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Oh et al.

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- (54) **WASHER**
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D06F 34/28 (2020.01)

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CPC **D06F 34/28** (2020.02); **D06F 34/34** (2020.02); **D06F 2101/12** (2020.02); **D06F 2101/20** (2020.02)

- (58) **Field of Classification Search**
CPC **D06F 34/28**; **D06F 34/34**; **D06F 2101/12**; **D06F 2101/20**

See application file for complete search history.

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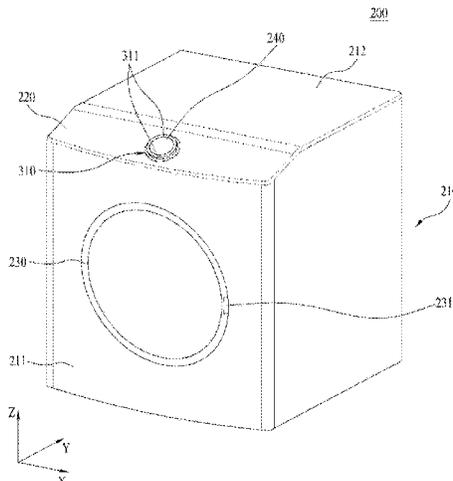
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(57) **ABSTRACT**

The present invention relates to a washer and, particularly, to a washer providing a plurality of washer settings and formed so as to enable the changing of at least one option involved in a specific washer setting when the specific washer setting is selected from the plurality of washer settings, the washer comprising: an operation part formed to be rotatable so as to select the specific washer setting and the at least one option involved in the specific washer setting; a display part formed to selectively display, on the radial inner side of the operation part, input items including at least one of a plurality of washer setting icons, option icons, which are respectively involved in the plurality of washer setting icons, for the at least one option, and a start icon; at least one command input part provided at the radial outer side of the display part and the radial inner side of the operation part, and formed to input the washer setting selected by the operation part, change the at least one option, and input a signal for executing and stopping the selected washer setting; and a control part for controlling the display part such that preset information is displayed on the display part on the basis of the signals from the operation part and the command input part.

21 Claims, 9 Drawing Sheets



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D06F 34/34 (2020.01)
D06F 101/12 (2020.01)
D06F 101/20 (2020.01)

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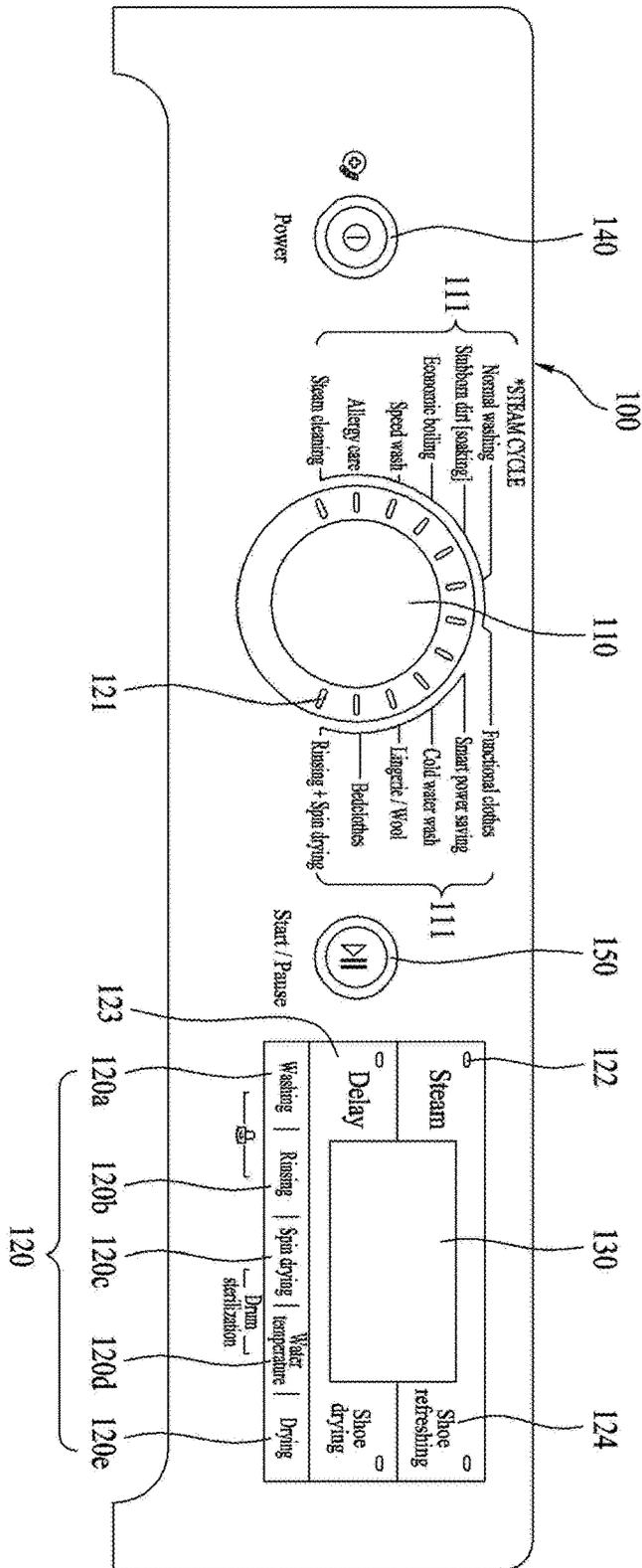
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FIG. 1

Conventional Art



Amended

FIG. 2

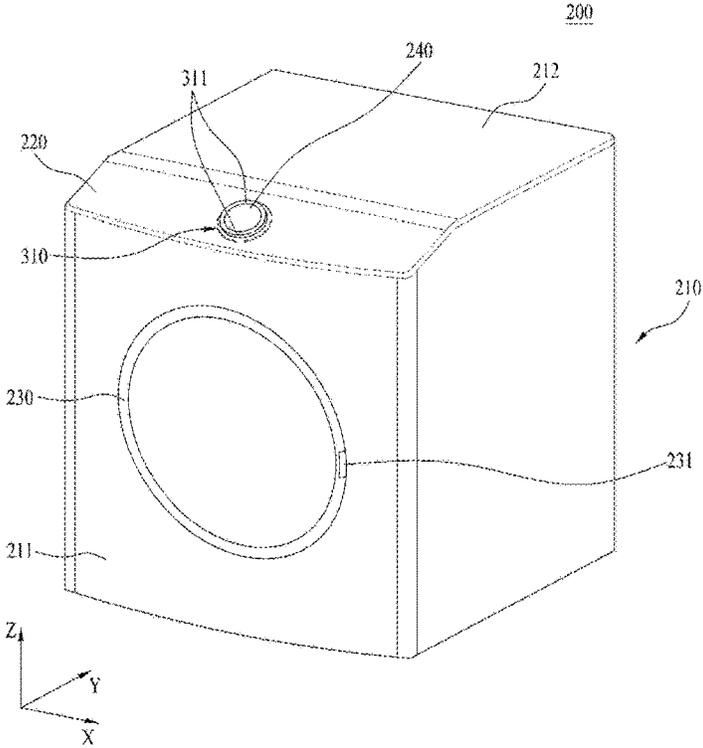


FIG. 3

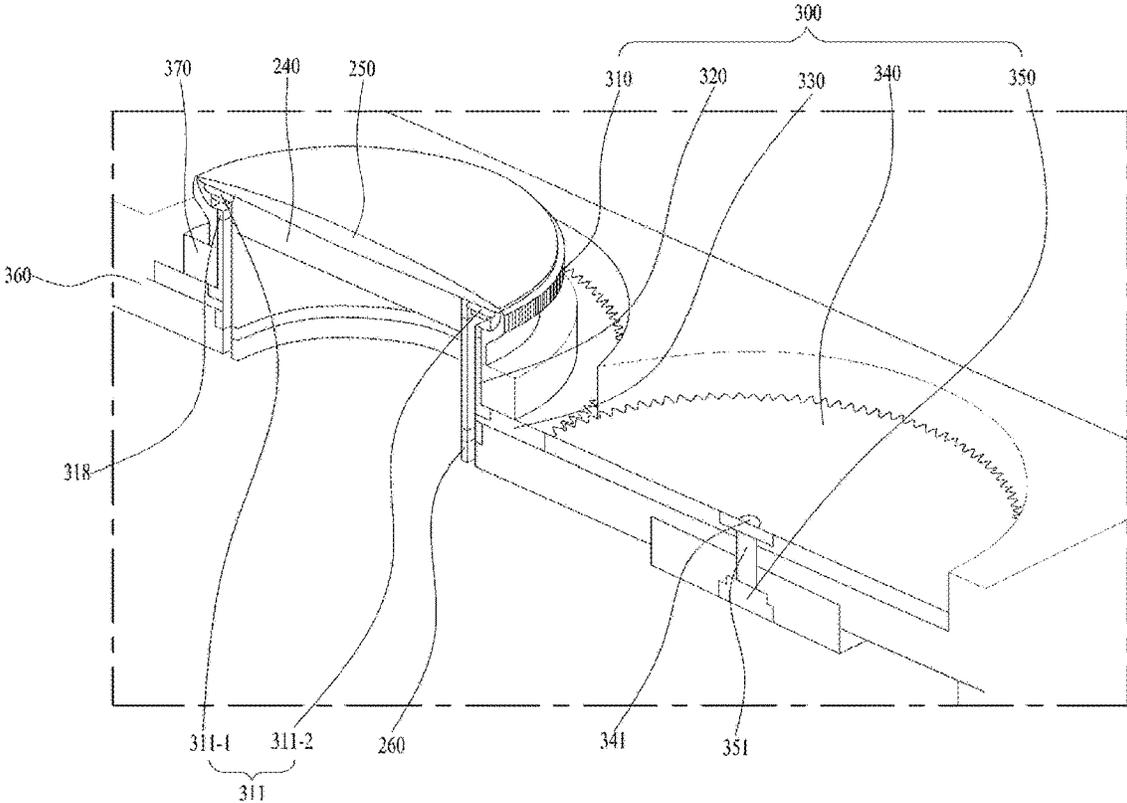


FIG. 4

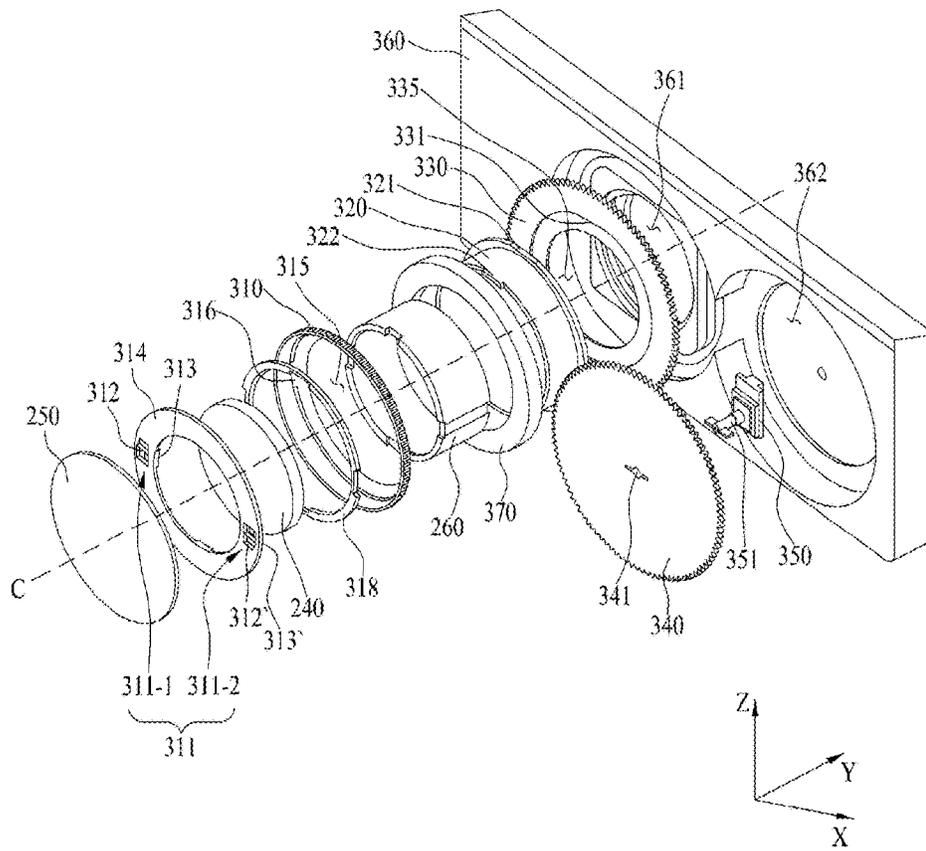


FIG. 5

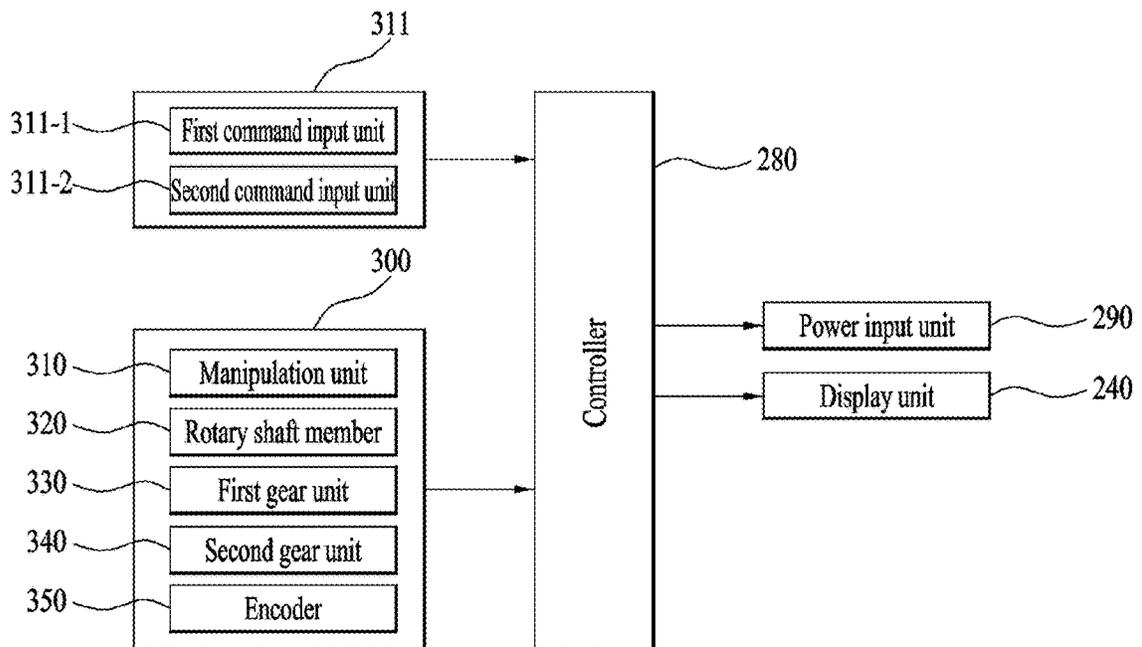


FIG. 6

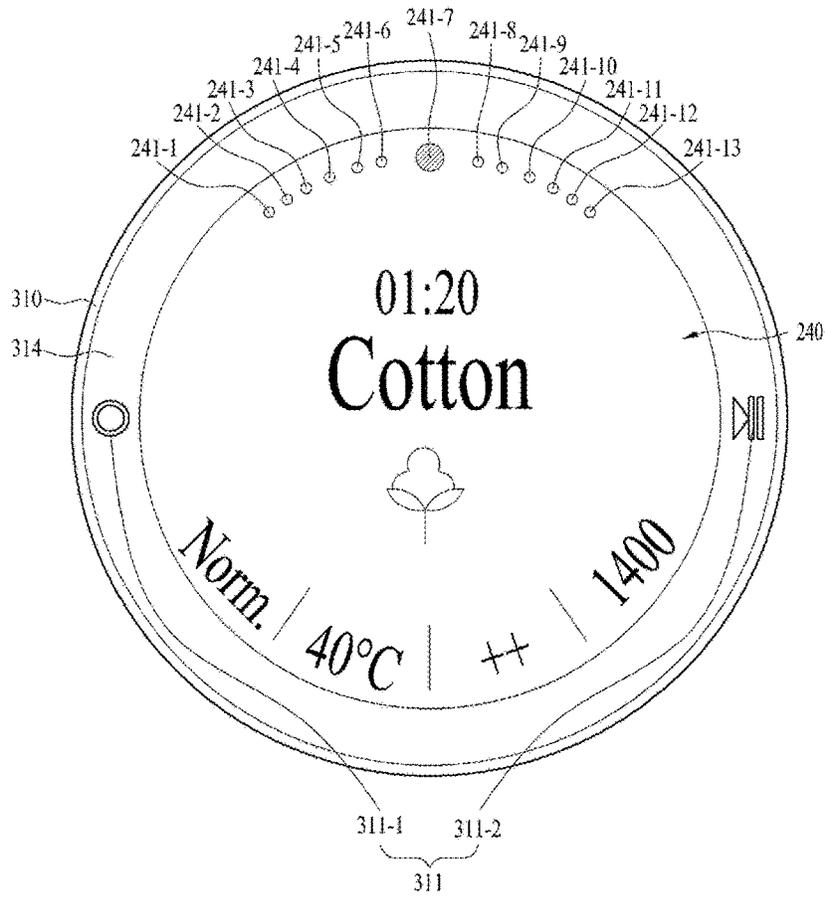


FIG. 7

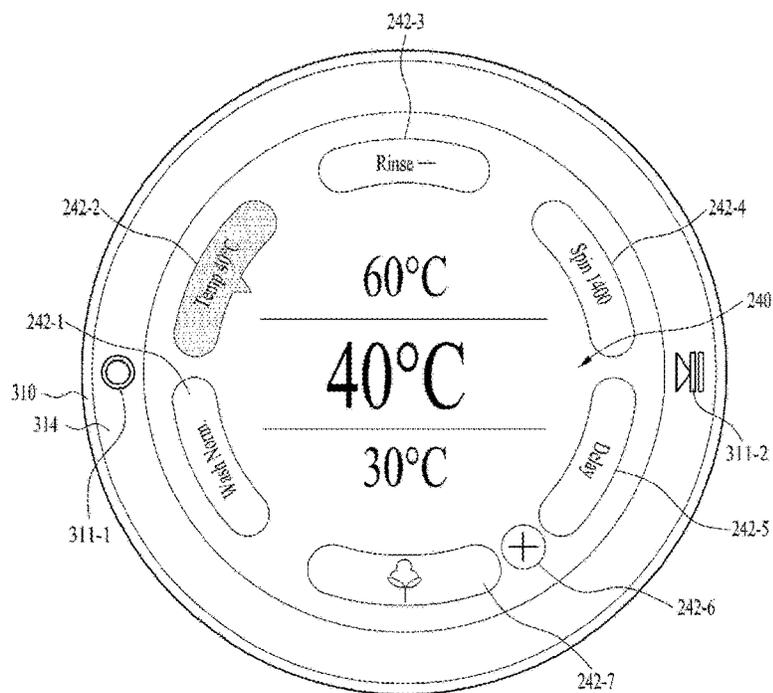


FIG. 8

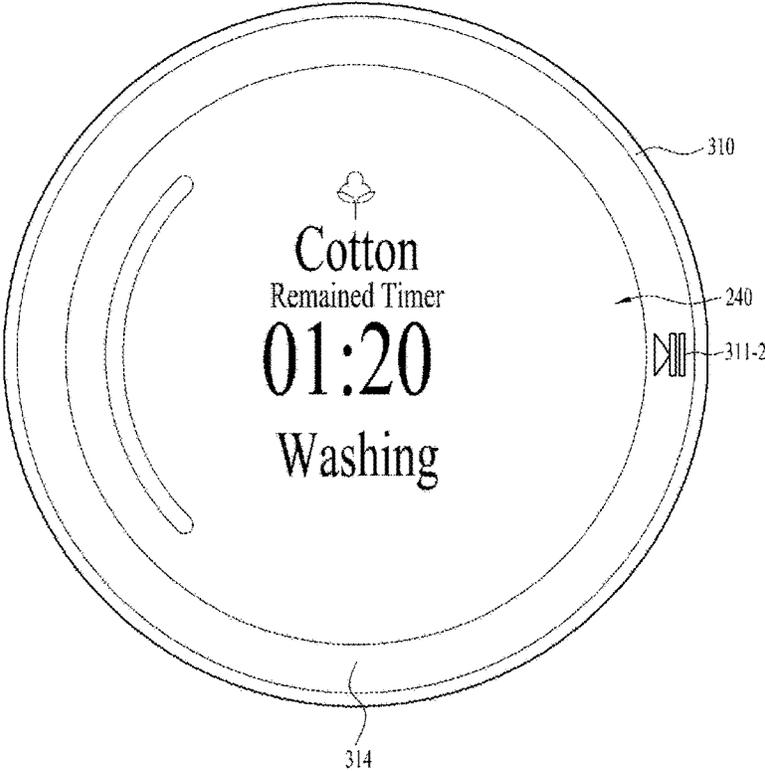


FIG. 9

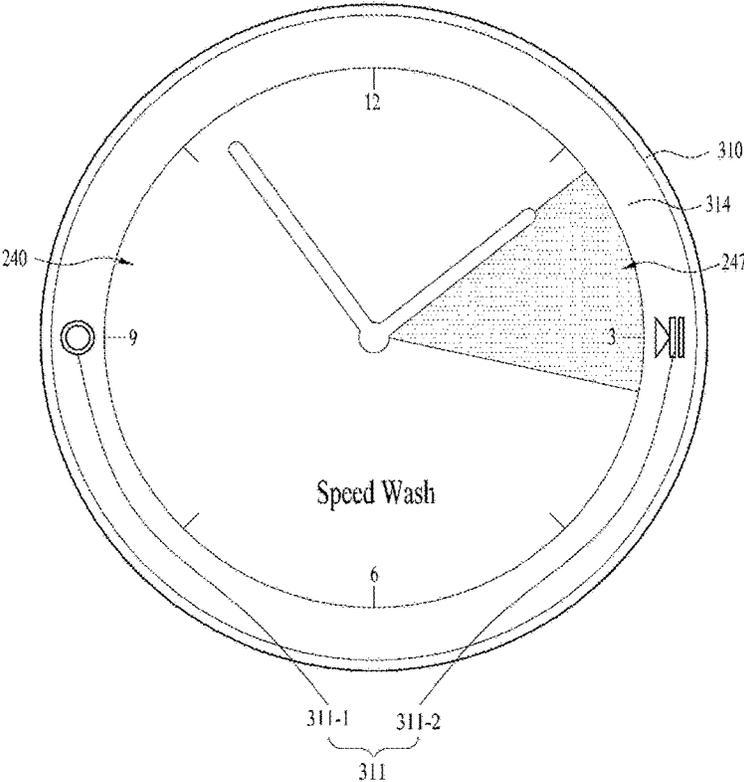


FIG. 10

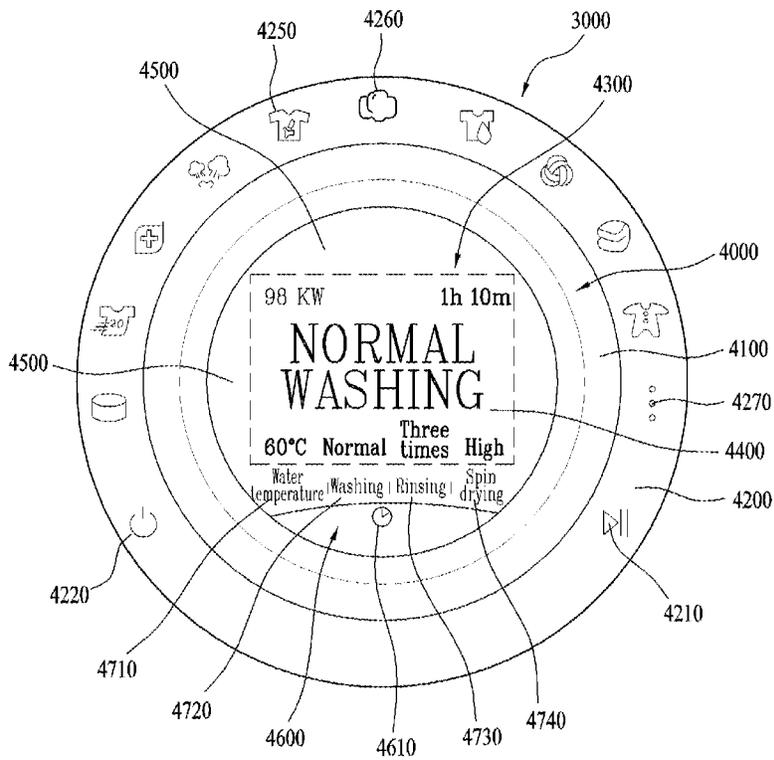


FIG. 11

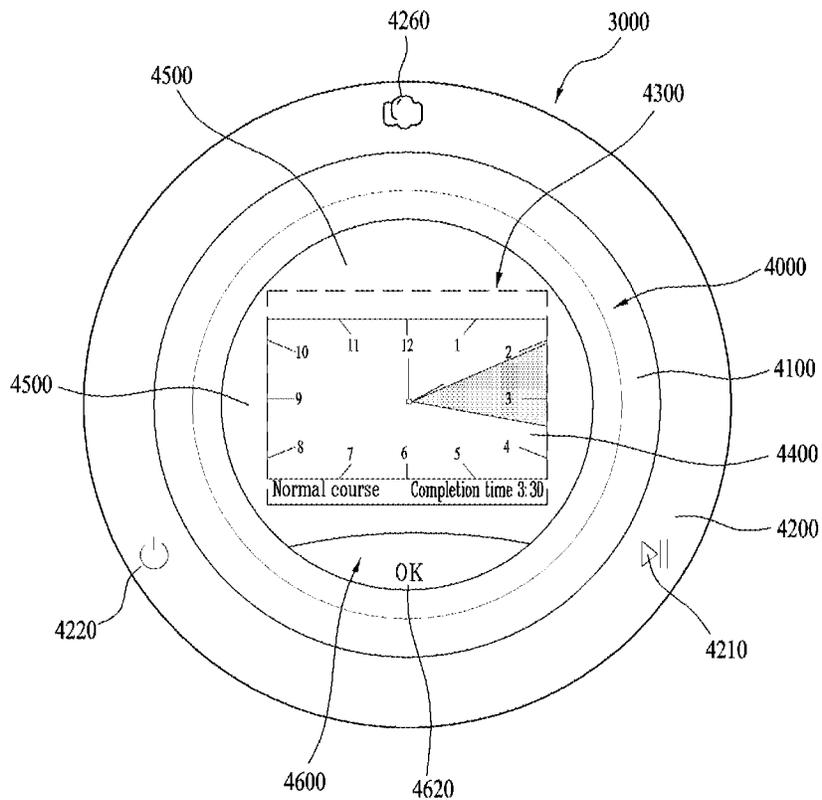


FIG. 12

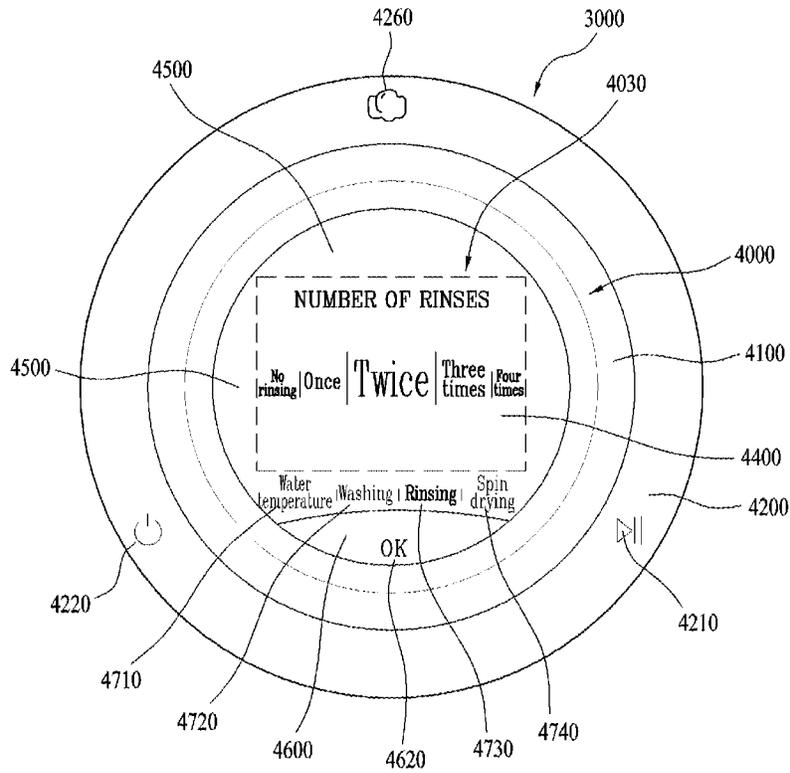


FIG. 13

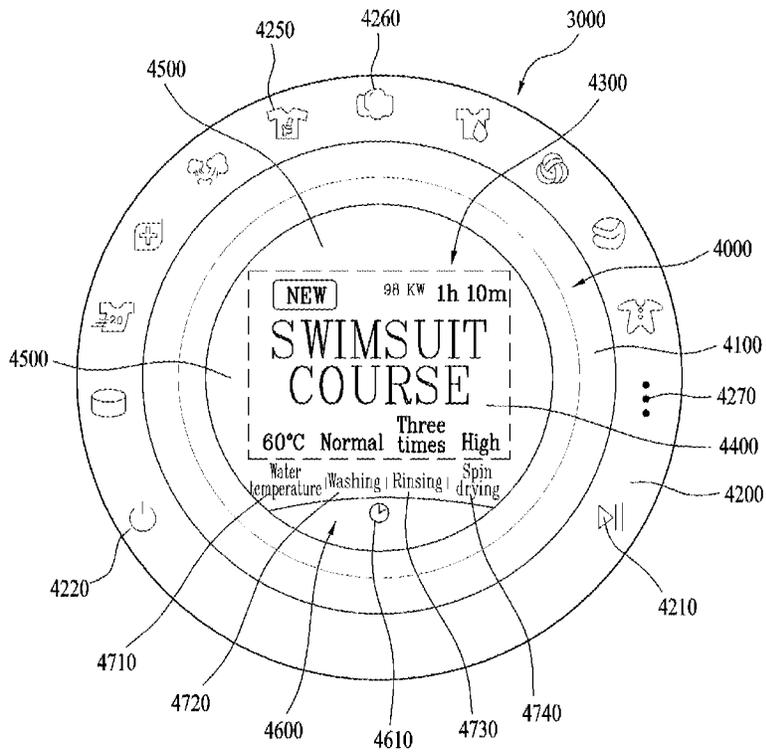


FIG. 14

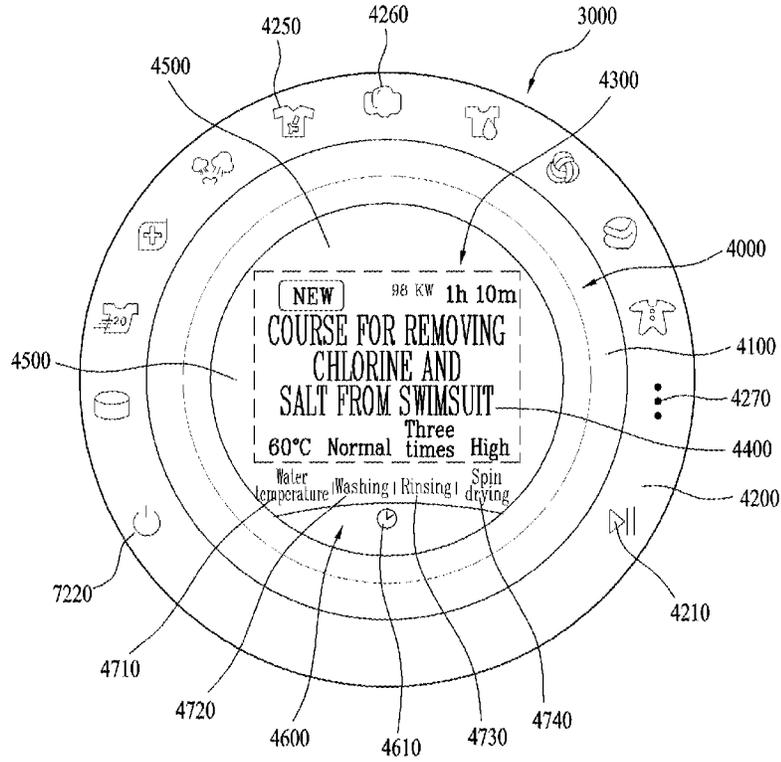


FIG. 15

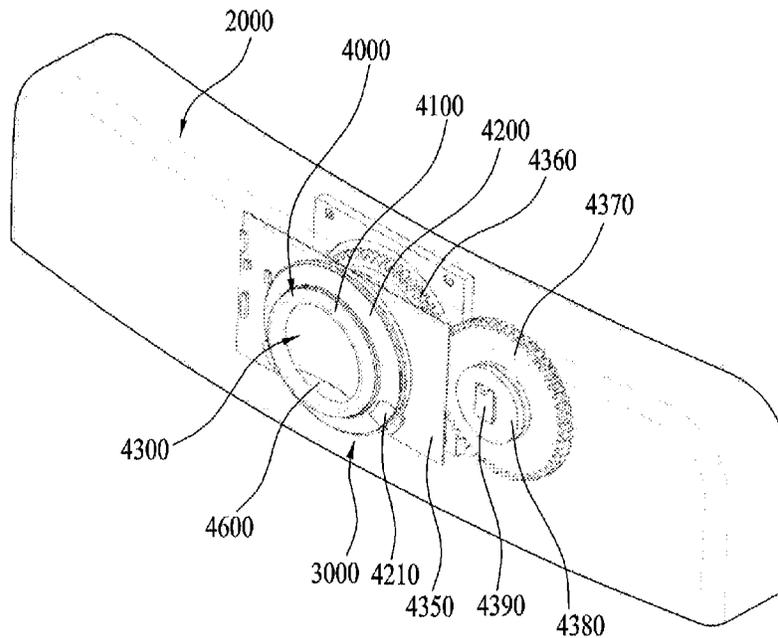
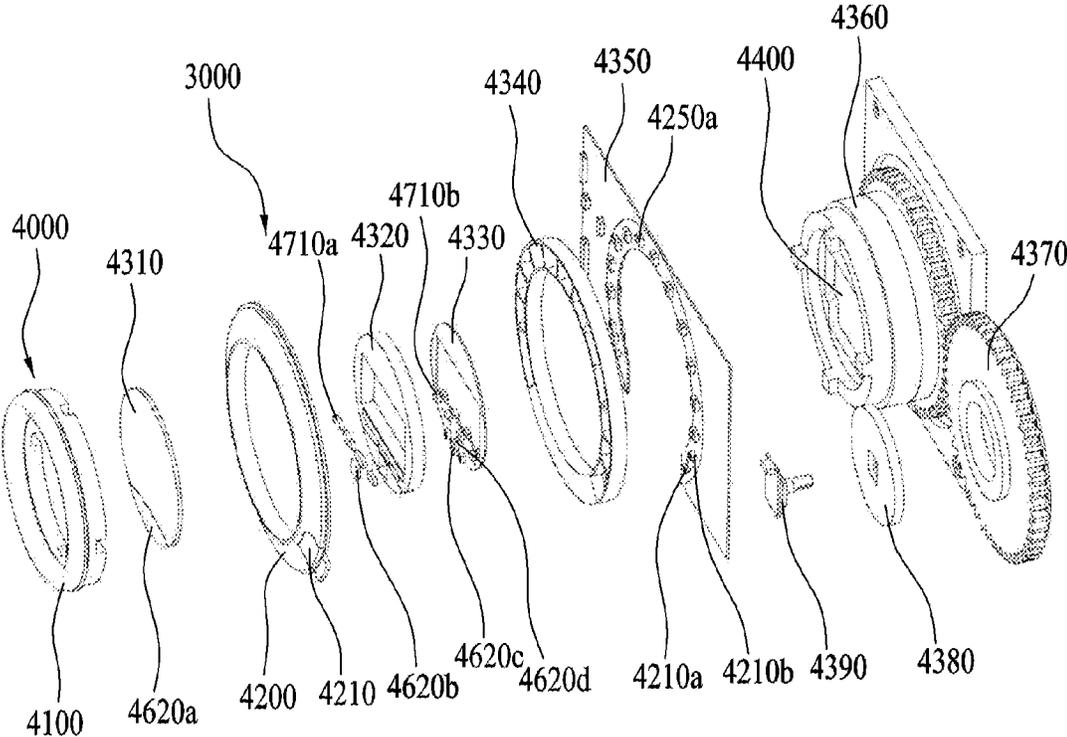


FIG. 16



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WASHER

Matter enclosed in heavy brackets [] appears in the original patent but forms no part of this reissue specification; matter printed in italics indicates the additions made by reissue; a claim printed with strikethrough indicates that the claim was canceled, disclaimed, or held invalid by a prior post-patent action or proceeding.

CROSS REFERENCE TO RELATED
APPLICATIONS

This application is a *Reissue Application of U.S. Pat. No. 10,550,506 issued on Feb. 4, 2020, which is the National Phase of PCT International Application No. PCT/KR2015/011373, filed on Oct. 27, 2015, which claims priority under 35 U.S.C. 119(a) to Patent Application Nos. 10-2014-0166181, filed in Republic of Korea on Nov. 26, 2014 and 10-2014-0182068, filed in Republic of Korea on Dec. 17, 2014, all of which are hereby expressly incorporated by reference into the present application.*

TECHNICAL FIELD

The present invention relates to a laundry machine, the user interface of which is convenient. More particularly, the present invention relates to a laundry machine that provides a simple and intuitive user interface.

BACKGROUND ART

A representative example of a laundry machine is a washer that washes laundry. A dryer that dries laundry is another example of a laundry machine. Of course, a washer/dryer that both washes and dries laundry is another example of a laundry machine.

In recent years, a refresher that refreshes laundry using hot air or steam without washing using water has come onto the market. The refresher is also another example of a laundry machine.

Hereinafter, a description will be made based on a washer, which is a representative example of a laundry machine. However, the present invention may be applied to other laundry machines, as long as the laundry machines are not exclusive or contradictory.

FIG. 1 shows a control panel of a conventional washer.

The control panel provides a user interface. In general, therefore, the control panel is provided at the front surface of the washer such that a user may easily access and manipulate the control panel. The control panel may be provided with input units or selection units, such as various kinds of buttons, for user manipulation and various kinds of display units for providing information to the user. Such input units or selection units and display units may be collectively referred to as a user interface.

The main function of the washer is washing. Consequently, a course selection unit **110** or a main function selection unit for selecting various kinds of washing courses is provided such that the user can select a course using the course selection unit. For example, the course selection unit **110** may be configured in the form of a rotary knob. In order for the user to easily select a course, the control panel **100** may be provided with a course display unit **111**. The user may manipulate the course selection unit **110** so as to correspond to the course display unit such that a desired washing course can be selected. When the course selection

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unit **110** is manipulated, a selected course may be recognized through the course display unit **111**.

As shown in FIG. 1, the course display unit **111**, in which various washing courses are displayed, is provided around the rotary knob **110**. The user may rotate the rotary knob **110** to select a corresponding washing course. A display unit **121** for displaying the selected washing course may be provided such that the user can easily recognize the selected washing course through the display unit **121**. That is, the user may easily recognize the selected washing course through the course display unit **111** and the light emitting diode (LED) display unit **121**, which is configured to blink. The course display unit **111** may be printed on the front surface of the control panel.

An option selection unit **120** for selecting an optional function, which may be added or changed during the execution of the main function, may be provided. The option selection unit **120** may be variously configured. FIG. 1 shows an option input unit **120** for selecting options related to washing **120a**, rinsing **120b**, spin drying **120c**, water temperature **120d**, drying **120e**, steam **122**, and delay **123**, by way of example. An option display unit **122** for displaying whether such an option has been selected may also be provided. In the same manner, the option display unit may be realized through a light emitting diode (LED).

The control panel **100** may be provided with a state display unit **130** for displaying the state of the washer. The current operational state of the washer, the state of the course or the option selected by the user, and time information may be displayed through the state display unit **130**. Generally, the state display unit **130** may be constituted by a liquid crystal display.

For example, in the case in which the washer is performing a rinsing step, a message "rinsing" may be displayed. In the case of waiting for user input of a course, a message "input a washing course" may be displayed. In addition, the current time or the time taken until the washer completes the washing course (i.e. remaining time) may also be displayed.

Meanwhile, the control panel **100** may be provided with a power input unit **140** for supplying power to the washer and interrupting the supply of power to the washer and a start/pause input unit **150** for starting or temporarily stopping the operation of the washer.

The conventional control panel **100** described above and the laundry machine including the same have the following problems.

It is difficult to realize an additional user interface in addition to the construction of a basic user interface due to space limitations of the control panel **100**. Of course, the user interface may be complicatedly and variously realized in the control panel **100**, which, however, requires excessive concentration and prior knowledge of the user. In addition, it may be difficult to manufacture the control panel **100**, or a high-capacity memory may be required, with the result that the price of the washer may be excessively increased.

Furthermore, the functions of the selection units **110** and **120** and the display units **111**, **121**, and **122** are predetermined or set, with the result that extension to provide additional functions is not easy. In addition, the various selection units **110** and **120** are exposed to the user. That is, a selection unit that is not necessary at a specific time, as well as a necessary selection unit, is exposed to the user. As a result, the user cannot use various functions that are provided by the laundry machine if the user is not skilled.

In addition, the number of selection units **110** and **120** and display units **111**, **121**, and **122** is large, and these units are spread, with the result that the user interface is very incon-

venient. That is, in order for the user to recognize information input to the laundry machine, the eyes of the user must be turned upon the respective components.

In recent years, a minimal design has been adopted in electric home appliances. In addition, the necessity for a simple and intuitive user interface, rather than a complicated user interface, has been increased. However, it is not easy to realize such a simple and intuitive user interface for a laundry machine. The reason for this is that a simple and intuitive user interface must be provided in a manner that includes at least the entirety of the user interface shown in FIG. 1. In addition, it is necessary for a user who is familiar with a conventional user interface to adapt himself or herself to a new user interface without great difficulty.

It is not easily to change the conventional user interface due to the various difficulties described above.

Meanwhile, as shown in FIG. 1, the number of courses that are basically provided by the laundry machine is predetermined. For example, FIG. 1 shows 12 washing courses. Consequently, it is difficult to add a new washing course, and, even when the new washing course is added, the added course must be selected through a separate option button, rather than through the course selection unit 110. That is, according to circumstances, even a course at the same level must be selected through another selection unit (e.g. a shoe refreshing course 124), rather than the course selection unit 110. As a result, it is not easy for the user to use the added washing course if the user is not very skilled.

DISCLOSURE

Technical Problem

The present invention has been made in view of the above problems, and it is an object of the present invention to provide a laundry machine having a simple and intuitive user interface.

It is another object of the present invention to provide a laundry machine designed such that a user interface is not spread across the control panel but is concentrated at a specific position.

It is another object of the present invention to provide a laundry machine that is capable of improving user convenience when using a manipulation unit.

It is another object of the present invention to provide a laundry machine that is capable of reducing the number of input units.

It is another object of the present invention to provide a laundry machine that is capable of eliminating or minimizing the amount of text printed on a control panel.

It is a further object of the present invention to provide a laundry machine configured such that a washing course and an option can be easily selected through a display screen.

Technical Solution

In accordance with the present invention, the above objects can be accomplished by the provision of a laundry machine that provides a plurality of washing courses, and when a specific washing course is selected from among the washing courses, is capable of changing at least one option accompanying the specific washing course, the laundry machine including a rotatable manipulation unit configured to select a specific washing course and to select at least one option accompanying the specific washing course, a display unit configured to selectively display input items, including one or more selected from among a plurality of washing

course icons, an option icon indicating at least one option accompanying each of the washing course icons, and a start icon, inside the manipulation unit in the radial direction thereof, at least one command input unit provided outside the display unit in the radial direction thereof and inside the manipulation unit in the radial direction thereof for inputting a washing course selected by the manipulation unit, changing the at least one option, and inputting a signal for executing and stopping the selected washing course, and a controller configured to control the display unit such that predetermined information is displayed on the display unit based on signals from the manipulation unit and the command input unit.

The display unit may be formed in a circular shape, may be provided inside the manipulation unit in the radial direction thereof, and may be configured to selectively display the input items.

The command input unit may include a first command input unit, configured to allow a user to input the washing course selected by the manipulation unit and to change the at least one option, and a second command input unit, configured to perform and stop the course selected by the manipulation unit.

When power is supplied to the laundry machine, a course selection screen may be displayed on the display unit, and the washing courses may be displayed on the course selection screen in the circumferential direction of the display unit.

Each of the washing courses may be displayed in the form of a dot.

The controller may control the display unit such that the dots displayed on the display unit are sequentially lit in response to the rotation of the manipulation unit.

The controller may control the display unit such that information about at least one option accompanying the selected course is displayed at a position different from positions at which the washing courses are displayed.

When one of the washing course icons is selected in response to the rotation of the manipulation unit and the selected washing course is input through the first command input unit, an option setting screen may be displayed in the display unit, and one or more selected from among one or more predetermined option icons accompanying the selected washing course, a delay icon, and an additional option icon may be displayed on the option setting screen in the circumferential direction of the display unit.

The one or more option icons, the delay icon, and the additional option icon may be sequentially lit in order of arrangement in response to the rotation of the manipulation unit.

A back icon may be further displayed on the option setting screen, and when the back icon is selected in response to rotation of the manipulation unit and a signal is input through the first command input unit, the controller may control the display unit such that the course selection screen is displayed again on the display unit.

When the delay icon is selected in response to the rotation of the manipulation unit and a signal is input through the first command input unit, a delay setting screen may be displayed on the display unit in the form of an analog clock, a delay time may be selected in response to the rotation of the manipulation unit, and a delay setting may be completed through the second command input unit.

The controller may perform control such that only the second command input unit, selected from between the first

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command input unit and the second command input unit, is activated when a cycle execution screen is displayed on the display unit.

The laundry machine may further include a power input unit configured to supply power to the laundry machine, wherein, when the manipulation unit is rotated by a predetermined angle or more or when the signal input through the command input unit is maintained for a predetermined time or more, power from an external power source may be supplied to the laundry machine via the power input unit.

When the signal input through the command input unit is maintained for the predetermined time or more in the state in which the power is supplied to the laundry machine, the power input unit may interrupt the supply of power from the external power source to the laundry machine.

The first command input unit and the second command input unit may be provided outside the display unit in the radial direction thereof and inside the manipulation unit in the radial direction thereof so as to be located at different positions.

One of the first command input unit and the second command input unit may be provided inside the manipulation unit in the radial direction thereof at a 3 o'clock position, and the other of the first command input unit and the second command input unit may be provided inside the manipulation unit in the radial direction thereof at a 9 o'clock position.

The washing courses may include one or more selected from among normal washing, baby clothes, boiling, speed wash, allergy care, steam cleaning, functional clothes, bedding cleaning, cold water wash, lingerie/wool, bedclothes, and rinsing/spin drying.

The option may include one or more selected from among washing intensity, wash water temperature, the number of rinses, and spin-drying intensity.

Advantageous Effects

According to the present invention, it is possible to provide a laundry machine having a simple and intuitive user interface.

In addition, according to the present invention, it is possible to provide a laundry machine designed such that a user interface is not spread across the control panel but is concentrated at a specific position.

In addition, according to the present invention, it is possible to provide a laundry machine that is capable of improving user convenience when using a manipulation unit.

In addition, according to the present invention, it is possible to provide a laundry machine that is capable of reducing the number of input units.

In addition, according to the present invention, it is possible to provide a laundry machine that is capable of eliminating or minimizing the amount of text printed on a control panel.

In addition, according to the present invention, it is possible to provide a laundry machine configured such that a washing course and an option can be easily selected through a display screen.

DESCRIPTION OF DRAWINGS

FIG. 1 is a front view showing a user interface of a conventional laundry machine;

FIG. 2 is a view showing a laundry machine including a manipulation unit and a display unit according to an embodiment of the present invention;

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FIG. 3 is a sectional view of the manipulation unit and the display unit shown in FIG. 2;

FIG. 4 is an exploded perspective view of the manipulation unit and the display unit shown in FIG. 2;

FIG. 5 is a block diagram showing the connection relationship between the manipulation mechanism, command input units, a controller, and the display unit;

FIG. 6 is a view showing an example in which a course selection screen is displayed on the display unit;

FIG. 7 is a view showing an example in which an option setting screen is displayed on the display unit;

FIG. 8 is a view showing a cycle execution screen displayed on the display unit when a specific washing course is started;

FIG. 9 is a view showing an example in which a delay setting screen is displayed on the display unit;

FIG. 10 is a front view showing an example of a user interface according to another embodiment of the present invention;

FIG. 11 is a front view showing an example in which a delay option screen is displayed on the user interface of FIG. 10;

FIG. 12 is a front view showing an example in which a rinsing option screen is displayed on the user interface of FIG. 10;

FIG. 13 is a front view showing an example in which an additional course screen is displayed on the user interface of FIG. 10;

FIG. 14 is a front view showing another example in which an additional course screen is displayed on the user interface of FIG. 10;

FIG. 15 is a perspective view showing the relationship between the user interface of FIG. 10 and a control panel; and

FIG. 16 is an exploded perspective view showing the user interface of FIG. 15.

BEST MODE

Hereinafter, a laundry machine according to an embodiment of the present invention will be described in detail with reference to the accompanying drawings. The accompanying drawings, which show an illustrative form of the present invention, are provided only to describe the present invention in detail, and do not limit the technical scope of the present invention.

In addition, the same reference numbers will be used throughout the drawings to refer to the same or like parts, and duplicate descriptions thereof will be omitted. In the drawings, the sizes and shapes of elements may be exaggerated or reduced for convenience of description.

Hereinafter, a laundry machine according to an embodiment of the present invention will be described in detail with reference to the accompanying drawings.

FIG. 2 is a view showing a laundry machine including a manipulation unit and a display unit according to an embodiment of the present invention.

In FIG. 2, the X-axis direction is defined as the lateral direction of the laundry machine, the Y-axis direction is defined as the forward-rearward direction of the laundry machine, and the Z-axis direction is defined as the height direction of the laundry machine, for the convenience of description.

Referring to FIG. 2, a laundry machine **200** according to an embodiment of the present invention may provide a plurality of washing courses. When a specific washing course is selected from among the washing courses, at least one option accompanying the specific washing course may be changed.

The washing courses may include one or more selected from among normal washing, baby clothes, boiling, speed wash, allergy care, steam cleaning, functional clothes, bedding cleaning, cold water wash, lingerie/wool, bedclothes, and rinsing/spin drying.

In addition, the at least one option may include one or more selected from among washing intensity, wash water temperature, the number of rinses, and spin-drying intensity.

In the embodiment of the present invention, the laundry machine **200** may include a cabinet **210** that defines the external appearance thereof, a control panel **220** provided at the upper part of the front of the cabinet **210**, a manipulation unit **310** installed at the control panel **220**, a circular display unit **240** provided inside the manipulation unit **310** in the radial direction thereof, command input units **311** provided outside the display unit **240** in the radial direction thereof and inside the manipulation unit **310** in the radial direction thereof, and a controller (see FIG. 5) configured to control the display unit **240**.

The cabinet **210** may define the entire external appearance of the laundry machine **200**. In addition, a tub (not shown) for receiving wash water and a drum (not shown) rotatably provided in the tub for receiving laundry may be provided in the cabinet **210**.

The tub and the drum are well known, and a detailed description thereof will be omitted.

In addition, a door **230** configured to be opened in order to introduce laundry into the drum or to remove the laundry from the drum may be provided at the front surface **211** of the cabinet **210**. A handle **231** configured to be gripped by a user to open and close the door **230** may be provided at one side of the door **230**.

In addition, the middle part of the door **230** may be made of a transparent material such that the interior of the drum is visible.

The control panel **220** may be provided at the upper part of the front of the cabinet **210** so as to be inclined downward in the forward direction of the cabinet **210**.

For example, the control panel **220** may be provided at the front part of the upper surface **212** of the cabinet **210**. In addition, the control panel **220** may be provided at the upper side of the front surface **211** of the cabinet **210**.

The control panel **220** may be integrally formed with the upper surface **212** of the cabinet **210**. That is, the front part of the upper surface of the cabinet **210** may be inclined downward, and the portion of the upper surface **212** of the cabinet **210** that is inclined downward may constitute the control panel **220**.

For example, the upper surface **212** of the cabinet **210** may include a flat part that is parallel to the installation surface of the cabinet **210**, an inclined part that is inclined from the flat part (i.e. from the front end of the flat part) toward the front of the cabinet, and an interface part that interconnects the flat part and the inclined part. The inclined part may constitute the control panel **220**. In addition, the flat part, the inclined part, and the interface part may be integrally formed.

In addition, the control panel **220** may be disposed such that the front edge of the control panel **220** contacts the upper edge of the upper surface **212** of the cabinet **210**. That is, the control panel **220** may be configured so as not to

protrude further toward the front of the cabinet than the front surface **211** of the cabinet **210**.

The manipulation unit **310** may be installed at the control panel **220**. More specifically, the manipulation unit **310** may be installed at the central part of the control panel **220** in the lateral direction thereof. The manipulation unit **310** may be disposed so as to protrude outside the control panel **220** (i.e. toward the front of the control panel **220**).

The manipulation unit **310** may be formed in a hollow cylindrical shape or a hollow dial shape. The user may rotate the manipulation unit **310** while holding the outer circumferential part of the manipulation unit **310**.

In addition, the manipulation unit **310** may be rotatably configured to select a specific washing course among a plurality of washing courses and to select at least one option accompanying the specific washing course.

The display unit **240** may be configured to selectively display a plurality of washing courses and at least one option based on the driving (i.e. the rotation) of the manipulation unit **310**. The display unit **240** may be formed in a circular shape, and may be disposed inside the manipulation unit **310** in the radial direction thereof.

In addition, the display unit **240** may be configured to selectively display input items including one or more selected from among washing course icons indicating a plurality of washing courses, an option icon indicating at least one option accompanying each of the washing courses, and a start icon.

More specifically, the display unit **240** may selectively display input items including one or more selected from among the washing course icons, the option icon indicating the at least one option, and the start icon.

In addition, the display unit **240** may be constituted by a liquid crystal display (LCD).

The command input units **311** may be provided outside the display unit **240** in the radial direction thereof and inside the manipulation unit **310** in the radial direction thereof.

The command input units **311** may be configured to allow the user to input the course selected by the manipulation unit **310** and to change the at least one option.

In addition, the command input units **311** may be configured to allow the user to input a command for executing the washing course selected by the manipulation unit **310**.

The command input units **311** may be provided at the portions of the display unit **240** that are located at 3 and 9 o'clock positions when the display unit **240** is viewed from the front thereof.

In addition, the command input units **311** may be configured to be pushed by the user. That is, the user may push the command input units **311** to input the course selected by the manipulation unit **310** and to change the at least one option. In addition, the user may push the command input units **311** to perform or temporarily stop the washing course selected by the manipulation unit **310**.

The controller (see FIG. 5) may control the display unit **240** such that predetermined information is displayed on the display unit **240** based on the manipulation (or the operation) of the manipulation unit **310** and the command input units **311**.

The predetermined information may include information about the input items, the course and options selected by the manipulation unit **310**.

The controller will be described in detail later with reference to other figures.

Meanwhile, the manipulation unit **310** may be included in a manipulation mechanism **300** (see FIGS. 3 and 4) installed

at the control panel 220. Hereinafter, the manipulation mechanism 300 will be described in detail with reference to FIGS. 3 and 4.

FIG. 3 is a sectional view of the manipulation unit and the display unit shown in FIG. 2, and FIG. 4 is an exploded perspective view of the manipulation unit and the display unit shown in FIG. 2.

In FIG. 4, the X axis indicates the lateral direction, the Z axis indicates the upward-downward direction (i.e. the height direction), and the Y axis indicates the forward-rearward direction, for the convenience of description.

Referring to FIGS. 2 to 4, the manipulation unit 310 may be formed in the shape of a cylinder having a through-hole 315 (hereinafter, referred to as a "manipulation unit through-hole") formed in the central part thereof. That is, the cylindrical manipulation unit 310 may be configured to be rotatable about a central axis C, and the manipulation unit through-hole 315 may be formed inside the manipulation unit 310 in the radial direction thereof.

In addition, as previously described, the manipulation unit 310 may be disposed so as to protrude outside the control panel 220 (i.e. toward the front of the control panel 220) such that the user can rotate the manipulation unit 310.

For example, at least a portion of the outer circumference of the manipulation unit 310 may be exposed from the control panel 220 such that the user can rotate the manipulation unit 310 in the state of holding the outer circumference of the manipulation unit 310.

The display unit 240 may be disposed in the through-hole 315 in the manipulation unit 310. That is, the display unit 240 may be disposed in the through-hole 315 in the manipulation unit 310 so as to display a screen (or an image) in a direction perpendicular to the control panel 220.

Consequently, the user may easily recognize information or the screen displayed on the display unit 240 at the front of the laundry machine 200.

Meanwhile, the laundry machine 200 according to the embodiment of the present invention may include a manipulation mechanism 300, which includes the manipulation unit 310.

The manipulation mechanism 300 may further include a first gear unit 330 configured to be rotated in the state of being interlocked with the rotation of the manipulation unit 310, a second gear unit 340 configured to be engaged with the first gear unit 330, and an encoder 350 configured to recognize the rotation of the second gear unit 340.

That is, the manipulation mechanism 300 may further include the manipulation unit 310, the first gear unit 330, the second gear unit 340, and the encoder 350.

The first gear unit 330 may be disposed at the lower side of the manipulation unit 310 so as to be rotated together with the rotation of the manipulation unit 310. More specifically, the first gear unit 330 may be configured to be rotated in the state of being interlocked with the rotation of the manipulation unit 310 when the user rotates the manipulation unit 310, and may be formed at the lower side of the manipulation unit 310 so as to receive the rotational force of the manipulation unit 310.

The second gear unit 340 may be disposed at one side of the first gear unit 330 so as to be engaged with the first gear unit 330. More specifically, the second gear unit 340 may be formed at the side surface of the first gear unit 330 so as to be engaged with the first gear unit 330. When the first gear unit 330 is rotated, therefore, the second gear unit 340 may also be rotated. That is, the second gear unit 340 may be rotated in the state of being interlocked with the rotation of the first gear unit 330.

Spur gears may be used as the first gear unit 330 and the second gear unit 340.

The encoder 350 may be connected to the second gear unit 340 to recognize the rotation of the manipulation unit 310.

Specifically, the encoder 350 may include a rotation recognition unit 351 configured to recognize the rotation of the second gear unit 340. The rotation recognition unit 351 may be fastened to a connection hole 341 formed in the second gear unit 340 at the center of rotation thereof. When the second gear unit 340 is rotated, therefore, the rotation recognition unit 351 of the encoder 350 may also be rotated, and the rotation pitch (or the rotational angle) of the second gear unit 340 may be recognized by the encoder 350.

As described above, the rotation of the manipulation unit 310 may be transmitted to the encoder 350 via the first gear unit 330 and the second gear unit 340. The encoder 350 may recognize the rotation pitch (or the rotational angle) of the manipulation unit 310 and may transmit the same to a controller (see FIG. 5), a description of which will follow.

That is, the rotational signal of the manipulation unit 310 may be transmitted to the controller via the encoder 350.

Meanwhile, the manipulation mechanism 300 may further include a rotary shaft member 320 disposed between the manipulation unit 310 and the first gear unit 330.

The rotary shaft member 320 may be disposed between the manipulation unit 310 and the first gear unit 330 so as to be engaged with the manipulation unit 310 and the first gear unit 330. Consequently, the rotation of the manipulation unit 310 may be transmitted to the first gear unit 330 via the rotary shaft member 320.

The rotary shaft member 320 may be formed in a cylindrical shape. The front end of the rotary shaft member 320 may be coupled to the inner circumferential surface of the manipulation unit 310, and the rear end of the rotary shaft member 320 may be engaged with the first gear unit 330.

For example, at least one fastening protrusion 322 provided at the front end of the rotary shaft member 320 may be fastened into at least one fastening recess 316 provided in the inner circumferential surface of the manipulation unit 310 so as to correspond to the at least one fastening protrusion 322.

When the manipulation unit 310 is rotated, therefore, the rotary shaft member 320 may be rotated together with the manipulation unit 310.

The rear end of the rotary shaft member 320 may be generally formed in a circular shape. In addition, at least a portion of the circumference of the rear end of the rotary shaft member 320 may be provided with at least one first straight part 321.

That is, one or more first straight parts 321 may be provided at the outer circumference of the rear end of the rotary shaft member 320. A first gear unit through-hole 335 may be formed in the central part of the first gear unit 330, and at least one second straight part 331 corresponding to the first straight part 321 may be provided on the inner circumferential surface of the first gear unit 330.

When the rotary shaft member 320 (i.e. the rear end of the rotary shaft member 320) is coupled to the first gear unit 330, the first straight part 321 and the second straight part 331 may be engaged with each other. Consequently, the rotational force of the rotary shaft member 320 may be transmitted to the first gear unit 330.

In other words, when the rotary shaft member 320 is rotated, the first gear unit 330 may be rotated together with the rotary shaft member 320. That is, the rotation (or the

rotational force) of the manipulation unit **310** may be transmitted to the first gear unit **330** via the rotary shaft member **320**.

Meanwhile, a bearing unit **370** for supporting the rotation of the rotary shaft member **320** may be disposed around the rotary shaft member **320**.

Specifically, the bearing unit **370** may be disposed around the rotary shaft member **320** so as to be located at the rear of the manipulation unit **310** and in front of the first gear unit **330**. That is, the bearing unit **370** may be disposed around the rotary shaft member **320** so as to be located between the manipulation unit **310** and the first gear unit **330**.

As described above, the rotary shaft member **320** may be disposed between the manipulation unit **310** and the first gear unit **330** so as to be engaged with the manipulation unit **310** and the first gear unit **330**.

When the manipulation unit **310** is rotated, therefore, the rotation recognition unit **351** of the encoder **350** may also be rotated via the rotary shaft member **320**, the first gear unit **330**, and the second gear unit **340**. The encoder **350** may be configured to recognize the rotation pitch (or the rotational angle) of the manipulation unit **310**. Information about the rotation pitch (or the rotational angle) may be transmitted to the controller (see FIG. 5).

Meanwhile, the laundry machine **200** according to the embodiment of the present invention may further include a cylindrical support shaft **260** disposed so as to protrude toward the front of the control panel **220** (i.e. perpendicular to the surface of the control panel).

Specifically, at least a portion of the support shaft **260** may protrude toward the upper side of the control panel **220**. In addition, the support shaft **260** may be formed in a cylindrical shape, and the diameter of the support shaft **260** may be less than that of the rotary shaft member **320**.

That is, the diameter of the outer circumferential surface of the support shaft **260** may be less than the diameter of the inner circumferential surface of the rotary shaft member **320**. The support shaft **260** may extend through the rotary shaft member **320**.

More specifically, the diameter of the outer circumferential surface of the support shaft **260** may be less than each of the diameter of the inner circumferential surface of the manipulation unit **310**, the diameter of the inner circumferential surface of the rotary shaft member **320**, and the diameter of the inner circumferential surface of the first gear unit **330**.

Consequently, the support shaft **260** may sequentially extend through the manipulation unit **310**, the rotary shaft member **320**, and the first gear unit **330**.

In addition, the display unit **240** may be installed on the inner circumferential surface of the support shaft **260**. For example, the display unit **240** may be installed on the inner circumferential surface of the front end of the support shaft **260**.

The support shaft **260** may be fixed such that the support shaft **260** is not rotated in the state of being interlocked with the rotation of the manipulation unit **310** and the rotation of the rotary shaft member **320**.

Meanwhile, the command input units **311** may be installed around the front end of the support shaft **260**.

The command input units **311** may include a first command input unit **311-1** configured to allow the user to input the course selected by the manipulation unit **310** and to change at least one option accompanying the selected course and a second command input unit **311-2** configured to allow the user to input a command for performing or temporarily stopping the selected course.

The first command input unit **311-1** and the second command input unit **311-2** may be provided at a circular ring-shaped support member **314** coupled to the support shaft **260**.

Specifically, the circular ring-shaped support member **314** may be installed on the outer circumferential surface of the front end of the support shaft **260**. The support member **314** may be disposed between the inner circumferential surface of the manipulation unit **310** and the outer circumferential surface of the support shaft **260**.

In addition, the support member **314** may be disposed on the front end of the rotary shaft member **320**. Even when the rotary shaft member **320** is rotated, however, the support member **314** may not be rotated. That is, the support member **314** may be configured so as not to be interlocked with the rotation of the manipulation unit **310** and the rotation of the rotary shaft member **320**.

In addition, the first command input unit **311-1** and the second command input unit **311-2** may be provided at different positions of the support member **314**. That is, the second command input unit **311-2** may be provided at the support member **314** so as to separate from the first command input unit **311-1**.

For example, one of the first command input unit **311-1** and the second command input unit **311-2** may be provided inside the manipulation unit **310** in the radial direction thereof at a 3 o'clock position, and the other of the first command input unit **311-1** and the second command input unit **311-2** may be provided inside the manipulation unit **310** in the radial direction thereof at a 9 o'clock position.

The first command input unit **311-1** may be located at the support member **314** at 9 o'clock, and the second command input unit **311-2** may be located at the support member **314** at 3 o'clock.

That is, the first command input unit **311-1** and the second command input unit **311-2** may be provided at the support member **314** so as to face each other.

Meanwhile, the first command input unit **311-1** may include a first light source **312** provided on one side surface (e.g. the front surface) of the support member **314** and a first switch **313** provided on the other side surface (e.g. the rear surface) of the support member **314** so as to correspond to the first light source **312**.

In addition, the second command input unit **311-2** may include a second light source **312'** provided on one side surface (e.g. the front surface) of the support member **314** and a second switch **313'** provided on the other side surface (e.g. the rear surface) of the support member **314** so as to correspond to the second light source **312'**.

The first light source **312** and the second light source **312'** emit light such that the user can easily recognize the positions of the first command input unit **311-1** and the second command input unit **311-2** from outside the laundry machine **200**. The first light source **312** and the second light source **312'** may be LEDs.

In addition, the first switch **313** and the second switch **313'** may be electrically connected to the controller (see FIG. 5).

When the user pushes the first command input unit **311-1** or the second command input unit **311-2**, therefore, the first switch **313** or the second switch **313'** may be operated, and a signal from the first switch **313** or the second switch **313'** may be transmitted to the controller.

In a preferred embodiment, the first light source **312** and the second light source **312'** may be provided at the front surface of the support member **314**, and the first switch **313** and the second switch **313'** may be provided at the rear surface of the support member **314**.

Meanwhile, a fixing member **318** for fixing the support member **314** to the circumference of the support shaft **260** may be provided at the rear of the support member **314**.

The fixing member **318** may be formed at the front end of the rotary shaft member **320** so as to be fixed to the circumference of the support shaft **260**. In addition, the support member **314** may be installed in front of the fixing member **318**.

Meanwhile, the support member **314** and the display unit **240** may be disposed such that the front surface of the support member **314** and the front surface of the display unit **240** are located in the same plane.

That is, the display unit **240** may be installed on the inner circumferential surface of the front end of the support shaft **260**, and the support member **314** may be installed on the outer circumferential surface of the front end of the support shaft **260**. The front surface of the display unit **240** and the front surface of the support member **314** may be located in the same plane.

In addition, a transparent member **250** may be disposed in front of the display unit **240**. The transparent member **250** may be configured to cover both the front surface of the display unit **240** and the front surface of the support member **314**. The transparent member **250** may be made of transparent acrylic.

The transparent member **250** may be disposed inside the manipulation unit **310** in the radial direction thereof, and may be configured not to rotate in a manner that is interlocked with the rotation of the manipulation unit **310**.

Consequently, the user may push the portion of the transparent member **250** corresponding to the first command input unit **311-1** or the second command input unit **311-2** to operate the first switch **313** or the second switch **313'**.

In addition, information or a screen displayed on the display unit **240** may be recognized by the user from the outside through the transparent member **250**.

Meanwhile, the laundry machine **200** may further include a support body **360** coupled to the rear surface of the control panel **220**.

That is, the support body **360** may be coupled to the rear surface of the control panel **220** so as not to be exposed outside the laundry machine **200**.

In addition, the support body **360** may be provided with a first installation seat **361** for installing the first gear unit **330** and the cylindrical support shaft **260** and a second installation seat **362** for installing the encoder **350** and the second gear unit **340**.

Specifically, the first installation seat **361** for installing the first gear unit **330** and the cylindrical support shaft **260** may be formed at one side of the support body **360** in the lateral direction thereof, and the second installation seat **362** for installing the encoder **350** and the second gear unit **340** may be formed at the other side of the support body **360** in the lateral direction thereof.

The first installation seat **361** and the second installation seat **362** may be disposed adjacent to each other. In addition, the first installation seat **361** and the second installation seat **362** may be disposed parallel to each other.

The cylindrical support shaft **260** may be fixed in the first installation seat **361** through the first gear unit through-hole **335**. Specifically, the rear end of the cylindrical support shaft **260** may be fixed in the first installation seat **361**.

Consequently, the display unit **240** and the command input units **311** may also be fixed to the front end of the cylindrical support shaft **260** so as not to be rotated.

In contrast, the first gear unit **330** may be rotatably installed in the first installation seat **361**.

Specifically, the first gear unit **330** may be installed in the first installation seat **361** so as to be rotatable about the cylindrical support shaft **260**. That is, the cylindrical support shaft **260** may serve as a rotary shaft of the first gear unit **330**.

In addition, the encoder **350** may be installed at the central part of the second installation seat **362**, and the second gear unit **340** may be installed at the second installation seat **362** above the encoder **350**.

The rotation recognition unit **351** provided at the encoder **350** may be rotatably installed at the center of the second gear unit **340**. That is, the rotation recognition unit **351** may be connected to the connection hole **341** formed in the center of the second gear unit **340** so as to be rotated in the state of being interlocked with the rotation of the second gear unit **340**.

Hereinafter, the principle by which the manipulation through the manipulation mechanism and the command input units is transmitted to the display unit via the controller will be described with reference to FIG. 5.

FIG. 5 is a block diagram showing the connection relationship between the manipulation mechanism, the controller, and the display unit.

Referring to FIGS. 3 to 5, the laundry machine **200** may include a controller **280** and a power input unit **290**.

The power input unit **290** may be configured to selectively supply power to the laundry machine **200**. That is, the power input unit **290** may be configured to selectively supply power to the laundry machine **200** under the control of the controller **280**.

The controller **280** may be electrically connected to the manipulation mechanism **300** and the command input units **311**.

That is, the controller **280** may be configured to receive a manipulation signal from the manipulation mechanism **300**. Specifically, the controller **280** may be configured to control the display unit **240** and the power input unit **290** based on the manipulation signal from the manipulation mechanism **300**.

For example, when the manipulation unit **310** is rotated by the user, the rotational force of the manipulation unit **310** may be sequentially transmitted to the rotary shaft member **320**, the first gear unit **330**, and the second gear unit **340**, and may be finally transmitted to the encoder **350** connected to the second gear unit **340**.

The encoder **350** may be configured to transmit a signal indicating the rotational angle of the manipulation unit **310** based on the rotation force transmitted from the manipulation unit **310** to the controller **280**.

The controller **280** may control the display unit **240** such that a plurality of input items displayed on the display unit **240** is sequentially lit (or activated) based on the signal indicating the rotational angle of the manipulation unit **310** transmitted from the encoder **350**.

In addition, the command input units **311** may be manipulated by the user. For example, the user may push the command input units **311** to input a command through the command input units **311**. That is, the command input units **311** may be configured to be pushed by the user.

When the command input units **311** are pushed by the user, the switches **313** and **313'** provided at the command input units **311** are operated, and a signal generated when the command input units **311** is pushed (i.e. a signal generated when the switches **313** and **313'** are pushed) may be transmitted to the controller **280**.

The controller **280** may control the display unit **240** to selectively display information about or the description of

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the input of the washing course selected by the manipulation unit 310, the change of at least one option accompanying the washing course, and the execution of the selected washing course based on the signal generated when the command input units 311 are pushed (i.e. the signal generated when the switches 313 and 313' are pushed).

In addition, when the manipulation unit 310 is rotated by a predetermined angle or more or when the signal input through the command input units 311 is maintained for a predetermined time or more, the controller 280 may control the power input unit 290 such that power from an external power source is supplied to the laundry machine 200 via the power input unit.

That is, in order to supply power to the laundry machine 200, the user may rotate the manipulation unit 310 by a predetermined angle (e.g. 360 degrees) or more. Alternatively, the user may push the command input unit (e.g. the first command input unit 311-1 or the second command input unit 311-2) for a predetermined time (e.g. 2 to 3 seconds) or more in order to supply power to the laundry machine 200.

In contrast, when the signal input through the command input unit 311 (e.g. the first command input unit 311-1 or the second command input unit 311-2) is maintained for the predetermined time (e.g. 2 to 3 seconds) or more in the state in which the power is supplied to the laundry machine 200, the power input unit 290 may interrupt the supply of power from the external power source to the laundry machine 200.

That is, the controller 280 may determine whether the signal input through the first command input unit 311-1 or the second command input unit 311-2 is maintained for the predetermined time or more in the state in which the power is supplied to the laundry machine 200. Upon determining that the input signal input is maintained for the predetermined time or more, the controller 280 may control the power input unit 290 such that the supply of power from the power input unit 290 or the external power source to the laundry machine 200 is interrupted.

As described above, the user may rotate the manipulation unit 310 or push the command input units 311 to supply power to the laundry machine 200. In addition, the user may push the command input units 311 for the predetermined time or more to interrupt the supply of power to the laundry machine 200.

Hereinafter, a screen or an image realized on the display unit 240 will be described in detail with reference to other drawings.

FIG. 6 is a view showing an example in which a course selection screen is displayed on the display unit.

Referring to FIGS. 2 to 6, the circular ring-shaped support member 314 may be provided inside the cylindrical manipulation unit 310, which is configured to be rotatable, in the radial direction thereof, and the circular display unit 240 may be provided inside the circular ring-shaped support member 314 in the radial direction thereof.

The outer circumferential surface of the cylindrical manipulation unit 310 has a predetermined width, and the user may rotate the manipulation unit 310 in the state of holding the outer circumferential surface of the cylindrical manipulation unit 310.

In addition, as previously described, the support member 314 and the display unit 240 remain fixed so as not to be rotated or moved irrespective of the rotation of the manipulation unit 310.

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The command input units 311 may be provided at the support member 314. The command input units 311 may include the first command input unit 311-1 and the second command input unit 311-2.

Meanwhile, when power is supplied to the laundry machine 200, a course selection screen shown in FIG. 6 may be displayed on the display unit 240. That is, when power is supplied to the laundry machine 200, the controller 280 may control the display unit 240 such that a course selection screen is displayed on the display unit 240.

On the course selection screen, a plurality of washing courses 241-1 to 241-13 may be displayed in the circumferential direction of the display unit 240 (i.e. in the circumferential direction of the front surface of the display unit 240). For example, each of the washing courses 241-1 to 241-13 may be displayed in the form of a dot.

The washing courses 241-1 to 241-13 may be selectively lit (or activated) through the rotation of the manipulation unit 310.

In addition, on the course selection screen, the description of a selected course, including the name of the selected course, and the time required for the selected course may be displayed at the central part of the display unit 240 in the lateral direction thereof.

The washing courses 241-1 to 241-13 may include one or more selected from among icons indicating normal washing, baby clothes, boiling, speed wash, allergy care, cotton, steam cleaning, functional clothes, bedding cleaning, cold water wash, lingerie/wool, bedclothes, and rinsing/spin drying.

In addition, on the course selection screen, information about at least one option accompanying the selected course may be displayed in the circumferential direction of the display unit at a position different from the positions at which the washing courses 241-1 to 241-13 are displayed.

For example, FIG. 6 shows information displayed on the display unit 240 in the case in which a cotton course is selected by the manipulation unit 310.

That is, FIG. 6 shows the state in which the cotton course is selected from among the washing courses 241-1 to 241-13, each of which is displayed in the form of a dot.

For example, the controller 280 may control the display unit 240 such that the dots (i.e. the washing courses) displayed on the display unit 240 are sequentially lit in response to the rotation of the manipulation unit 310. That is, when the user rotates the manipulation unit 310, the dots (i.e. the washing courses) displayed on the display unit 240 may be sequentially lit or activated.

In addition, a signal generated when the manipulation unit 310 is rotated may be transmitted to the controller 280 via the encoder 350, which has been described with reference to FIGS. 3 to 5. The controller 280 may control the display unit 240 based on the rotational angle of the manipulation unit 310 transmitted via the encoder 350.

Information about the cotton course and information about the time required for the cotton course may be displayed on the central part of the display unit 240 in the form of text. In addition, information about at least one option accompanying the selected course may be displayed in the circumferential direction of the display unit 240.

Meanwhile, one or more command input units 311 may be provided at the support member 314 disposed outside the display unit 240 in the radial direction thereof. For example, the command input units 311 may include a first command input unit 311-1 and a second command input unit 311-2.

The first command input unit 311-1 may be configured to allow the user to input the course selected by the manipu-

lation unit **310**. In addition, the second command input unit **311-2** may be configured to start or temporarily stop a washing cycle based on the course selected by the manipulation unit **310**.

When a signal is input through the first command input unit **311-1** in the state in which the cotton course is selected in response to the rotation of the manipulation unit **310**, as shown in FIG. 6, an option setting screen for setting (or changing) options accompanying the cotton course shown in FIG. 7 is displayed.

That is, when the user pushes the first command input unit **311-1** in the state in which the cotton course is selected in response to the rotation of the manipulation unit **310**, the controller **280** may control the display unit **240** to display an option setting screen, on which options accompanying the cotton course are displayed.

Meanwhile, when a signal is input through the second command input unit **311-2** in the state in which the cotton course is selected in response to the rotation of the manipulation unit **310**, as shown in FIG. 6, a cycle execution screen shown in FIG. 8 is displayed.

That is, when the user pushes the second command input unit **311-2** in the state in which the cotton course is selected in response to the rotation of the manipulation unit **310**, the controller **280** may control the display unit **240** to display a cycle execution screen, on which the state in which the cotton course is being executed is displayed.

Hereinafter, the option setting screen and the cycle execution screen will be described in detail with reference to FIGS. 7 and 8.

FIG. 7 is a view showing an example in which the option setting screen is displayed on the display unit.

Referring to FIG. 7, one or more selected from among one or more predetermined option icons **242-1** to **242-4** accompanying a washing course selected by the user, a delay icon **242-5**, and an additional option icon **242-6** may be displayed on the option setting screen in the circumferential direction of the display unit **240** (i.e. in the circumferential direction of the front surface of the display unit **240**).

The option icons **242-1** to **242-4** may include one or more selected from among a washing intensity icon **242-1**, a wash water temperature icon **242-2**, a number-of-rinses icon **242-3**, and a spin-drying intensity icon **242-4**.

That is, the controller **280** may control the display unit **240** such that one or more selected from among the one or more option icons **242-1** to **242-4** accompanying the selected washing course, the delay icon **242-5**, and the additional option icon **242-6** are displayed on the option setting screen in the circumferential direction of the display unit **240**.

The controller **280** may control the display unit **240** such that the one or more option icons **242-1** to **242-4**, the delay icon **242-5**, and the additional option icon **242-6** are sequentially lit (or activated) in order of arrangement in response to the manipulation (i.e. the rotation) of the manipulation unit **310**.

For example, the option icons **242-1** to **242-4** may be displayed on the display unit **240**. The user may rotate the manipulation unit **310** to select one of the option icons **242-1** to **242-4**. In addition, the user may change the setting of the selected option.

As shown in FIG. 7, the user may rotate the manipulation unit **310** to light or activate the wash water temperature icon **242-2**. When the user inputs a signal through the first command input unit **311-1** in this state (i.e. when the user pushes the first command input unit **311-1**), the temperature of wash water may be changed.

That is, the first command input unit **311-1** may be configured to change the value of the option selected in response to the rotation of the manipulation unit **310**. Consequently, the user may push the first command input unit **311-1** to change the value of the option selected by the manipulation unit **310**.

In addition, the user may input a signal through the second command input unit **311-2** (i.e. the user may push the second command input unit **311-2**) on the option setting screen shown in FIG. 7 to drive the laundry machine **200** based on predetermined options without changing the setting of the options.

That is, when the user pushes the second command input unit **311-2** without changing the values of the options on the option setting screen shown in FIG. 7, the laundry machine **200** may be driven based on the course selected by the manipulation unit **310** and the predetermined options accompanying the selected course.

In other words, the user may push second command input unit **311-2** to drive the laundry machine **200** based on the selected course and the set options, irrespective of whether the current screen is the course selection screen or the option setting screen.

Information about (or the setting value of) the temperature of the wash water may be displayed on the central part of the display unit **240** in the radial direction thereof.

In addition, an additional option icon **242-6** and a back icon **242-7** may be further displayed on the option setting screen.

The additional option icon **242-6** and the back icon **242-7** may be displayed in the circumferential direction of the display unit **240** together with the one or more option icons **242-1** to **242-4** and the delay icon **242-5**.

When a signal is input through the first command input unit **311-1** in the state in which the additional option icon **242-6** is lit (or activated), the controller **280** may control the display unit **240** such that options other than the one or more predetermined option icons **242-1** to **242-4** are displayed on the display unit **240**.

The other options may include rough washing and steam washing. In the state in which the other options are display on the display unit **240**, the user may rotate the manipulation unit **310** to select an option to be changed. In addition, the user may push the first command input unit **311-1** to determine whether the other option icons are to be executed.

In addition, when a signal is input through the first command input unit **311-1** in the state in which the back icon **242-7** is lit (or activated), the controller **280** may control the display unit **240** such that the course selection screen is displayed again on the display unit **240**.

That is, when the back icon **242-7** is selected in response to the rotation of the manipulation unit **310** and a signal is input through the first command input unit **311-1**, the controller **280** may control the display unit **240** such that the course selection screen shown in FIG. 6 is displayed again on the display unit **240**.

Hereinafter, an image or a screen displayed on the display unit **240** during the driving of the laundry machine **200** (i.e. during the execution of a cycle) will be described with reference to FIG. 8.

FIG. 8 is a view showing a cycle execution screen displayed on the display unit when a specific washing course is started.

Specifically, FIG. 8 shows a cycle execution screen displayed on the display unit when an execution command is

input through the second command input unit **311-2** after the cotton course is selected on the course selection screen shown in FIG. 6.

As described with reference to FIGS. 6 and 7, the user may drive the laundry machine **200** by pushing the second command input unit **311-2** after completing the selection of a desired washing course, or may drive the laundry machine **200** by pushing the second command input unit **311-2** after completing the selection of a desired washing course and the setting of options.

During the driving of the laundry machine **200**, information about a washing course that is being executed and information about the time left until washing is completed may be displayed on the display unit **240**.

That is, during the driving of the laundry machine **200**, information about a washing course that is being performed and the time left until washing is completed may be displayed on the display unit **240** realized inside the manipulation unit **310** in the radial direction thereof. A cycle that is being performed (e.g. washing) may be further displayed on the display unit **240**.

In addition, the controller **280** may control the first command input unit **311-1** provided at the support member **314** such that the first command input unit **311-1** is not activated when the cycle execution screen is displayed on the display unit **240**.

That is, the controller **280** may control the second command input unit **311-2** provided at the support member **314** such that only the second command input unit **311-2** is activated when the cycle execution screen is displayed on the display unit **240**.

In contrast, the controller **280** may control the first command input unit **311-1** and the second command input unit **311-2** provided at the support member **314** such that both the first command input unit **311-1** and the second command input unit **311-2** are activated when the course selection screen (FIG. 6) and the option setting screen (FIG. 7) are displayed on the display unit **240**.

Consequently, the user may push the second command input unit **311-2** to temporarily stop the driving of the laundry machine **200** when the cycle execution screen is displayed on the display unit **240**.

In addition, the user may push again the second command input unit **311-2** in the state in which the laundry machine **200** is temporarily stopped in order to drive the laundry machine **200** again.

Hereinafter, a delay setting screen will be described with reference to FIG. 9.

FIG. 9 is a view showing an example in which a delay setting screen is displayed on the display unit.

Referring to FIG. 9, when a delay icon is selected on the option setting screen shown in FIG. 7 in response to the rotation of the manipulation unit **310** and a signal is input through the first command input unit **311-1**, a delay setting screen may be displayed on the display unit **240**.

For example, a delay setting screen may be displayed on the display unit **240** in the form of an analog clock.

A delay time may be selected in response to the rotation of the manipulation unit **310**, and the laundry machine **200** may be driven based on the delay setting made through the second command input unit **311-2**.

When the delay setting screen is displayed on the display unit **240**, the first command input unit **311-1** may return the screen displayed on the display unit **240** to the previous screen (i.e. the option setting screen).

That is, when the user pushes the first command input unit **311-1** in the state in which the delay setting screen is

displayed on the display unit **240**, the option setting screen may be displayed again on the display unit **240**.

More specifically, an indication **247** of a time remaining from the current time until a washing completion time may be lit on the initial delay setting screen in the shape of a sector.

A washing end time may be displayed on the central part of the display unit **240**. Furthermore, a time required for washing may also be displayed through the area of the sector-shaped indication **247** of the washing completion time.

In addition, when the user wishes to input a delay setting, the user may rotate the manipulation unit **310**. In response to the rotation of the manipulation unit **310**, the sector-shaped indication **247** of the washing completion time may also be moved (i.e. rotated).

For example, the sector-shaped indication **247** of the washing completion time may also be rotated in the clockwise direction in response to the clockwise rotation of the manipulation unit **310**.

In addition, when the sector-shaped indication **247** of the washing completion time is located at a desired washing completion time, therefore, the user may push the second command input unit **311-2** to complete the delay setting.

That is, when a signal is input through the second command input unit **311-2** in the state in which the indication **247** of the washing completion time is located at a desired washing completion time, the controller **280** may control the laundry machine **200** such that the laundry machine **200** is driven at the set delay time.

Hereinafter, a user interface of a laundry machine according to another embodiment of the present invention will be described with reference to the other drawings.

FIG. 10 is a front view showing an example of a user interface **3000** of a laundry machine according to another embodiment of the present invention.

The user interface **3000** may be provided at a control panel **2000** (see FIG. 15) of the laundry machine or a cabinet that defines the external appearance of the laundry machine. Of course, the control panel **2000** may be a portion of the cabinet that defines the external appearance of the laundry machine, or may be mounted at the cabinet.

According to this embodiment, as shown, it is possible to provide a user interface **3000** configured such that various complicated input units or selection units and a display, characteristics of the conventional art, are concentrated about a rotary knob **4100** and a laundry machine including the same. The rotary knob **4100** may be configured as a manipulation unit.

That is, according to this embodiment, it is possible to realize a user interface having a minimum number of input units disposed about the rotary knob **4100** without various input units and a display being spread out, unlike the conventional user interface shown in FIG. 1. In addition, it is possible to substantially include or easily add all conventional user interface functions through such a user interface.

The laundry machine according to this embodiment may include a display zone **4300** provided inside the rotary knob **4100** in the radial direction thereof. The display zone **4300** may include a display **4400**. The display **4400** may be configured to display course information and option information.

The display **4400** may be realized by a liquid crystal display (LCD), a light emitting diode (LED) display, or an organic light emitting diode (OLED) display. Of course, the display **4400** may be realized by a touch display, such as a display of a smart phone.

In the case in which the display is realized by a touch display, however, production costs may be excessively increased due to the display. In addition, a high-performance processor may be required to constitute the controller, with the result that production costs may be excessively increased. Consequently, it is preferable to provide a liquid crystal display that is capable of displaying simple text and figures.

Specifically, the display **4400** may selectively display a course screen for a specific washing course selected by the rotary knob and an option screen for option changing. Of course, the display **4400** may display a guidance screen (not shown) or a course progress screen (not shown), in addition to the course screen and the option screen.

The laundry machine according to this embodiment may provide a plurality of washing courses. The user may select a specific course from among the washing courses based on the purpose of washing or the kind of laundry. FIG. **10** shows an example in which **10** washing courses are basically provided. The number of washing courses may be known from the number of icons **4250**. In addition, as will be described later, at least one new washing course may be added using an additional icon **4270**.

The user may select a specific course from among the washing courses using the rotary knob **4100**. When the user rotates the rotary knob **4100** while holding the same, a course to be selected may be changed in a predetermined order. Course selection using the rotary knob **4100** is similar to what is shown in FIG. **1**. Consequently, it is possible to minimize a burden or difficulty when a user who is accustomed to course selection through the rotary knob **4100** uses a new user interface.

When power is supplied to the laundry machine, an initial guidance screen may be displayed on the display **4400**. For example, an initial guidance screen displaying a sentence "Select a washing course" may be displayed.

As the user rotates the rotary knob **4100** for course selection, a plurality of washing courses may be sequentially displayed on the display **4400**. This screen may be referred to as a course screen. FIG. **10** shows a course screen that provides information about a "normal washing" course as an example of the course screen. When the user further rotates the rotary knob **4100** one pitch in the state in which the course screen for the normal washing course is displayed, a course screen for the next course may be displayed on the display. Basically, therefore, the course displayed on the course screen may be selected.

Various kinds of information about a selected specific course as well as a course name may be displayed on the course screen. For example, as shown in FIG. **10**, information about power consumption, a course execution time, and the cycles in the course may be displayed.

The user may intuitively recognize information about the selected course through the display **4400** provided inside the rotary knob **4100**. That is, the user may easily recognize information about the selected course without moving or scanning with his/her eyes.

Meanwhile, the languages displayed on the display may be variously changed. That is, languages may be easily changed via software. In particular, the course name, which is set based on the respective languages, may be easily set without changing hardware even when the language is changed.

For the control panel shown in FIG. **1**, course names are printed on the front surface of the control panel. A laundry machine that is manufactured by a laundry machine manufacturer may be sold in various countries using various

languages, as well as domestically. In this case, the hardware must be changed depending on the language. In the case in which the display is provided inside the rotary knob **4100** in the radial direction thereof or is provided so as to be surrounded by the rotary knob **4100**, however, the course names may be easily set via software even when the language is changed. This means that it is not necessary to manufacture multiple different control panels for respective languages.

In general, a washing course may include a washing cycle, a rinsing cycle, and a spin-drying cycle. Of course, at least one cycle may be omitted depending on the course. The execution time, the number of times of execution, and the drum driving pattern of each cycle may be set differently depending on the course.

In addition, each washing course has basic set values. For example, the normal washing course shown in FIG. **10** has a wash water temperature of 60° C., normal washing intensity, three rinses, and fast spin drying as the basic set values. The basic set values may be differently set and changed for each course. Of course, such a change may be limited in a specific course.

After the selection of a specific course from among the washing courses, the user may select a start/pause input unit **4210**. This form is the most basic use form of the laundry machine. That is, when start is input, the laundry machine starts to be driven according to the selected specific course, sequentially performs predetermined cycles, and completes the course.

As previously described, various options may be selected in the washing course. That is, various options that are capable of changing a predetermined value or condition may be selected. The options may be selected on the premise that the specific washing course is selected.

The options may include at least one selected from among changing the conditions of the respective cycles included in the course, performing an additional cycle, and changing the execution completion time of the course (i.e. delay setting).

In general, the options may be provided to change the temperature of wash water, washing intensity, the number of rinses, and spin-drying intensity. The options may be changed by selecting one from among a plurality of values. The four options may be basic options.

For example, the "spin-drying intensity" option may be provided to select one from among high, intermediate, and low. Of course, the RPM of the drum may be changed to select one from among them. The "number of rinses" option may be provided to select one from among five values ranging from no rinses to 4 rinses.

The options may include a delay option. The delay option may be an option for delaying the time at which the course is finished. For example, in the case in which a two-hour specific course is selected, the time at which the course is finished may be set to 4 hours after the current time. In this case, the laundry machine may have a two-hour waiting time, may perform the selected course for the remaining two hours, and may finish the course. The delay option is very useful when leaving home for a long time. That is, washing may be set to be finished upon returning home. Consequently, it is possible to prevent laundry that is being washed or laundry that has been washed from remaining in the laundry machine for a long time.

In this embodiment, it is possible to provide a laundry machine having a single variable input unit **4600** for providing an intuitive and minimal user interface.

The single variable input unit **4600** may be configured to select one from between a plurality of pieces of input

information **4610** and **4620** depending on when it is selected. That is, one input unit may be configured to perform a plurality of functions. The single variable input unit **4600** may be configured to be selected by the user irrespective of the rotary knob **4100**. The single variable input unit **4600** may be constituted by a button that is selected by a user's touch or push.

Specifically, the single variable input unit **4600** may be configured to have a plurality of pieces of input information **4610** and **4620** and to selectively display the input information. That is, what the selection of the single variable input unit **4600** at the current time means may be visually displayed.

FIG. **10** shows an example in which a clock-shaped icon **4610** is displayed in the single variable input unit **4600**. It can be seen through the clock-shaped icon that input information is related to time, more particularly to delay. Consequently, the user may intuitively recognize input information as a delay time through the clock-shaped icon **4610**.

In an example, the user may select the single variable input unit **4600** on the course screen for the "normal washing" shown in FIG. **10**. This means that the user's intention to delay the time at which the normal washing course is performed and finished is directly reflected.

When the input unit **4600** in which input information as a delay time (i.e. the clock-shaped icon) is displayed is selected, the display **4400** switches from the course screen to the option screen. That is, the option screen for option changing is displayed. At this time, the single variable input unit **4600** is provided for delay entry. The display may be configured to selectively display the course screen and the option screen.

FIG. **11** shows an example of an "option screen" for delay option changing. That is, when the single variable input unit **4600** for displaying delay information is selected on the course screen, the display displays an option screen for delay setting shown in FIG. **11**. That is, a delay option screen for delay time changing is displayed. At this time, a clock form may be displayed, and the current time may be displayed. In addition, a predetermined course name and completion time may be displayed. The completion time may indicate the number of hours after the current time that washing will be finished. On the premise that the screen is switched from FIG. **10** to FIG. **11**, it means that the normal course will be started 2 hours and 20 minutes after the current time. In addition, it means that the normal course will be performed for 1 hour and 10 minutes and will be finished 3 hours and 30 minutes after the current time.

Such a delay change may be performed by rotating the rotary knob **4100**. That is, on the option screen, particularly on the option screen for delay changing, not on the course screen, the rotary knob **4100** may be a means for changing delay time. For example, as the rotary knob **4100** is rotated clockwise by one pitch, the delay time may be increased by 10 minutes or 30 minutes. The delay time may be decreased by 10 minutes or 30 minutes when the rotary knob **4100** is rotated counterclockwise by one pitch. Of course, the delay time setting range and unit may be preset.

In an example, the user may set the delay time through the rotary knob **4100** and may then perform input indicating that the delay setting has been completed through the single variable input unit **4600**. That is, an indication that the delay setting has been completed may be input through the single variable input unit **4600**. At this time, the single variable input unit **4600** may be provided to complete, for example, delay option setting.

When the single variable input unit **4600** is selected to complete the delay option setting, the display switches again from the option screen to the course screen. Of course, the time information shown in FIG. **10** may be changed from 1 hour and 10 minutes to 3 hours and 30 minutes.

Consequently, the single variable input unit **4600** may be provided to selectively perform option entry for option changing and option setting completion after option changing. That is, according to circumstances, a plurality of inputs or functions may be selected through the input unit **4600**. As a result, it is possible to prevent an increase in the number of input units. The course selection time and the option selection time after course selection may be distinguished from each other in order to guide the user to perform necessary input. In addition, since the meaning of the selection of the single variable input unit is visually displayed depending on the time, it is possible to prevent mistakes and confusion on the part of the user. Since such input information is displayed in the single variable input unit **4600**, it is possible for the user to more intuitively recognize what the selection of the input unit **4600** means.

Meanwhile, the distinction between the course selection time and the option selection time after course selection may be identical to the distinction between the course screen display time and the option screen display time on the display, as previously described.

For example, a clock icon **4610** may be displayed on the course screen, and the "OK" icon **4620** may be displayed on the option screen. The controller may perform control such that the screens displayed on the display are distinguished from each other, whereby the input information displayed in the single variable input unit **4600** is changed.

That is, the controller may perform control such that input information corresponding to each course screen is displayed in the single variable input unit. In addition, when the single variable input unit **4600** is selected, the controller may determine that the input information displayed in the single variable input unit has been input. In an example, when the single variable input unit **4600** is input in the state in which delay option entry information is displayed, the controller may control the display to display an option screen for delay option changing. When the single variable input unit **4600** is input in the state in which setting completion information is displayed, the controller may control the display to display a course screen. Of course, the course screen may be a course screen in which the changed option has been reflected.

As shown in FIGS. **10** and **11**, the two icons **4610** and **4620** may be disposed up and down in the single variable input unit **4600**. Of course, the two icons may be disposed side by side. In addition, the two icons may be selectively displayed.

Such a plurality of pieces of input information may be selectively displayed through the control of a light source. For example, the pieces of input information may be selectively displayed through control of the brightness of an LED, a description of which will follow.

Meanwhile, the single variable input unit **4600** may be provided inside the rotary knob **4100** in the radial direction thereof. That is, the display zone **4300** may include the single variable input unit **4600** as well as the display **4400**. Consequently, the movement of the user's eyes may be minimized, and intuitive input may be possible.

As previously described, the options may include basic options as well as the delay option. In other words, the basic options may be changed in a specific washing course. Option selection units **4710** to **4740** may be provided to change the

basic options. Four basic option selection units are shown in FIG. 10. The number of basic options may be changed. The option selection units 4710 to 4740 may be realized by buttons that are identical or similar to the single variable input unit 4600, a description of which will follow.

On the course screen shown in FIG. 10, for example, the user may select an option selection unit 4730 corresponding to a rinsing option in order to change the rinsing option. The option selection unit 4730 may be selected by the user pushing or touching the option selection unit 4730. When the rinsing option selection unit 4730 is selected, an option screen for rinsing option changing may be displayed on the display 4400. That is, when the rinsing option selection unit 4730 is input, the controller may control the display 4400 to display an option screen corresponding thereto. FIG. 12 shows an example of an option screen for rinsing option changing.

The user may select a desired rinsing option on the screen shown in FIG. 12. That is, the user may select a number of rinses that is different from a predetermined number of rinses. In an example, the number of rinses may be set to two instead of three, which is a basic set value.

The number of rinses may be changed through the rotary knob 4100. As the rotary knob 4100 is rotated, the number of rinses may be sequentially changed. For example, when the user wishes to change the number of rinses from three to two, the user may counterclockwise rotate the rotary knob 4100 by one pitch.

In addition, the number of rinses may be changed by pushing the rinsing option selection unit 4730. Whenever the user pushes the rinsing option selection unit 4730, the number of rinses may be sequentially changed.

After changing the number of rinses, the user may input the single variable input unit 4600 on the screen shown in FIG. 12. That is, the selection of a specific number of rinses may be completed by inputting the single variable input unit 4600. At this time, the single variable input unit 4600 may display "OK" information in the same manner as in the completion of delay option setting described above. That is, "OK" information indicating the completion of rinsing option setting may be displayed.

On the option screen for option changing, therefore, input information indicating the completion of option setting may be displayed by the single variable input unit. This applies equally to other options, such as the temperature of wash water, the washing intensity, and the spin-drying intensity.

FIG. 12 shows an option screen for rinsing option changing. Consequently, the rinsing option selection unit 4730 may be more brightly displayed than other option selection units 4710, 4720, and 4740. Of course, the options may not be selected on the delay setting screen shown in FIG. 10. Consequently, the selection units 4710 to 4740 may not be displayed on the delay setting screen.

Meanwhile, as previously described, the washing course and the options may be selected in the display zone 4300 through the rotary knob 4100. That is, the user's hands and eyes do not need to travel over the user interface but may be concentrated on a specific zone, whereby the convenience in use of the user interface is improved.

That is, since the screen is immediately changed due to the manipulation of the rotary knob 4100 and the display inside the rotary knob in response thereto, the user interface may be very easily manipulated. In addition, the selection and changing of the options and the completion of the option setting are performed in the display zone inside the rotary knob 4100. As a result, the user interface may be very easily manipulated.

Meanwhile, the course display unit 121 is provided outside the rotary knob 110 shown in FIG. 1. As the rotary knob 110 is rotated, therefore, the position of a lit course display unit is changed. In this embodiment, a circular decoration unit 4200 that is similar to such a user interface and icons 4250 located in the decoration unit 4200 may be provided for the convenience of users who are familiar with the user interface. A plurality of icons 4250 may be provided so as to correspond to courses that are basically provided.

The icons 4250 may be formed in the shape of a diagram or a figure in order to intuitively indicate respective washing courses. Since the icons 4250 are not languages, the icons may not be affected even when the languages are changed. That is, since the laundry machine is not bound to specific languages used in places where the laundry machine is sold, the laundry machine may be configured to have a minimal design.

The icons 4250 may be auxiliary means for easy course selection. In this embodiment, the icons 4250 may be provided to visually display information about the selected specific washing course to the user during option changing.

Meanwhile, the decoration unit 4200 may include an additional icon 4270 as well as icons indicating the respective washing courses. The additional icon 4270 may correspond to a washing course other than the washing courses that are basically provided in the laundry machine.

As the material for clothes is diversified and the frequency in use of functional clothes is increased, it is necessary to provide a new washing course. In this case, such a new washing course may be added to the laundry machine. However, it is not easy to change the conventional user interface.

In the case in which the new washing course is added, such information may not be easily exposed to the user. For this reason, the addition of the new washing course may not be attempted.

In the embodiment of the present invention, the user may easily recognize and use an added washing course through an additional icon that is not based on text in order to solve the above problem.

In addition, a washing course that is rarely used may be included in the conventional washing courses. It is not necessary for a washing course that is rarely used to be visible to the user. However, it may not be desirable to remove a washing course that is rarely used. Consequently, it is possible to make a washing course that is rarely used correspond to the additional icon 4270. As a result, it is possible to prevent the reduction of recognition due to the excessive increase in the number of icons 4250.

In other words, the additional icon 4270 may correspond to a washing course that is newly added in addition to the basic washing courses and/or a washing course that is rarely used in addition to washing courses that are frequently used.

For example, as the user rotates the rotary knob 4100, the basic icons are sequentially displayed more brightly. When the user further rotates the rotary knob 4100, the additional icon is displayed more brightly. At this time, a course corresponding to the additional icon is displayed on the display 4400.

In the case in which the number of new courses is 3, the additional icon may remain displayed more brightly until the rotary knob 4100 is rotated two pitches. Of course, when the rotary knob 4100 is rotated one pitch, a corresponding new course is displayed on the display.

FIG. 13 shows a swimsuit course as an example of an added new course. Consequently, the user may easily use the added new course through the additional icon. This may

mean that it is not necessary to change the hardware for the user interface. Consequently, the new course may be easily added, selected, and used while the conventional course selection method is not changed.

Meanwhile, the swimsuit course may be a basic course. The swimsuit course may be rarely used. Consequently, such a course that is rarely used may be configured to correspond to the additional icon **4270**. As a result, it is possible to prevent the washing course that is rarely used from being constantly exposed to the user.

FIG. **14** also shows a swimsuit course as an example of an added new course. In this case, a word that describes the course may be displayed instead of a course name, unlike what is shown in FIG. **13**. Of course, the screens shown in FIGS. **13** and **14** may be alternately displayed. Meanwhile, in the case in which a course is added, the added course may be clearly displayed on the display **4400**. FIGS. **13** and **14** show an example in which the added course is clearly displayed through a word "NEW".

As previously described, the icons **4250** provided in the decoration unit **4200** may be additional means for easy course selection. Consequently, an icon corresponding to a selected washing course may be visually different from other icons.

FIG. **10** shows an example in which an icon corresponding to the "normal washing" course is displayed more brightly than other icons.

When power is supplied to the laundry machine, a washing course is generally selected first. When power is supplied to the laundry machine, therefore, all icons corresponding to a plurality of washing courses may be displayed at the same brightness. As the rotary knob **4100** is rotated, only an icon corresponding to a selected washing course may be displayed at higher brightness.

Consequently, the brightness of the additional icon **4270** as well as the icons **4250** may be controlled so as to have a plurality of levels, such as the minimum level (or the OFF state), the intermediate level, and the maximum level.

In the state in which no power is supplied or in the state in which no washing course can be selected, the brightness may have the minimum level. In the state in which a washing course can be selected, the brightness may have the intermediate level. In the state in which a washing course has been selected, the brightness may have the maximum level.

In FIG. **10**, since the normal washing course has been selected, the icon indicating the normal washing course may have the maximum level of brightness, and the other icons may have the intermediate level of brightness. That is, the washing course may be changed in this state. Consequently, it is possible to intuitively recognize the current state based on the difference in brightness level among the icons.

FIGS. **11** and **12** respectively show examples in which delay option changing and rinsing option changing are performed on the premise that the normal washing course is selected. Since such option changing is performed on the premise that the normal washing course is selected, course changing is not possible at this time. Consequently, the icon indicating the normal washing course is displayed at the maximum level of brightness, and the other icons are displayed at the minimum level of brightness. Consequently, the user may clearly recognize the sequence of the course selection and option selection.

The icons **4250** and **4280** may be realized through a light transmission unit **4260**. In the same manner, input information of the single variable input unit may be realized through the light transmission unit.

As shown in FIG. **10**, a power input unit **4220** and a start/pause input unit **4210** may be provided in the decoration unit **4200**. The input units **4210** and **4220** may be configured in the form of a button. The position of the input units **4210** and **4220** substantially means that the user interface **3000** is concentrated at the rotary knob **4100**. Icons indicating the input units **4210** and **4220** may be realized through the light transmission unit.

Meanwhile, the display zone **4300** may include the display **4400**, the option selection units **4710** to **4740**, and the single variable input unit **4600**. That is, the display zone **4300** may be partitioned into a plurality of parts.

Consequently, the circular zone inside the rotary knob **4100** in the radial direction thereof may be partitioned into the display **4400**, the option selection units **4710** to **4740**, and the single variable input unit **4600**. In addition, in the case in which a quadrangular display is used, the display zone **4300** may further include a dummy zone **4500**.

The display zone **4300** may have a background screen having the same color. For example, the display zone may have a black background screen. That is, all of the zone inside the rotary knob **4100** in the radial direction thereof may be realized as a single black display. Of course, in practice, only a portion thereof may be a display. Consequently, it is possible to realize satisfaction in use and design as if a touch display were being used, but without the provision of a high-priced touch display.

The black display effect may be further prominent through the light transmission units. The reason for this is that no light is transmitted through the light transmission units in the state in which no power is supplied. That is, all icons shown in FIG. **10** may seem to disappear. That is, no light is transmitted through the light transmission unit corresponding to the option selection units **4710** to **4740** and through the light transmission unit corresponding to the single variable input unit **4600**. The display **4400** is also turned off. Consequently, the display zone may seem to be a black display. In addition, no light is transmitted through the light transmission unit **4260** corresponding to the washing course icons **4250** and **4270**. As a result, it is possible to realize a minimal design having no text or language printed on the front surface of the control panel.

Hereinafter, an example of the structure of the user interface **3000** will be described in detail with reference to FIGS. **15** and **16**.

FIG. **15** shows the relationship between a control panel **2000** and the user interface **3000**. The rotary knob **4100** and the decoration unit **4200** may be exposed at the front surface of the control panel **2000**, and the other components may be located inside the control panel **2000**. In addition, the display zone **4300** may be exposed at the front surface of the control panel **2000** such that the user can access the display zone.

The rotary knob **4100** is configured to be rotatable, and the display zone **4300** provided inside the rotary knob **4100** in the radial direction thereof is not rotated.

The rotation of the rotary knob **4100** is transmitted to a display mounting unit **4360**, and the rotation of the display mounting unit **4360** is transmitted to an encoder mounting unit **4370**. When the encoder mounting unit **4370** is rotated, an encoder **4390** is rotated. A signal indicating the rotation of the encoder **4390** is transmitted to a controller **4350**. The controller may be realized through a controller mounted in a printed circuit board (PCB).

The display **4400** may be located inside the display mounting unit **4360** in the radial direction thereof. The display **4400** may be fixed so as not to be rotated even when

the display mounting unit 4360 is rotated. That is, the rotary knob 4100 and the display mounting unit 4360 may be configured to be rotatable relative to the display zone 4300. For this reason, it is difficult to locate the encoder 4390 at the rear of the rotary knob 4100. Consequently, the encoder mounting unit 4370 may be located outside the display mounting unit 4360 in the radial direction thereof in order to transmit the rotation of the rotary knob 4100 to the encoder 4390.

The display mounting unit 4360 and the encoder mounting unit 4370 may be engaged with each other in a gear engagement fashion in order to achieve the transmission of rotation.

FIG. 16 is an exploded perspective view of the user interface 3000 shown in FIG. 15.

A portion of the rotary knob 4100 may be inserted into the inside of the decoration unit 4200 in the radial direction thereof so as to be matched with the display mounting unit 4360. A window 4310 and a single touch unit 4620a are located at the front surface of the display zone 4300.

An input unit housing 4320 and an LED PCB 4330 may be located at the rear of the window 4310 and the single touch unit 4620a.

Four touch sensing units 4710a corresponding to the option input units 4710 to 4740 and a tact switch 4620b corresponding to the single touch unit 4620a may be mounted in the input unit housing 4320.

The LED PCB 4330 may be provided with a plurality of LEDs 4710b as light sources corresponding to the option input units 4710 to 4740 and a plurality of LEDs 4620c and 4620d corresponding to the single touch unit 4620a.

Four LEDs 4710b may be provided so as to correspond to four basic options. The brightness of the LEDs 4710b may be differently controlled. In the same manner, the brightness of the LEDs 4620c and 4620d may be differently controlled so as to selectively display input information from the single variable input unit 4600.

A main PCB constituting the controller 4350 may be provided at the rear of the decoration unit 4200. The main PCB may be provided with a plurality of LEDs 4250a corresponding to the respective washing courses. An LED support 4340 may be located between the LEDs 4250a and the decoration unit 4200.

Meanwhile, light transmission units are formed in the window 4310, the single touch unit 4620a of the single variable input unit, and the decoration unit 4200. The light transmission units may be icons. That is, light may be substantially transmitted only through the icons. Consequently, the brightness of light that is transmitted through the icons may be differently controlled so as to visually display the current state.

The light transmission units may correspond to the respective light sources. Of course, the light sources may be LEDs. The controller 4350 may selectively control the brightness of the light sources. The brightness of the light sources may have three levels, as previously described. In addition, the brightness of the light sources may be controlled through on/off control of the LEDs or control of a duty ratio.

The light sources, particularly the LEDs, are controlled so as to timely show information displayed through the light transmission units. That is, in the state in which selection or input is necessary or enabled, light is transmitted through the light transmission units so as to show that selection or input is enabled. In addition, which selection or input is possible may be shown based on the shape of the icons indicating the light transmission units. On the other hand, in the state in

which selection or input is unnecessary or disabled, no light is transmitted. Consequently, it is possible to prevent mistakes and confusion on the part of the user due to the exposure of such information.

Particularly, in this embodiment, since a single input unit selectively shows which input is possible depending on the current state, the number of input units may be reduced, user convenience may be improved, and mistakes and confusion on the part of the user may be effectively prevented.

Although the preferred embodiments of the present invention have been described in detail above, it will be apparent to those skilled in the art that various modifications can be made in the present invention without departing from the spirit and scope of the present invention defined in the appended claims. Thus, it is intended that changes to future embodiments of the present invention do not depart from the technology of the present invention.

INDUSTRIAL APPLICABILITY

Described in the specification.

The invention claimed is:

1. A laundry machine that provides a plurality of washing courses, and when a specific washing course is selected from among the washing courses, is capable of changing at least one option accompanying the specific washing course, the laundry machine comprising:

a rotatable manipulation unit configured to select a specific washing course and to select at least one option accompanying the specific washing course;

a display unit configured to selectively display input items, comprising one or more selected from among a plurality of washing [course icons, an] *courses and at least one option* [icon indicating at least one option] accompanying each of the washing [course icons, and a start icon,] *courses* inside the manipulation unit in a radial direction thereof;

at least one command input unit provided outside the display unit in a radial direction thereof [and inside the manipulation unit in a radial direction thereof] for inputting a washing course selected by the manipulation unit, changing the at least one option, and inputting a signal for executing and stopping the selected washing course; and

an additional input unit disposed separately from the at least one command input to receive a command different from the manipulation unit and the at least one command input unit; and

a controller configured to control the display unit such that predetermined information is displayed on the display unit based on signals from the manipulation unit and the command input unit,

wherein the display unit is formed in a circular shape, is provided inside the manipulation unit in the radial direction thereof, and is configured to selectively display the input item, [and]

wherein the command input unit comprises a first command input unit, configured to allow a user to input the washing course selected by the manipulation unit and to change the at least one option, and a second command input unit, configured to perform and stop the course selected by the manipulation unit,

wherein the additional input unit is provided inside the manipulation unit, and

wherein the additional input unit and the display unit are disposed separately from each other.

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2. The laundry machine according to claim 1, wherein when power is supplied to the laundry machine, a course selection screen is displayed on the display unit, and the washing courses are displayed on the course selection screen in a circumferential direction of the display unit.

3. The laundry machine according to claim 2, wherein each of the washing courses is displayed in a dot form.

4. The laundry machine according to claim 3, wherein the controller controls the display unit such that the dots displayed on the display unit are sequentially lit in response to rotation of the manipulation unit.

5. The laundry machine according to claim 3, wherein the controller controls the display unit such that information about at least one option accompanying the selected course is displayed at a position different from positions at which the washing courses are displayed.

6. The laundry machine according to claim 3, wherein, when one of the washing [course icons] *courses* is selected in response to rotation of the manipulation unit and the selected washing course is input through the first command input unit, an option setting screen is displayed in the display unit, and one or more selected from among one or more predetermined [option icons] *options* accompanying the selected washing course, a delay icon, and an additional option icon are displayed on the option setting screen in the circumferential direction of the display unit.

7. The laundry machine according to claim 6, wherein the one or more [option icons] *options*, the delay icon, and the additional option icon are sequentially lit in order of arrangement in response to rotation of the manipulation unit.

8. The laundry machine according to claim 6, wherein a back icon is further displayed on the option setting screen, and

when the back icon is selected in response to rotation of the manipulation unit and a signal is input through the first command input unit, the controller controls the display unit such that the course selection screen is displayed again on the display unit.

9. The laundry machine according to claim 6, wherein, when the delay icon is selected in response to rotation of the manipulation unit and a signal is input through the first command input unit, a delay setting screen is displayed on the display unit in a form of an analog clock, a delay time is selected in response to the rotation of the manipulation unit, and a delay setting is completed through the second command input unit.

10. The laundry machine according to claim 1, wherein the controller performs control such that only the second command input unit, selected from between the first command input unit and the second command input unit, is activated when a cycle execution screen is displayed on the display unit.

11. The laundry machine according to claim 1, further comprising:

a power input unit configured to supply power to the laundry machine, wherein

when the manipulation unit is rotated by a predetermined angle or more or when the signal input through the command input unit is maintained for a predetermined time or more, power from an external power source is supplied to the laundry machine via the power input unit.

12. The laundry machine according to claim 11, wherein, when the signal input through the command input unit is maintained for the predetermined time or more in a state in which the power is supplied to the laundry machine, the

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power input unit interrupts a supply of power from the external power source to the laundry machine.

13. The laundry machine according to claim 1, wherein the first command input unit and the second command input unit are provided outside the display unit in the radial direction thereof and inside the manipulation unit in the radial direction thereof so as to be located at different positions.

14. The laundry machine according to claim 13, wherein one of the first command input unit and the second command input unit is provided inside the manipulation unit in the radial direction thereof at a 3 o'clock position, and the other of the first command input unit and the second command input unit is provided inside the manipulation unit in the radial direction thereof at a 9 o'clock position.

15. The laundry machine according to claim 1, wherein the washing courses comprise one or more selected from among normal washing, baby clothes, boiling, speed wash, allergy care, steam cleaning, functional clothes, bedding cleaning, cold water wash, lingerie/wool, bedclothes, and rinsing/spin drying.

16. The laundry machine according to claim 1, wherein the option comprises one or more selected from among a washing intensity, a wash water temperature, a number of rinses, and a spin-drying intensity.

17. *The laundry machine according to claim 1, wherein the additional input unit is configured to differently set an input command according to the contents displayed on the display unit.*

18. *The laundry machine according to claim 1, wherein the additional input unit is disposed below the display unit.*

19. *The laundry machine according to claim 1, wherein the at least one command input unit is spaced apart from the manipulation unit in a radial direction thereof.*

20. *The laundry machine according to claim 1, wherein the at least one command input unit is provided separately from the manipulation unit.*

21. *A laundry machine that provides a plurality of washing courses, and when a specific washing course is selected from among the washing courses, is capable of changing at least one option accompanying the specific washing course, the laundry machine comprising:*

a rotatable manipulation unit configured to select a specific washing course and to select at least one option accompanying the specific washing course;

a display unit configured to selectively display input items, comprising one or more selected from among a plurality of washing courses and at least one option accompanying each of the washing courses inside the manipulation unit in a radial direction thereof;

a first command input unit, configured to allow a user to input the washing course selected by the manipulation unit and to change the at least one option;

a second command input unit, configured to perform and stop the course selected by the manipulation unit;

an additional input unit disposed separately from the first command input and the second command input unit to receive a command different from the manipulation unit, the first command input unit and the second command input unit;

a controller configured to control the display unit such that predetermined information is displayed on the display unit based on signals from the manipulation unit and the first and second command input units,

wherein the display unit is formed in a circular shape, is provided inside the manipulation unit in the radial direction thereof, and is configured to selectively display the input item,

wherein at least one of the first command input unit or the second command input unit is provided outside the display unit in a radial direction thereof and inside the manipulation unit in a radial direction thereof,

wherein the additional input unit is provided inside the manipulation unit, and

wherein the additional input unit and the display unit are disposed separately from each other.

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