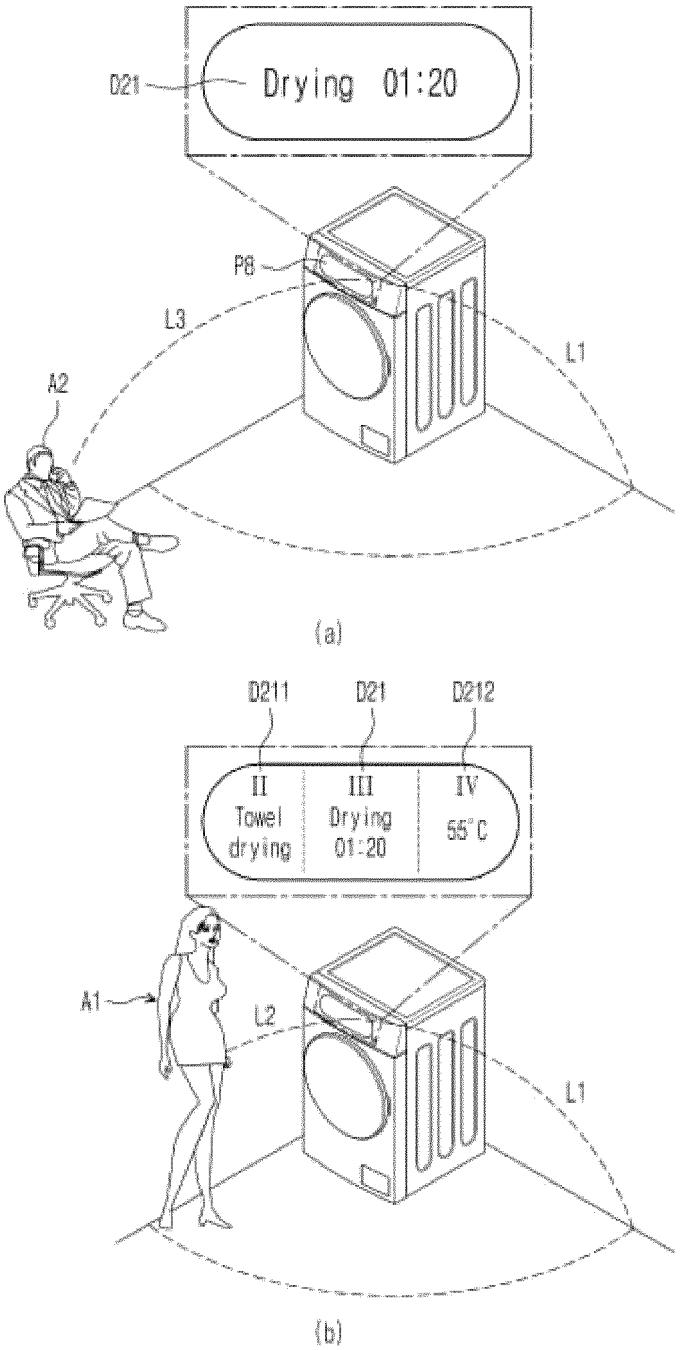
【FIG 5】


Start
Detect distance
X1
Display
X2
NO
Detect change in position
X3
YES
Change display
X4
End

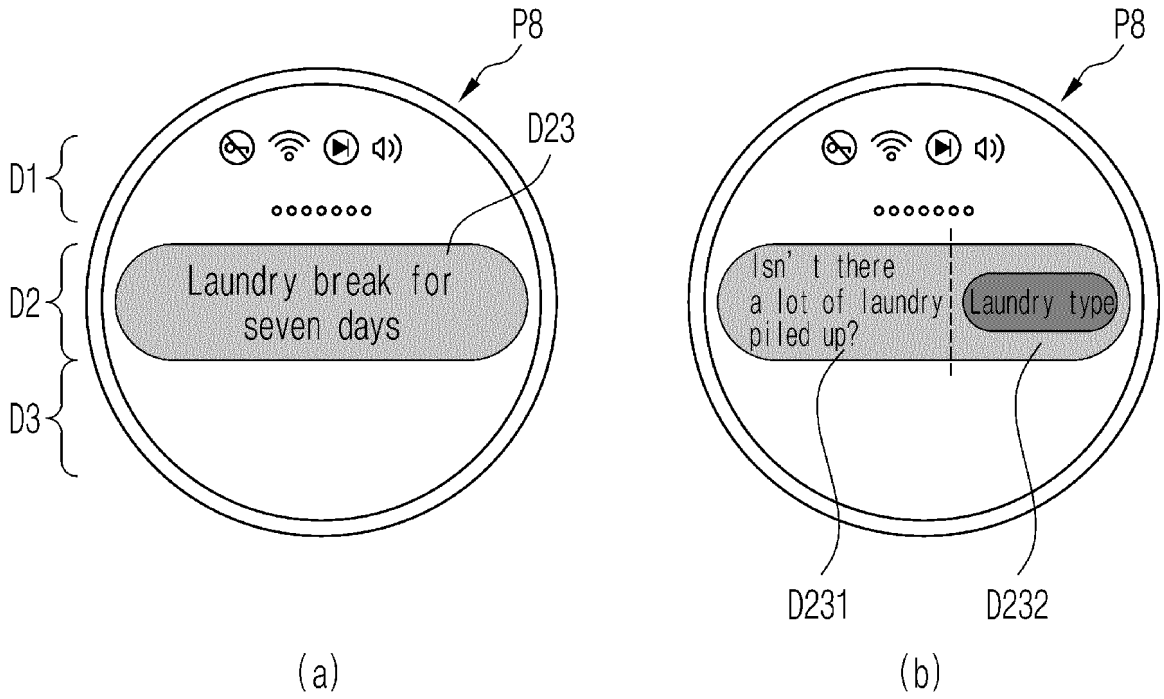
【FIG 6】


P8
S
100
L1
L3
A2
D11 D12 D13 D14
D1
D2
D3
P8
Drying 01:20
D21
(a)
A1
P8
S
100
L2
L1
D11 D12 D13 D14
P8
Towel drying
Drying 01:20
55 °C
D211
D21
D212
(b)

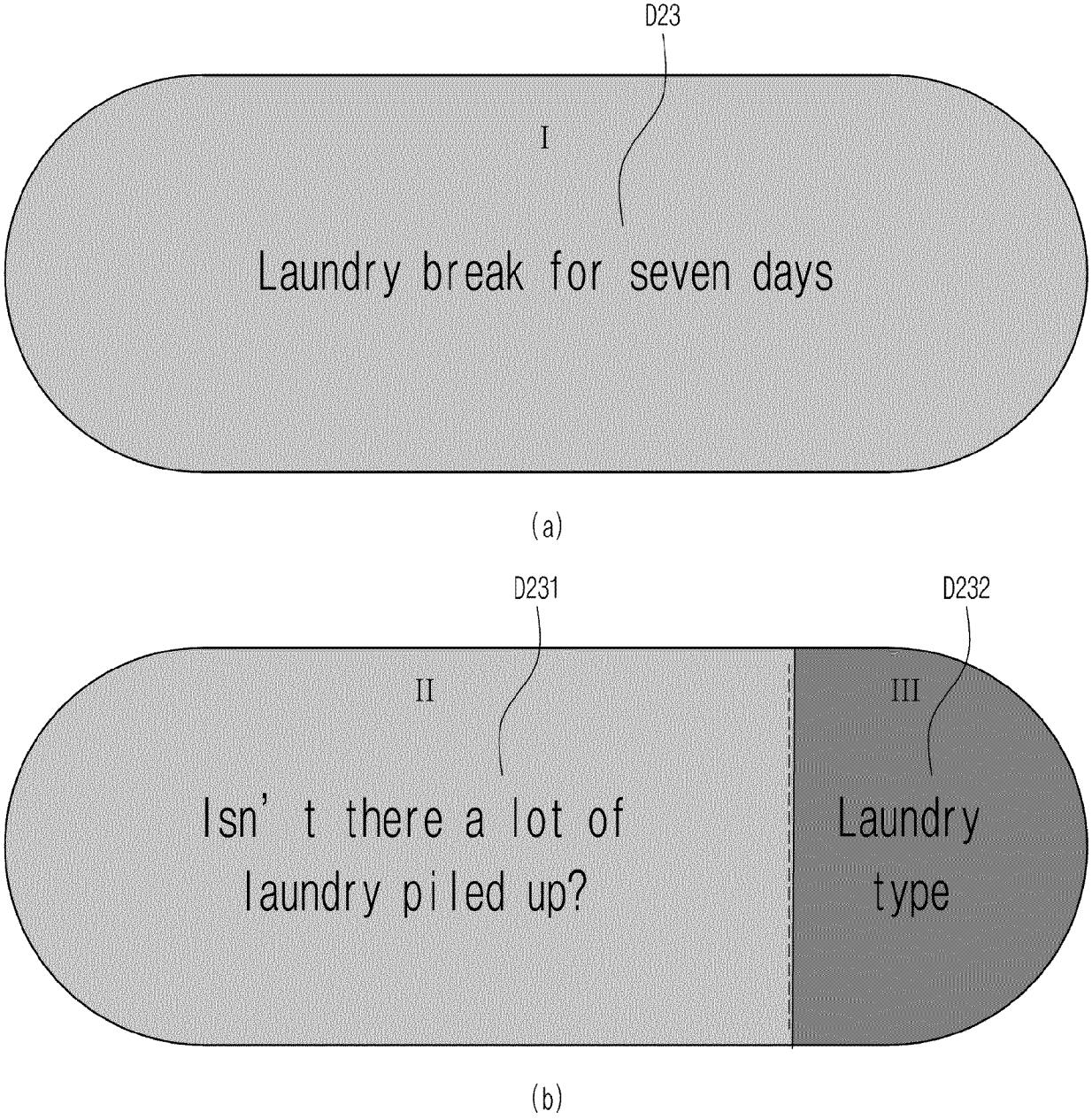
【FIG 7】


D21
Drying 01:20
P8
L3
L1
A2
(a)
D211
D21
D212
II
Towel drying
III
Drying 01:20
IV
55°C
A1
L2
L1
(b)

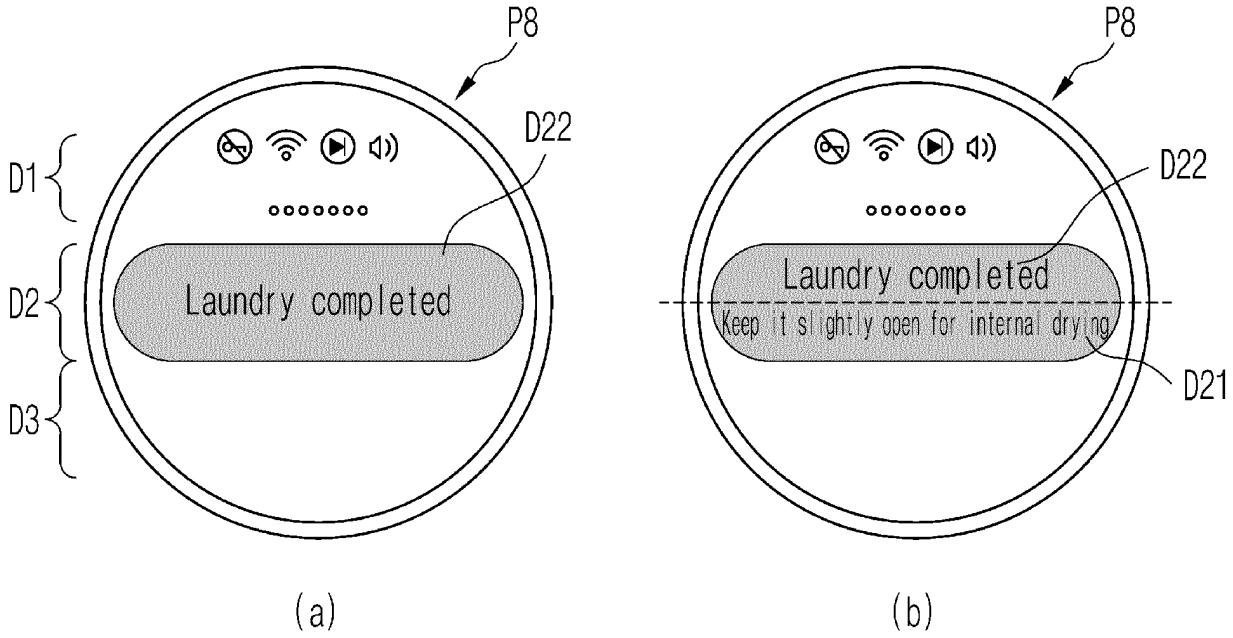
【FIG 8】


P8
D23
D1
D2
D3
Laundry break for seven days
(a)
P8
Isn't there a lot of laundry piled up?
Laundry type
D231
D232
(b)

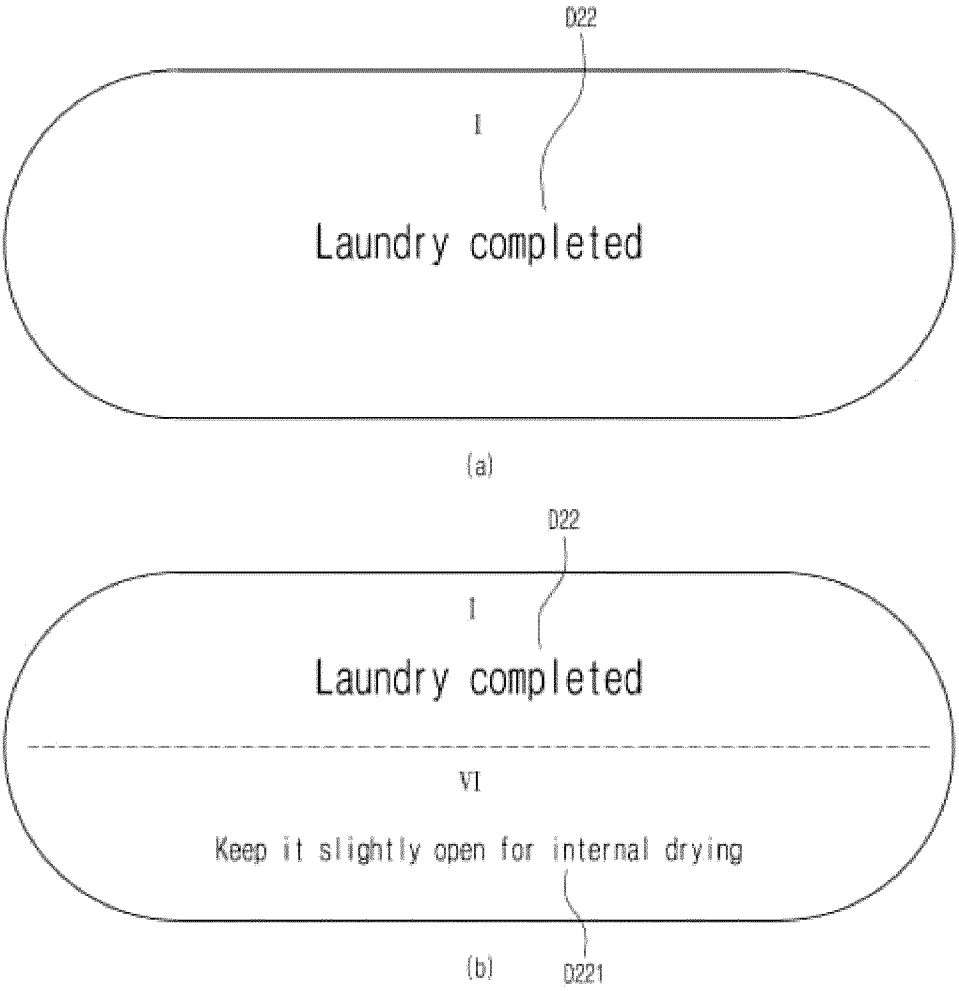
【FIG 9】


D23
I
Laundry break for seven days
(a)
D231
D232
II
III
Isn' t there a lot of laundry piled up?
Laundry type
(b)

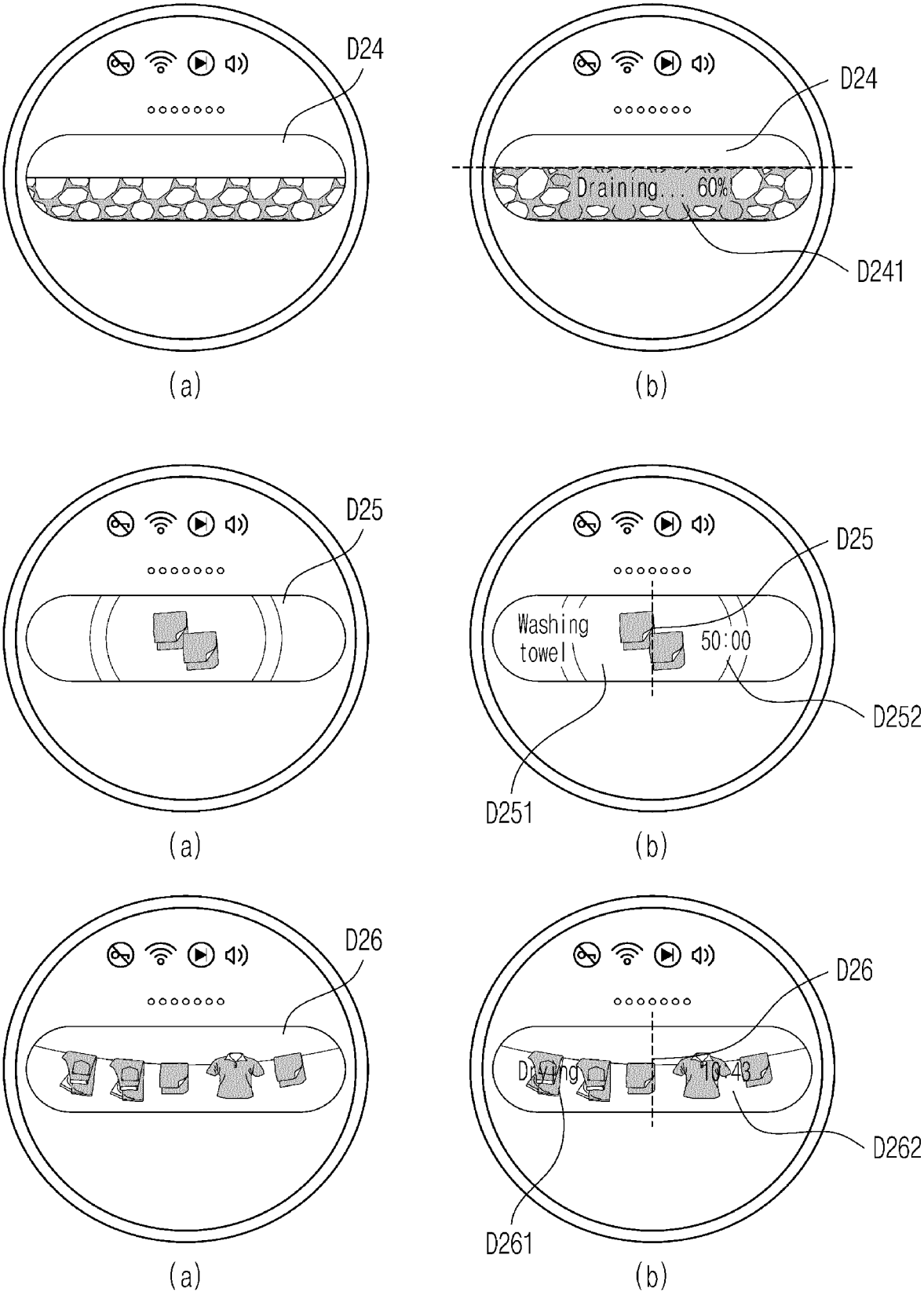
【FIG 10】


P8
D22
D1
D2
D3
Laundry completed
(a)
P8
D22
Laundry completed
Keep it slightly open for internal drying.
D21
(b)

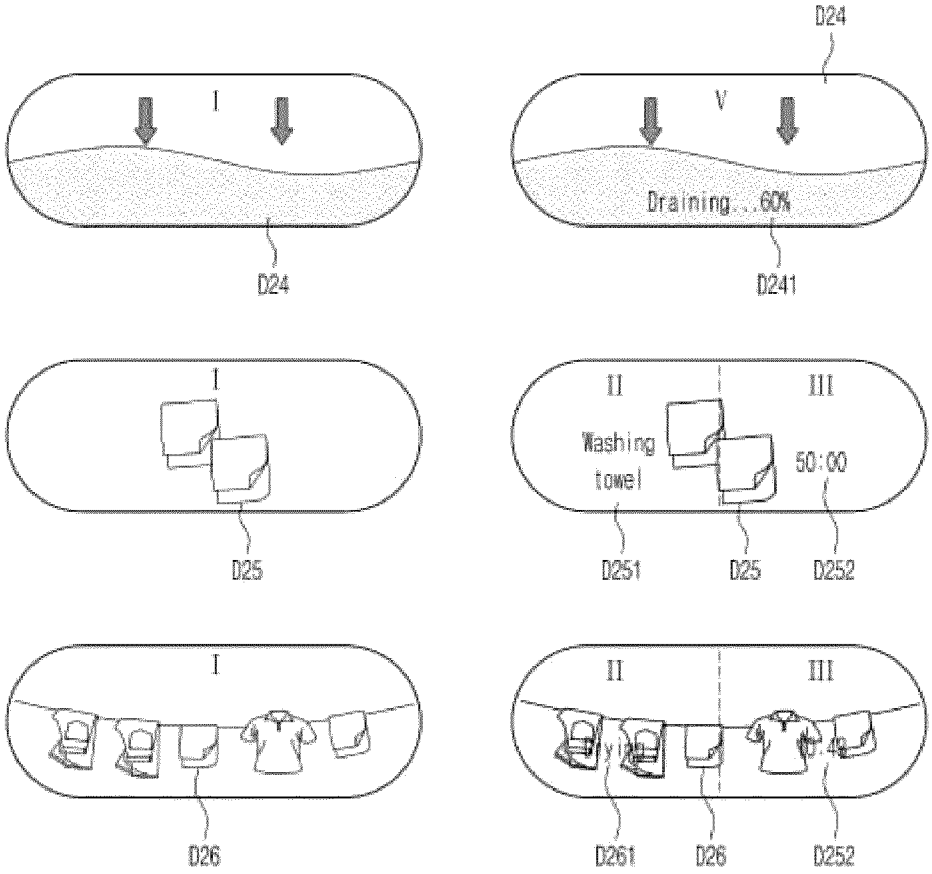
【FIG 11】


D22
I
Laundry completed
(a)
D22
I
Laundry completed
VI
Keep it slightly open for internal drying
(b)
D221

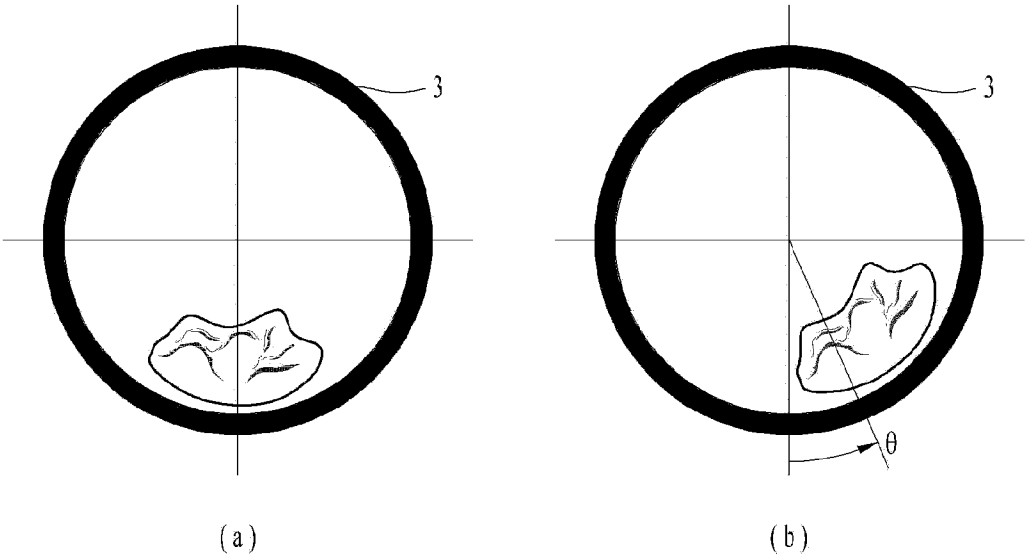
【FIG 12】


D24
(a)
D24
Draining... 60%
D241
(b)
D25
(a)
D25
Washing
towel
50:00
D252
D251
(b)
D26
(a)
D26
Drying
10:43
D262
D261
(b)

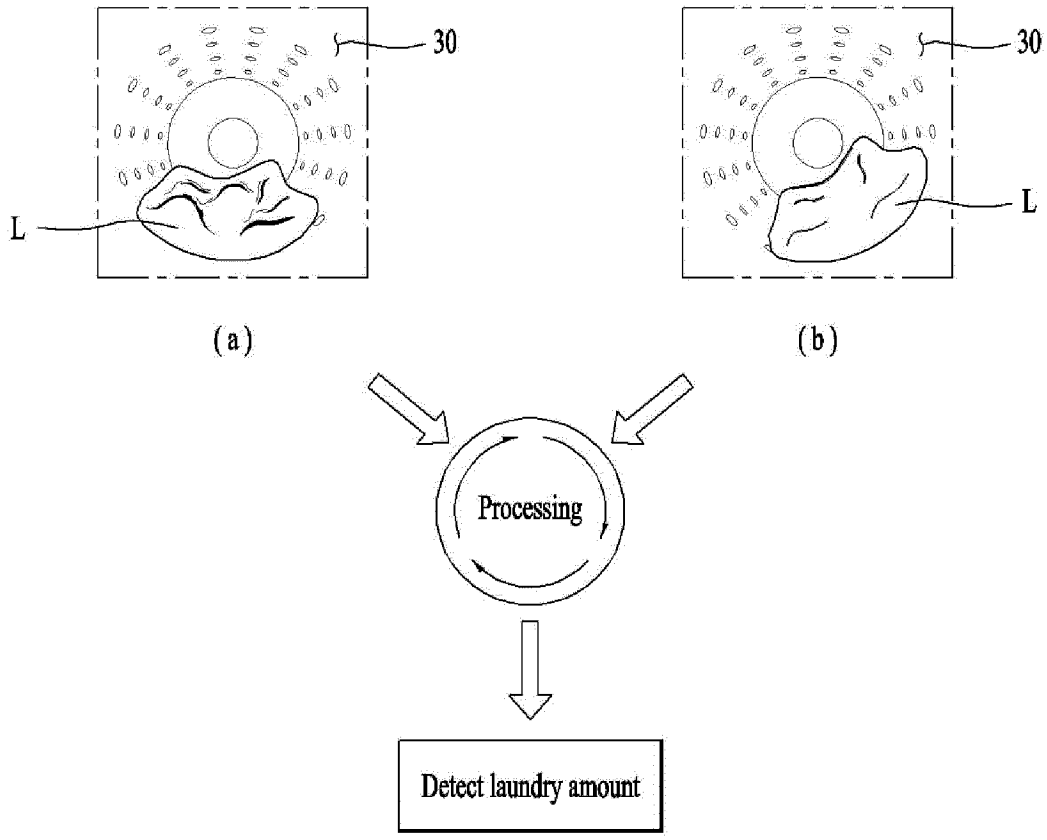
【FIG 13】


D24
I
D24
V
Draining...60%
D241
I
D25
II
III
Washing
towel
50:00
D251
D25
D252
I
D26
II
III
D261
D26
D252

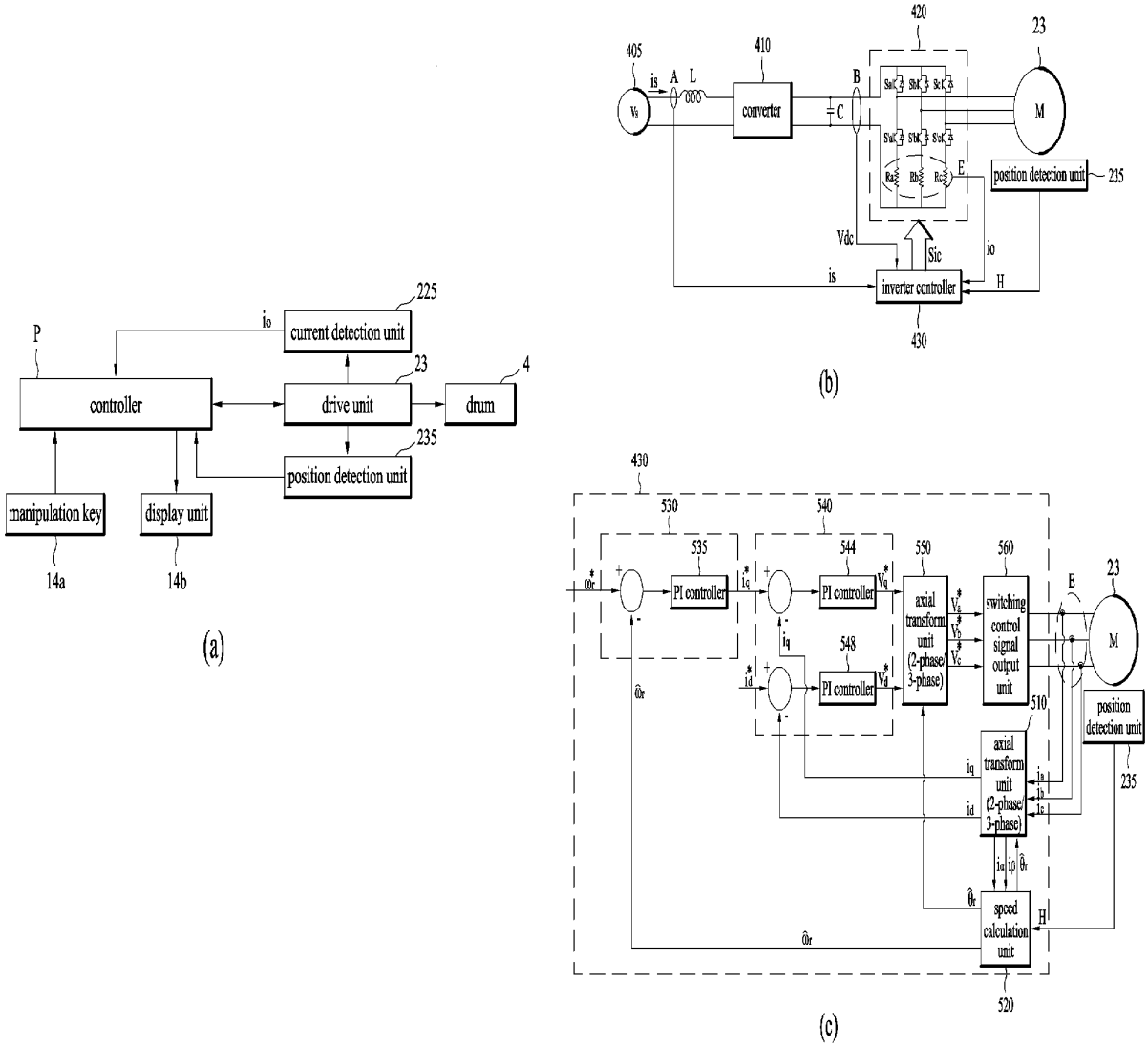
【FIG 14】



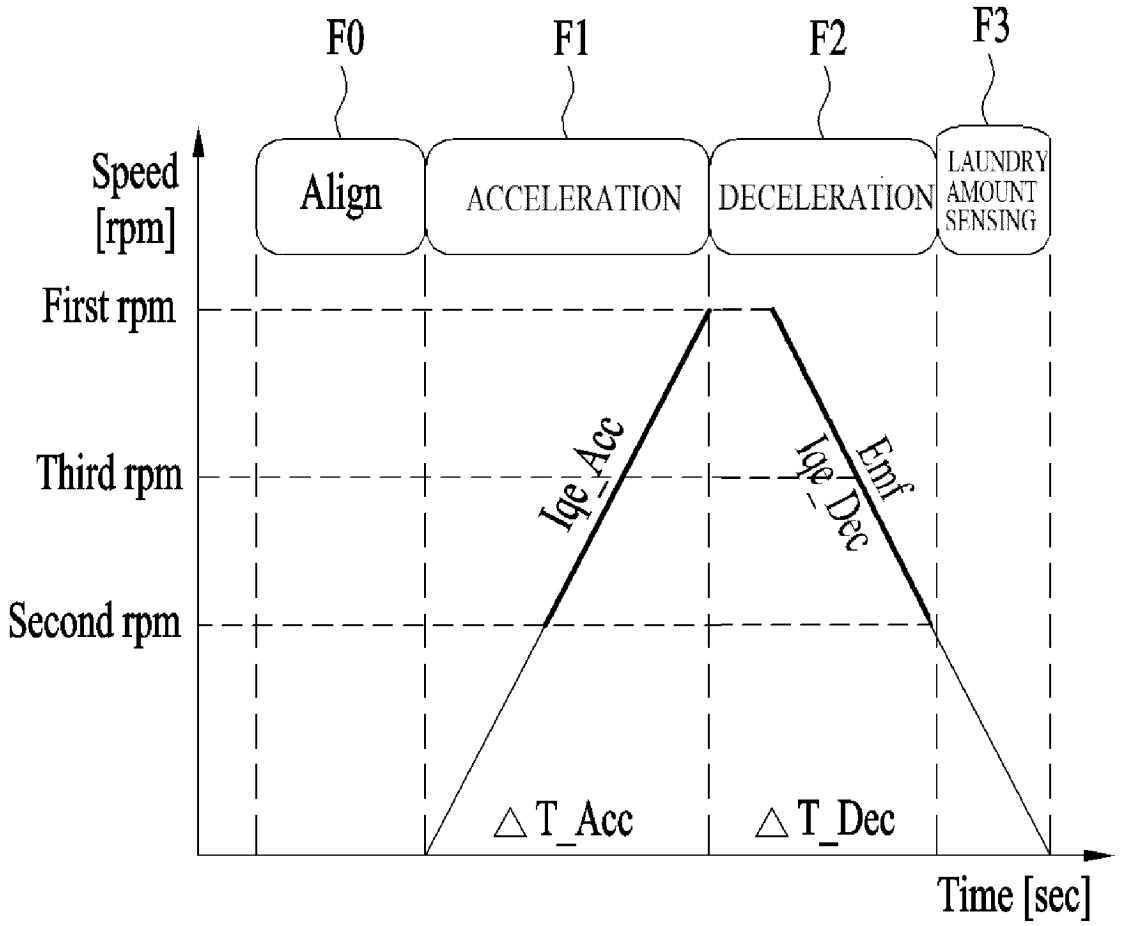
【FIG 15】



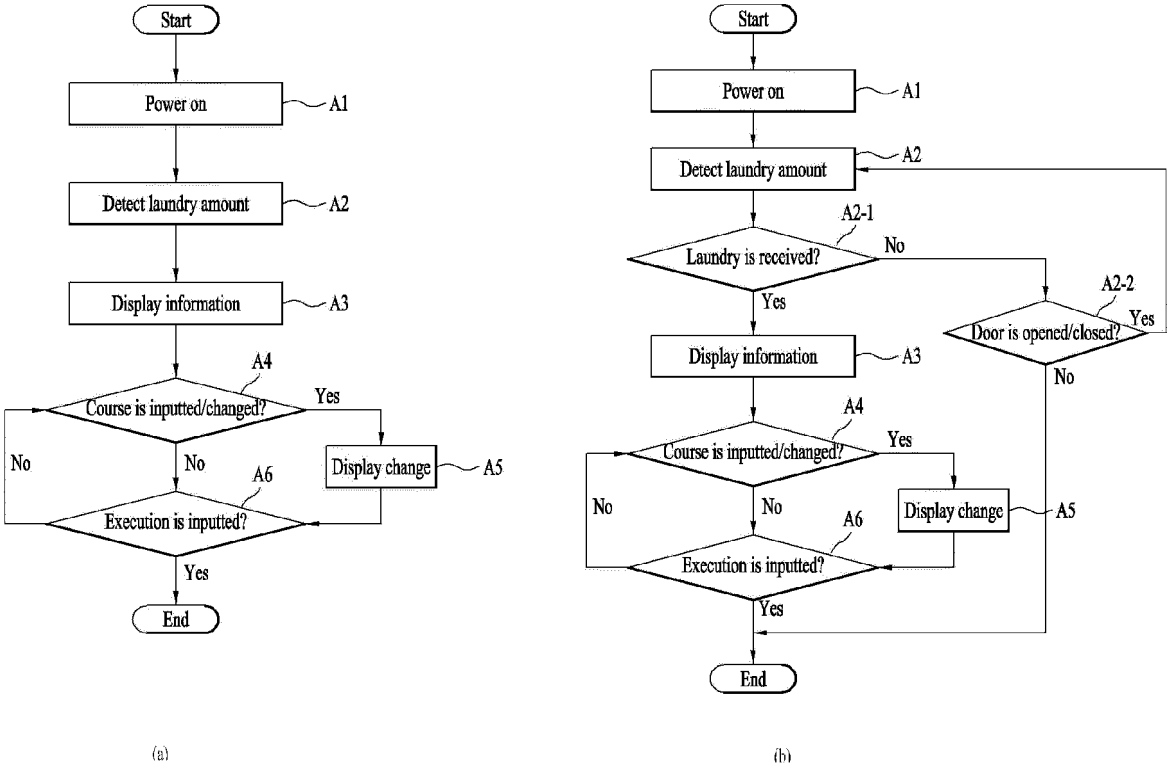
【FIG 16】


225
io
current detection unit
P
23
4
controller
drive unit
drum
235
position detection unit
manipulation key
display unit
14a
14b
(a)
420
23
405
410
is
A
L
B
converter
C
M
E
position detection unit
235
Vdc
Sic
io
is
inverter controller
H
430
(b)
430
530
540
535
544
550
560
E
23
PI controller
PI controller
PI controller
axial transform unit (2-phase/3-phase)
switching control signal output unit
M
510
position detection unit
axial transform unit (2-phase/3-phase)
235
speed calculation unit
H
520
(c)

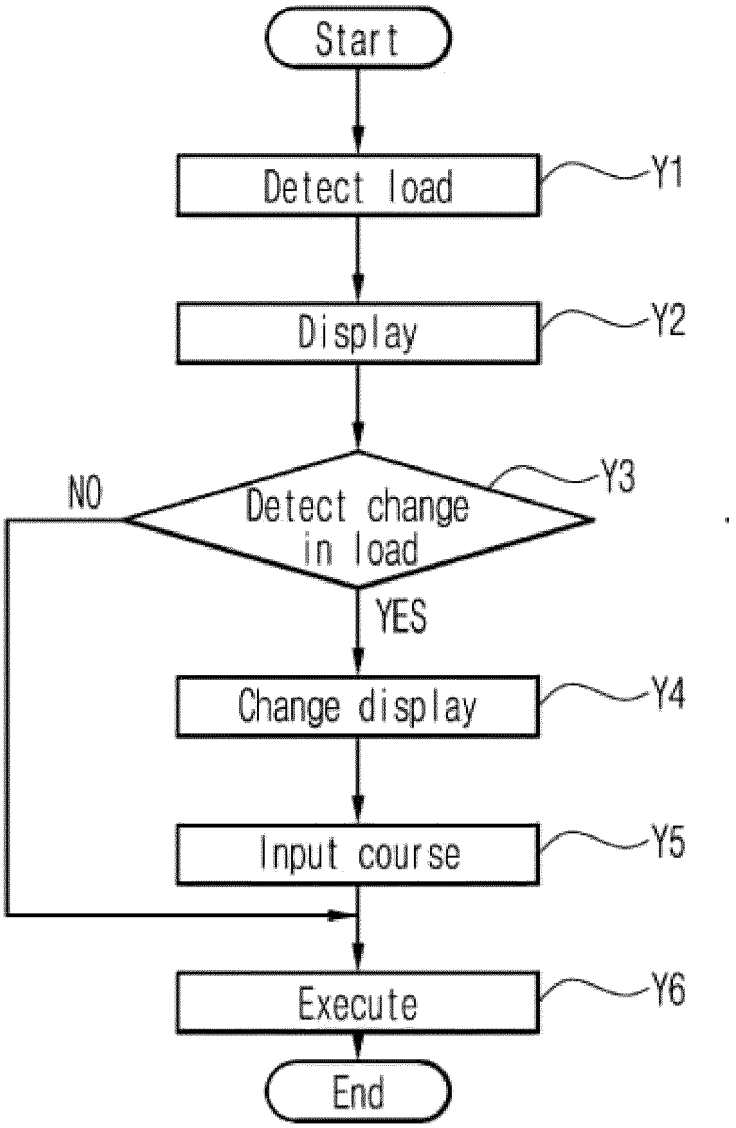
【FIG 17】


F0
F1
F2
F3
Speed [rpm]
Align
ACCELERATION
DECELERATION
LAUNDRY AMOUNT SENSING
First rpm
Third rpm
Second rpm
Iqe_Acc
Emf
Iqe_Dec
△T_Acc
△T_Dec
Time [sec]

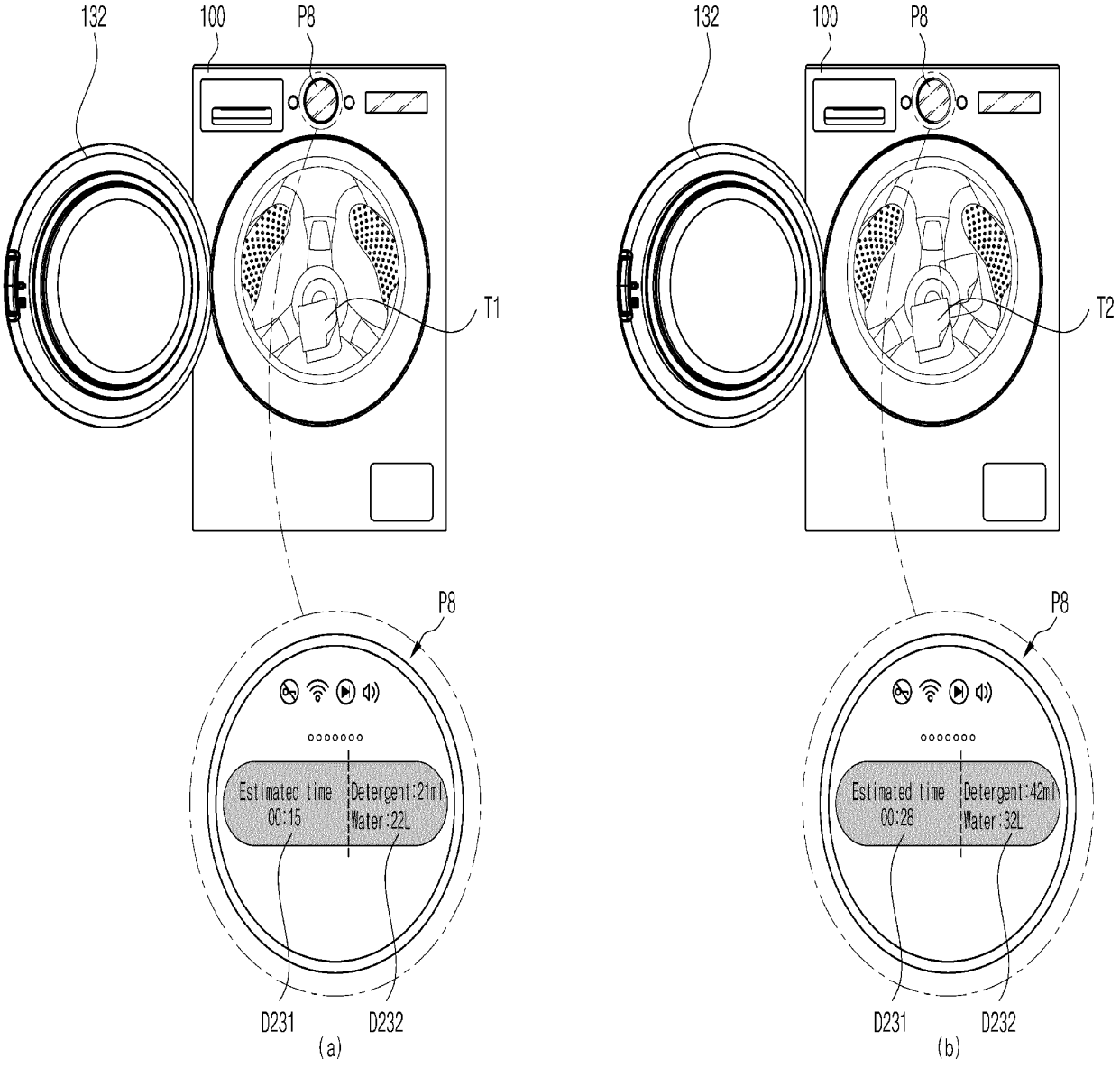
【FIG 18】


Start
Power on
A1
Detect laundry amount
A2
Display information
A3
A4
Course is inputted/changed?
Yes
No
No
Display change
A5
A6
Execution is inputted?
Yes
End
(a)
Start
Power on
A1
Detect laundry amount
A2
A2-1
Laundry is received?
No
Yes
A2-2
Door is opened/closed?
Yes
No
Display information
A3
A4
Course is inputted/changed?
Yes
No
No
Display change
A5
A6
Execution is inputted?
Yes
End
(b)

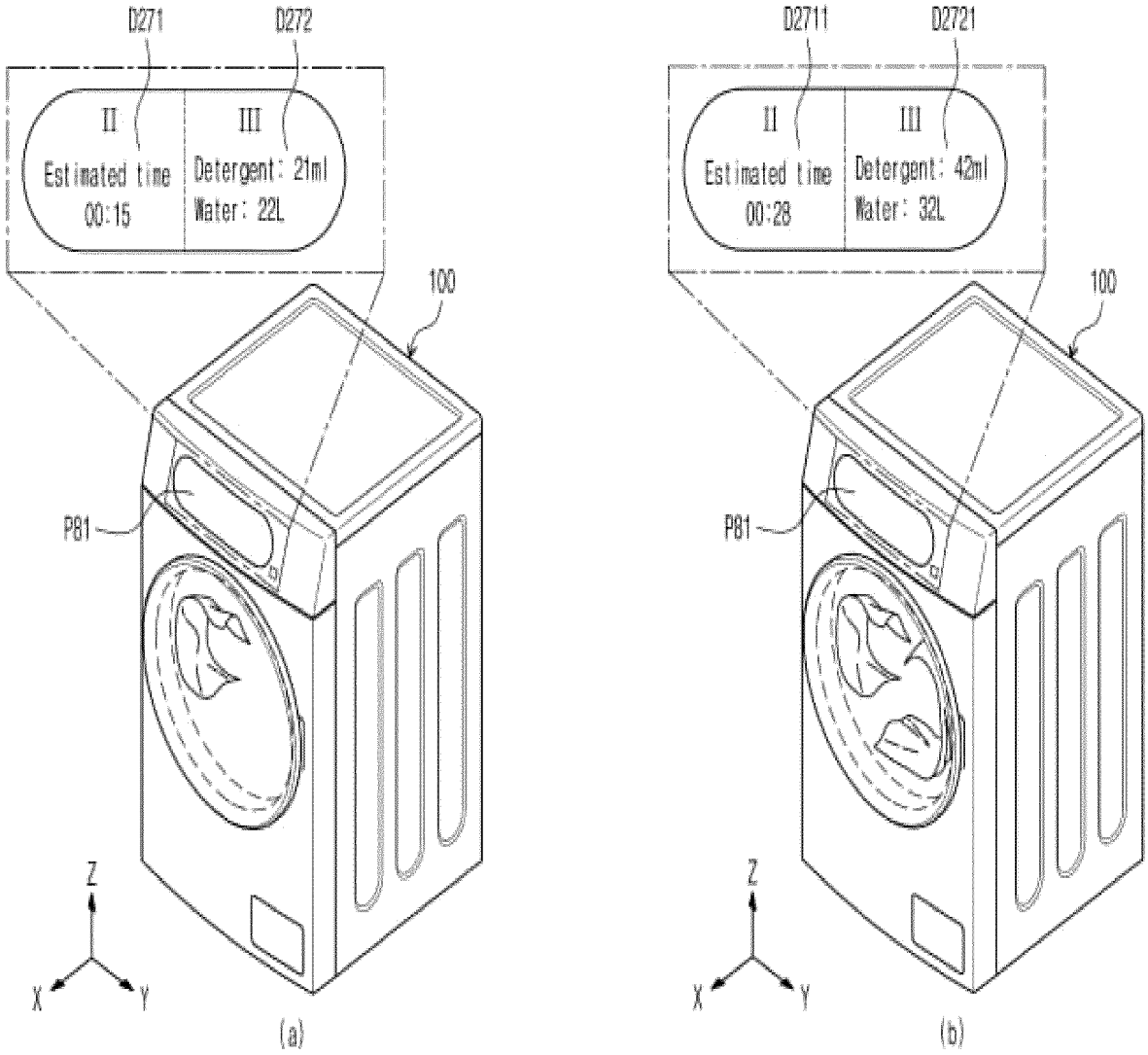
【FIG 19】


Start
Detect load
Y1
Display
Y2
Detect change in load
Y3
NO
YES
Change display
Y4
Input course
Y5
Execute
Y6
End

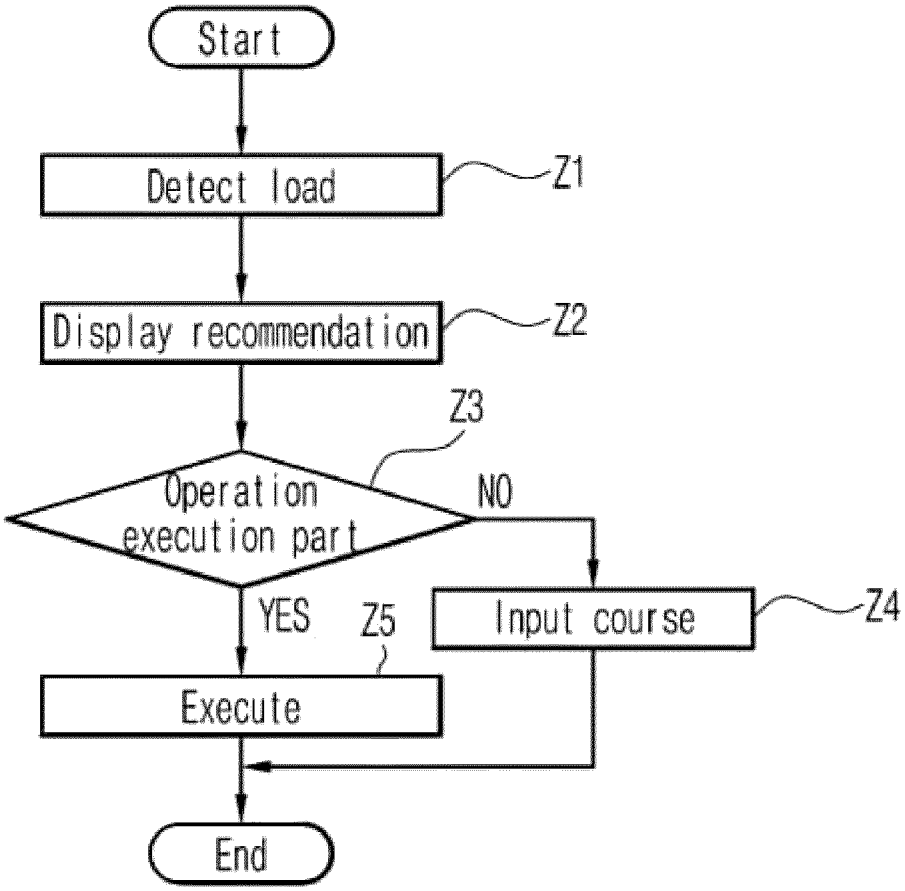
【FIG 20】


132
100
P8
T1
P8
Estimated time
00:15
Detergent:21ml
Water:22L
D231
D232
(a)
132
100
P8
T2
P8
Estimated time
00:28
Detergent:42ml
Water:32L
D231
D232
(b)

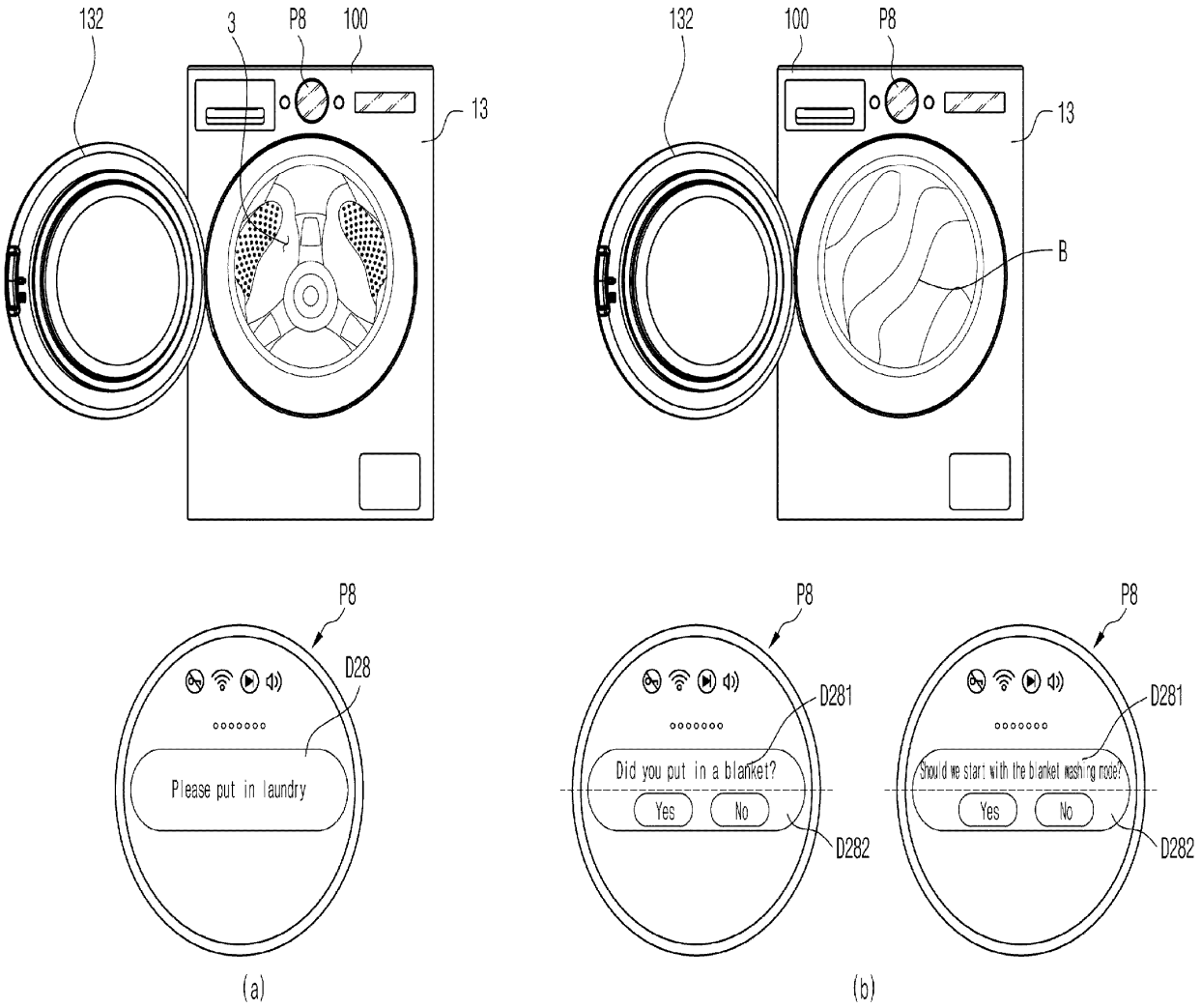
【FIG 21】


D271
D272
II
III
Estimated time
00:15
Detergent: 21ml
Water: 22L
100
P81
Z
X
Y
(a)
D2711
D2721
II
III
Estimated time
00:28
Detergent: 42ml
Water: 32L
100
P81
Z
X
Y
(b)

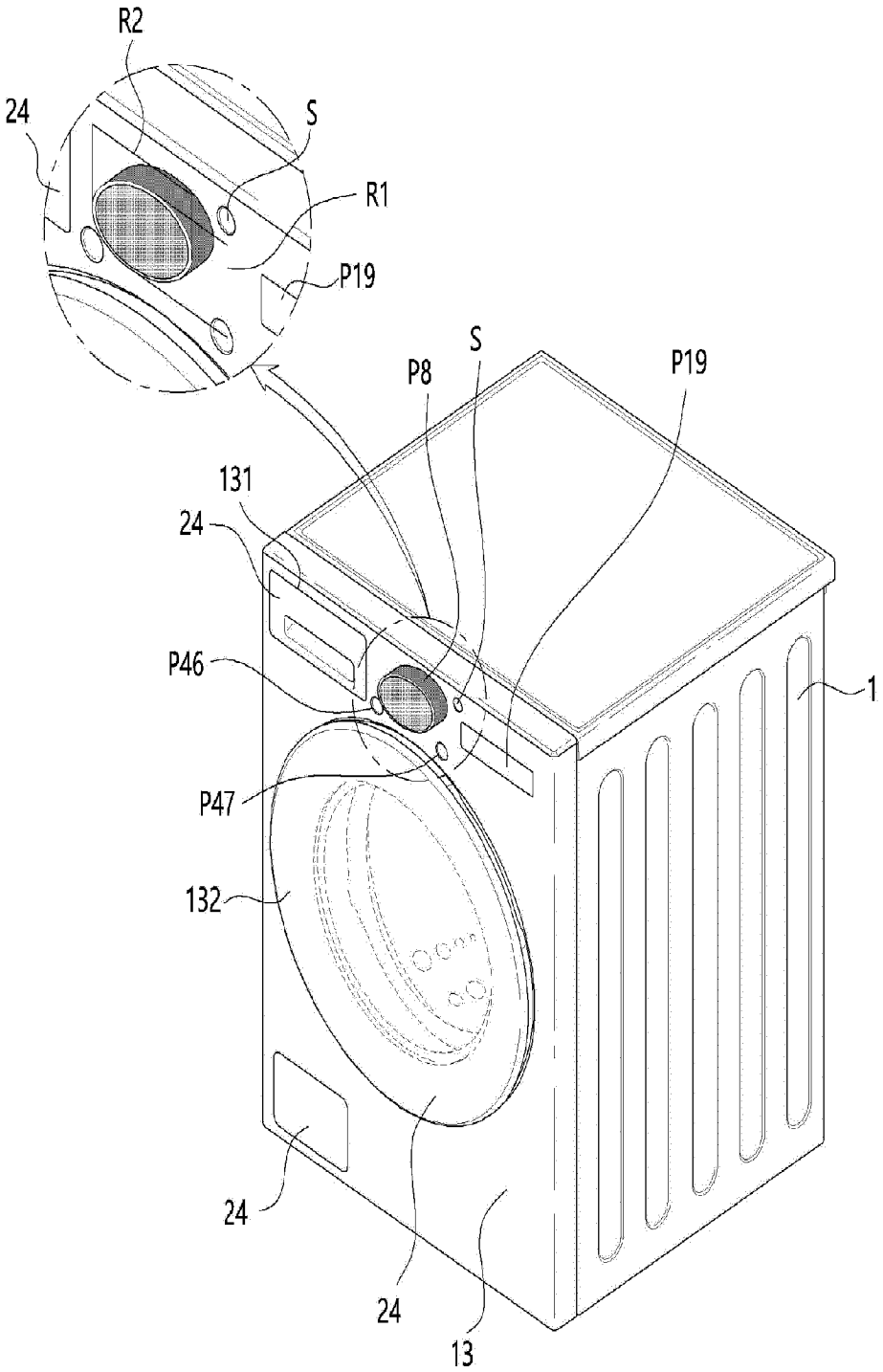
【FIG 22】


Start
Detect load
Z1
Display recommendation
Z2
Z3
Operation execution part
NO
YES
Z5
Input course
Z4
Execute
End

【FIG 23】


132
3
P8
100
13
132
100
P8
13
B
P8
D28
Please put in laundry
(a)
P8
D281
Did you put in a blanket?
Yes
No
D282
P8
D281
Should we start with the blanket washing mode?
Yes
No
D282
(b)

【FIG 24】



INTERNATIONAL SEARCH REPORT

International application No.
PCT/KR2023/011119

A. CLASSIFICATION OF SUBJECT MATTER

D06F 34/34(2020.01)i; **D06F 34/14**(2020.01)i; **D06F 34/18**(2020.01)i; **D06F 34/30**(2020.01)i; **D06F 34/32**(2020.01)i; **D06F 103/04**(2020.01)i; **D06F 105/58**(2020.01)i

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

D06F 34/34(2020.01); D06F 33/30(2020.01); G06F 3/01(2006.01); G06F 3/14(2006.01); G09G 5/00(2006.01); H04B 1/40(2006.01)

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

Korean utility models and applications for utility models: IPC as above
Japanese utility models and applications for utility models: IPC as above

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

eKOMPASS (KIPO internal) & keywords: 의류처리장치(clothing treatment device), 거리(distance), 표시(display), 변경(change)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	KR 10-2015-0083677 A (LG ELECTRONICS INC.) 20 July 2015 (2015-07-20) See paragraphs [0003]-[0103], claims 1-11 and figures 1-8.	1-4,9-10,15
Y		5-8,11-14
Y	JP 5248225 B2 (FUJI FILM CORPORATION) 31 July 2013 (2013-07-31) See paragraphs [0007]-[0066], claims 1-7 and figures 1-14.	5-6
Y	JP 2003-076355 A (SHARP CORPORATION) 14 March 2003 (2003-03-14) See paragraphs [0017]-[0120], claims 1-8 and figures 1-2.	7-8
Y	KR 10-2016-0015883 A (LG ELECTRONICS INC.) 15 February 2016 (2016-02-15) See paragraphs [0041]-[0217], claims 1-15 and figures 1-8.	11-14
A	KR 10-0761347 B1 (LG TELECOM, LTD.) 27 September 2007 (2007-09-27) See paragraphs [0014]-[0048], claims 1-5 and figures 1-5.	1-15

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

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

Date of the actual completion of the international search	Date of mailing of the international search report
20 November 2023	**20 November 2023**
Name and mailing address of the ISA/KR **Korean Intellectual Property Office** **Government Complex-Daejeon Building 4, 189 Cheongsa-ro, Seo-gu, Daejeon 35208** Facsimile No. **+82-42-481-8578**	Authorized officer Telephone No.

Form PCT/ISA/210 (second sheet) (July 2022)

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/KR2023/011119

Patent document cited in search report	Publication date (day/month/year)	Patent family member(s)	Publication date (day/month/year)
KR 10-2015-0083677 A	20 July 2015	CN 104775268 A	15 July 2015
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