



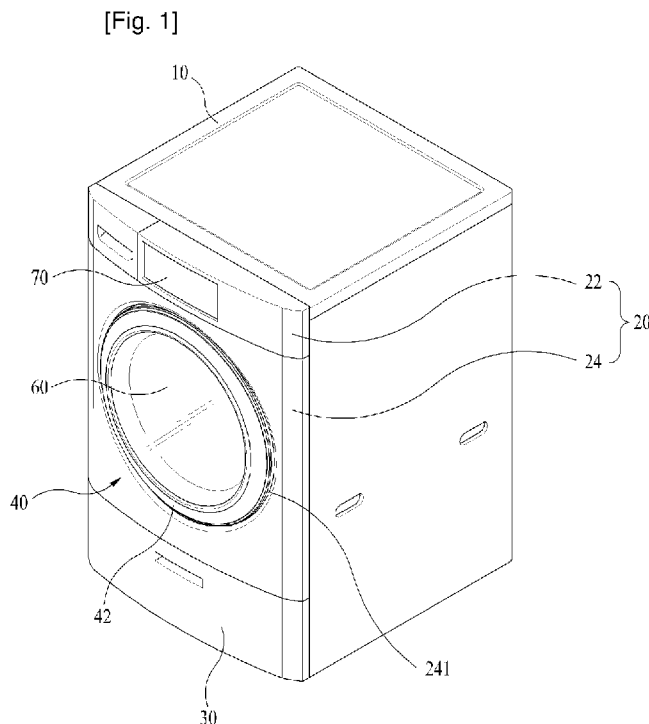
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- (54) Title: WASHING MACHINE



- (57) Abstract:** A washing machine is disclosed which washes laundry using a mechanical force. The washing machine includes a display unit formed at a door to display information on washing, accordingly expanding the installation space for the display unit. In addition, when the display unit comprises a touch screen, not only input and display of the washing information but also visual inspection of laundry in a drum can be achieved by the display unit.



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Description

Title of Invention: WASHING MACHINE

Technical Field

- [1] The present invention relates to a washing machine that washes clothes using a mechanical force.

Background Art

- [2] Generally, a washing machine refers to an apparatus to remove various contaminants attached to clothes and the like, using chemical degradation, for example emulsification by detergent, and a physical impact such as friction of a water current and impact applied to laundry generated by a pulsator or rotation of a drum.
- [3] The washing machine, using an electric motor as a main power source, performs washing, rinsing and spin-drying processes using detergent and water, thereby separating contaminants from the clothes, that is, laundry. For this purpose, the washing machine includes a mechanical unit equipped with an electric motor as a power unit to transmit power to laundry, a control unit to control the overall washing process, and a water supply unit and a water drain unit to supply and drain water.
- [4] According to methods of applying an impact to laundry, the washing machine may be classified into a pulsator washing machine that directly applies an impact to laundry and a drum washing machine that applies an impact to laundry by tumbling the laundry through rotation of a drum.
- [5] The drum washing machine has a reduced height compared to the pulsator washing machine wherein a drum functioning as a washing tub is rotated in a vertical position. Also, the drum washing machine is more effective at preventing entanglement of laundry and adding a drying function, than the pulsator washing machine.
- [6] Various functions of the washing machine, including starting, stopping, time setting, control of a supplied water quantity, and selection of courses are input through an input unit. A display unit is provided near the input unit to display various operational states of the washing machine.
- [7] However, since the display unit of general washing machines only displays washing information, a dedicated input unit becomes necessary for input of control commands.
- [8] Furthermore, the increase of the size of the display unit is restricted in general washing machines because an installation space supplied for the display unit is insufficient.
- [9] Meanwhile, in addition, a door for introduction and removal of laundry is disposed on a front side in general washing machines. Nevertheless, aesthetic appeal of the door has rarely been taken into practical use.

Disclosure of Invention

Technical Problem

- [10] An object of the present invention devised to solve the problem lies on a washing machine having a display unit not only functioning as a general input unit for input of information regarding washing but also as an output unit to display the washing information.
- [11] Another object of the present invention devised to solve the problem lies on a washing machine capable of maximizing the size of the display unit that displays the washing information.
- [12] A further object of the present invention devised to solve the problem lies on a washing machine with improved aesthetics for users by designing a front exterior appearance thereof in various patterns.
- [13] A further object of the present invention devised to solve the problem lies on a washing machine capable of supplying respectively different user interfaces to different users in accordance with information on the users.

Solution to Problem

- [14] The object of the present invention can be achieved by providing a washing machine including a cabinet forming an exterior appearance of the washing machine and including an opening; a drum rotatably mounted in the cabinet and supplied with laundry through the opening; a door mounted at the cabinet to open and close the opening; and a display unit provided at the door to display washing information.
- [15] The display unit may be disposed at a position corresponding to the opening.
- [16] The display unit may include a transparent display panel which transmits light from inside of the drum.
- [17] The display unit may further include an input unit to select the washing information being displayed on the transparent display panel.
- [18] The input unit may include a touch panel formed on a surface of the transparent display panel.
- [19] The door may include a door frame shaped corresponding to the opening, and the input unit may be formed along an outer circumference of the door frame.
- [20] The input unit may be a button-type input unit including operation buttons.
- [21] The washing machine may further include a light emitting unit disposed under the buttons to emit light.
- [22] The washing machine may further include a light transmission unit which transmits light from inside of the drum, and the opening may be partitioned by the light transmission unit and the display unit.
- [23] The display unit may be a touch screen including a transparent display panel

transmitting the light from inside of the drum, and a touch panel disposed on an upper surface of the transparent display panel.

- [24] The door may include a door frame shaped corresponding to a front outer circumference of the cabinet, and a door glass fixed to an upper surface of the door frame, thereby forming a front exterior appearance of the cabinet, and the display unit may be provided to the door glass.
- [25] The door glass may include a penetration part into which the display unit is inserted, and the display unit may be supported by the door frame and exposed out of the door glass through the penetration part.
- [26] The display unit may be disposed at a position corresponding to the opening.
- [27] The display unit may be a transparent display panel which transmits light from inside of the drum.
- [28] The display unit may further include an input unit to select the washing information being displayed on the transparent display panel.
- [29] The input unit may include a touch panel formed on a surface of the transparent display panel.
- [30] The display unit may supply respectively different user interfaces to different users based on user information input in advance.
- [31] The user information may include at least one of a user's age, gender, living environment, and family members.
- [32] The display unit may display letters or icons of the user interface in different sizes according to the user's age input as the user information.

Advantageous Effects of Invention

- [33] The present invention provides a washing machine having a display unit capable of both input and display of information.
- [34] In addition, a front exterior appearance of the washing machine may be variously designed so as to be aesthetically pleasing to users.
- [35] Also, according to the embodiment of the present invention, the washing machine may have a display unit which outputs respectively different user interfaces differently set according to users.

Brief Description of Drawings

- [36] The accompanying drawings, which are included to provide a further understanding of the invention, illustrate embodiments of the invention and together with the description serve to explain the principle of the invention.
- [37] In the drawings:
- [38] FIG. 1 illustrates a perspective view of a washing machine according to a first embodiment of the present invention;

- [39] FIG. 2 and FIG. 3 illustrate views showing the operational state of a display unit of the washing machine according to the first embodiment;
- [40] FIG. 4 illustrates a perspective view of a washing machine according to a second embodiment of the present invention;
- [41] FIG. 5 and FIG. 6 illustrate perspective views of a washing machine according to a third embodiment of the present invention;
- [42] FIG. 7 illustrates a view of a user interface displayed on a display unit; and
- [43] FIG. 8 illustrates a view of the user interface being varied in size on the display unit.

Best Mode for Carrying out the Invention

- [44] Reference will now be made in detail to the preferred embodiments of the present invention, examples of which are illustrated in the accompanying drawings. In describing the embodiments, the same elements and structures will be denoted by the same reference numerals throughout and will not be repeatedly explained in detail.
- [45] FIG. 1 illustrates a perspective view of a washing machine according to a first embodiment of the present invention.
- [46] The washing machine includes a cabinet 10 having an open front side and constituting the overall exterior appearance of the washing machine, a front panel 20 connected at the front side of the cabinet 10, thereby constituting the front exterior appearance of the washing machine, a drawer 30 disposed at a lower part of the cabinet 10 to be withdrawable to the front of the cabinet 10, a door 40 fixed to the cabinet 10, and a display unit 60 provided to the door 40 to display information on washing to a user or through which the user may input washing information.
- [47] Here, the washing information refers to various information regarding washing for the user, including information on a plurality of washing courses classified according to types and characteristics of laundry, information on controlling factors set to the respective washing courses, such as a water temperature, a water level and a steam temperature, and information on the progress of the washing courses, such as an elapsed time and an expected finishing time.
- [48] The cabinet 10 has a front side which is opened for connection with the front panel 20 having an opening 241, and is equipped with various components therein to perform the washing of laundry. More specifically, the cabinet 10 may include therein a tub supplied with wash water, a drum (not shown) rotatably mounted in the tub, a damper controlling vibration generated from the tub, and a driving unit to rotate the drum.
- [49] Laundry introduced through the opening 241 is stacked in the drum. The drum may have a plurality of lifters (not shown) mounted at the inside thereof to move the stacked laundry.

- [50] More specifically, the lifters are protruded from an inner circumferential surface of the drum. As the drum rotates, the lifters lift the laundry and the laundry lifted in the drum falls to a bottom of the drum due to gravity. Accordingly, the lifters may improve the washing efficiency of the washing machine.
- [51] The driving unit (not shown) for rotating the drum is disposed at a rear part of the drum. The driving unit may be structured in various manners. For example, a driving force generated by a motor may be transmitted to the drum through a transmission belt. Alternatively, a rotational shaft of a motor may be connected directly to the drum.
- [52] The tub is elastically supported against the cabinet 10 by a spring (not shown) and a damper (not shown). Therefore, vibration caused by rotation of the drum may be absorbed by the spring and the damper, thereby minimizing the vibration transmitted to the cabinet 10.
- [53] Meanwhile, when designing a washing machine with a laundry drying function, components for supplying heated air into the tub may be further provided.
- [54] Specifically, the components for the drying function may include an air duct (not shown) to introduce air to an inside of the tub, a heater (not shown) to heat the air introduced to the inside of the tub, and a ventilation fan (not shown) to blow air to the tub through the air duct.
- [55] The front panel 20 is connected to the front side of the cabinet 10, thereby constituting the exterior appearance of the washing machine. The front panel 20 includes the opening 241 communicated with an inside of the drum. Also, the front panel 20 may include a single panel or two or more separate panels.
- [56] Referring to FIG. 1, the front panel 20 is divided into an upper panel 22 and a middle panel 24 in consideration of ease of assembly of the washing machine 10, an aesthetic effect, and connection relations with other component parts.
- [57] The drawer 30 may be disposed at the lower part of the cabinet 10. The drawer 30 which is withdrawable to the front of the cabinet 10 may perform washing or drying of a small quantity of laundry.
- [58] The door 40 selectively opens and closes the opening 241 formed at the middle panel 24, being hinged between the cabinet 10 and the middle panel 24.
- [59] Therefore, when the door 40 is opened, the laundry can be inserted into or removed from the inside of the drum which is fluidly communicated with the opening 241.
- [60] The door 40 includes a door frame 42 forming the exterior appearance thereof. The door frame 42 may be shaped corresponding to the opening 241. FIG. 1 shows the door frame 42 having a ring shape.
- [61] The door frame 42 may have the display unit 60 that displays the washing information and supplies menus for confirming and selecting the washing information, for example, in the form of a graphic user interface (GUI). The washing information

being displayed may include information on a plurality of washing courses classified according to types and characteristics of laundry, information on controlling factors of the respective washing courses, such as a water temperature, a water level and a steam temperature, and information on the progress of the washing courses, such as an elapsed time and an expected finishing time.

[62] The display unit 60 may have various forms so long as they are capable of supplying information to the user. Representatively, the display unit 60 may be implemented by a liquid crystal display (LCD) panel, an organic light emitting diode (OLED) panel, a flexible display panel, and a 3D display panel.

[63] When the display unit 60 is provided at the door frame 42 to correspond to the opening 241, the user convenience will be improved since the user is able to easily recognize the washing information. In addition, the aesthetics of the washing machine 10 can be improved.

[64] The display unit 60 may take the form of a transparent display panel so that the user can check the laundry in the drum through the door 40. A transparent OLED (TOLED) is generally used for the transparent display panel that transmits the external light of the panel.

[65] When the transparent display panel is employed for the display unit 60, the user is able to not only be supplied with the washing information but also check a state of the laundry in the drum through the display unit 60 before, after and during the washing.

[66] The display unit 60 may further include an input unit for the user to select the washing information being displayed.

[67] The input unit may include a device that converts a pressure applied to a specific position of the display unit 60 or variation of capacitance generated at a specific position of the display unit 60 into an electric input signal.

[68] For example, a touch panel is representatively used for the input unit, which is capable of sensing a position to which an external force is applied, a surface area of the position, and a magnitude of the external force.

[69] That is, the display unit 60 may be a touch screen constituted by a transparent display panel, and a touch screen deposited on a surface of the display unit 60 to generate pre-determined signals upon detection of an external force.

[70] In this case, the display unit 60 is capable of not only displaying the washing information but also being input with the washing information. Moreover, the display unit 60 enables the user to check the laundry in the drum even while displaying the washing information.

[71] FIG. 2 illustrates a view showing the display unit 60 supplying the washing information to be selected by the user. FIG. 3 illustrates a view showing the display unit 60 displaying the washing course selected by the user and time related to the washing

course, such as an estimated time remaining.

[72] More specifically, in FIG. 2, the transparent display panel formed at the door frame 42 is displaying the washing information to be selected regarding setting of the temperature and rinsing, steaming, and spinning operations.

[73] The user may select or input desired information among the washing information being displayed on the transparent display panel, by touching the desired information.

[74] Thus, the display unit 60 including the touch screen functions as an information selection unit to select the washing courses and set the controlling factors of the selected course, such as a water temperature and a water level, and as an information display unit to display the washing information and the operational state of the washing machine.

[75] Although the display unit 60 of the present embodiment has been explained to include a touch screen, the display unit 60 may be structured in a manner that a touch panel is formed on an upper surface of an opaque display panel. In this case, the same effect as when the display unit 60 includes the touch screen can be obtained except that the laundry in the drum cannot be checked.

[76] The washing machine 10 may further include an auxiliary display unit 70 to assist the functions of the display unit 60, being disposed at the upper panel 22.

[77] The auxiliary display unit 70 does not have to be a transparent display panel when provided at the upper panel 22. However, in this case as well, the auxiliary display unit 70 may include a touch panel for input of the washing information.

[78] For example, the auxiliary display unit 70 may include a touch screen to be used as an input unit whereas the display unit 60 includes only a transparent display panel.

[79] Hereinafter, a washing machine according to a second embodiment of the present invention will be described with reference to FIG. 4. Since an input unit of the second embodiment is the only distinctive feature from the first embodiment, the same elements as in the first embodiment will not be described in detail.

[80] The washing machine according to the present embodiment includes a cabinet 110 constituting the exterior appearance thereof, a front panel 120 connected to a front side of the cabinet 110 and divided into an upper panel 122 and a middle panel 124, a drawer 130 that can be withdrawn to the front of the cabinet 110, and a door 140 opening and closing an opening 1241 formed on the middle panel 124.

[81] The door 140 includes a door frame 142 shaped corresponding to an outer circumference of the opening 1241. The washing machine may further include a display unit 162 formed at the opening 1241 and fixed to the door frame 142, a light transmission unit 164 formed at the opening 1241 and fixed to the door frame 142, and an input unit 166 formed along an outer circumference of the door frame 142.

[82] The input unit 166 may include a plurality of parts sequentially arranged along the

outer circumference of the door frame 142. The user selects the washing information being displayed on the display unit 162 through the input unit 166.

[83] The input unit 166 may be provided although the display unit 162 is implemented by a touch screen. However, the input unit 166 will be more useful when the display unit 162 does not have the touch panel and therefore cannot function as a washing information input unit.

[84] That is, if the display unit 162 is merely a transparent display panel incapable of inputting the user's selection, the user may select or input the washing information through the input unit 166 while confirming the selected or input washing information through the display unit 162.

[85] The input unit 166 may be a button-type input unit. In this case, an LED (not shown) may be provided under the input unit 166 to emit light.

[86] More specifically, the LED may be mounted in the door frame 142 corresponding to the input unit 166 and controlled so that a pressed part of the input unit is recognized by the user.

[87] As well as notifying the user of the pressed part of the input unit, the LED may flicker or emit respectively different colors according to the washing courses, such as washing and rinsing, in progress, thereby improving the aesthetic appearance of the washing machine.

[88] According to this embodiment, the light transmission unit 164 may be further provided, which is made of a material transmitting light from the inside of the drum. The light transmission unit 164 is supported by the door frame 142. Therefore, the opening 1241 is partitioned by the light transmission unit 164 and the display unit 162.

[89] Here, the display unit 162 may be a touch screen constructed by a transparent display panel and a touch panel, or an opaque display panel.

[90] According to an exemplary embodiment, the light transmission unit 164 includes a transparent plate enabling the user to check the laundry in the drum regardless of characteristics of the display unit 162 such as whether the display unit 162 is transparent or opaque. According to this, the user is able to confirm the washing information through the display unit 162 and check the laundry in the drum through the light transmission unit 164. That is, the light transmission unit 164 is more useful when the display unit 162 is not a transparent display panel.

[91] The washing machine of the present embodiment may further include an auxiliary display unit 170. The auxiliary display unit 170 may be formed on the upper panel 122 adapted to assist the functions of the display unit 162.

[92] For example, the auxiliary display unit 170 may include a touch panel adapted to perform the same function as the input unit 166.

[93] Hereinafter, a washing machine according to a third embodiment of the present

invention will be described with reference to FIG. 5 and FIG. 6.

- [94] Since the third embodiment is distinctive from the first and the second embodiments only regarding the door, the other structures which are the same as in the previous embodiments will not be explained in detail.
- [95] The washing machine shown in FIG. 5 includes a cabinet 210 constituting the exterior appearance thereof, an upper panel 220 disposed at an upper front part of the cabinet 210, a drawer 230 that can be withdrawn to the front of the cabinet 210, and a door 240 disposed between the upper panel 220 and the drawer 230.
- [96] In this embodiment, the door 240 serves as the middle panel of the first and the second embodiments. Specifically, the door 240 includes a door frame 242 forming the front exterior appearance of the cabinet 210, and a door glass 268.
- [97] The door frame 242 has a form to constitute the front exterior appearance of the cabinet 210. For example, the door frame 242 is in the form of a rectangular panel as shown in FIG. 5.
- [98] A display unit 260 is provided at the door frame 242. When the display unit 260 is in the form of a touch screen, the user may be able to select the washing information through a touch panel while confirming the selected washing information through a transparent display panel.
- [99] Here, since the transparent display panel refers to a light transmitting panel and the touch panel may also include a light transmitting panel, the user is able to check the laundry in the drum through the display unit 260.
- [100] The door glass 268 having a form corresponding to the door frame 242 may be further provided on the front side of the door frame 242.
- [101] The door glass 268 is connected to the front side of the door frame 242, thereby constituting the front exterior appearance of the washing machine.
- [102] In this case, the display unit 260 should not interfere with the door glass 268.
- [103] More specifically, the display unit 260 needs to be touchable by the user for input of the washing information by the user. To this end, the display unit 260 may be inserted in the door glass 268 or disposed on an upper surface of the door glass 268.
- [104] In order to insert the display unit 260 in the door glass 268, a penetration part 269 is formed at the door glass 268 so that the display unit 260 can be exposed out of the door glass 268 through the penetration part 269, as shown in FIG. 6.
- [105] On the other hand, if the display unit 260 does not include a touch panel and therefore functions only as a display device, the display unit 260 may be disposed between the door frame 242 and the door glass 268 as shown in FIG. 5. In this case, a dedicated input unit becomes necessary for selection of the washing information. The input unit may be achieved by providing the front panel 220 with a dedicated button or providing an auxiliary display panel 270.

- [106] Hereinafter, the user interface (UI) supplied to the user through the display unit will be explained with reference to FIG. 7 and FIG. 8.
- [107] The UI is a device allowing the user to exchange control commands with the washing machine. A graphic user interface (GUI) using graphics such as icons may be employed in the washing machine.
- [108] In addition, the washing machine according to the embodiments of the present invention may further include a storage unit storing information on the user such as the user's age, gender, hobby, living environment, family members and the like so that different UIs can be supplied to different users. The washing machine may further include a control unit supplying the display unit with the user information stored in the storage unit.
- [109] Accordingly, when the user stores user information in the storage unit in advance through the input unit such as the touch panel or the button, the control unit displays the UI corresponding to the user information on the display unit.
- [110] Since the UI is supplied corresponding to the user information, contents of the washing information, and arrangement pattern and order of the washing information are varied according to the user information.
- [111] In a case where a GUI is supplied, kinds and arrangement patterns of icons representing the washing information will be variably shown.
- [112] For example, when the UI is variably supplied according to the users' ages, differences between adult clothes and infant clothes made of a friction-sensitive material may be considered. Therefore, an icon may be displayed, which represents a washing course to minimize friction between clothes and the drum, when infant clothes are to be washed.
- [113] If the UI is supplied according to the users' genders and the user is male, an icon representing a washing course proper for men's clothes may be preferentially displayed. Likewise, when information on a female user is input as the user information, an icon representing a washing course proper for women's clothes will be preferentially displayed.
- [114] If a user prefers dark clothes, the UI may be set to preferentially display an icon representing a washing course to make a color of the dark clothes clearer or to prevent cross-staining to other clothes.
- [115] Furthermore, if the UI is supplied according to the users' living environments, an icon representing a washing course proper for thick clothes or thin clothes may be preferentially displayed.
- [116] Accordingly, the washing machine according to the embodiments of the present invention is capable of supplying the UI based on user information through the display units 60, 162 and 260.

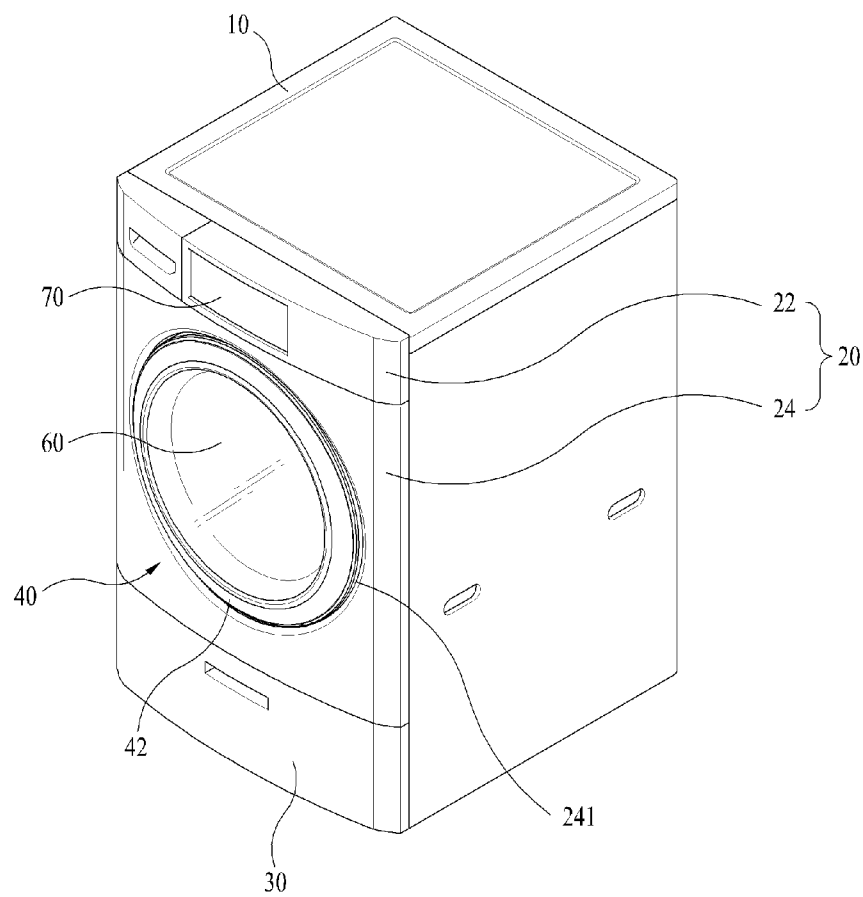
- [117] Moreover, as shown in FIG. 8, sizes of letters or icons displayed on the display units 60, 162 and 260 may be varied in consideration of the users' ages.
- [118] More specifically, a predetermined size of letters or icons may be maintained when the user's age is set to be lower than a reference age. On the other hand, the letters or icons may be enlarged when the user's age is set to be equal to or greater than the reference age so that the elderly user can conveniently check and select the washing information.
- [119] Although the display unit capable of inputting and displaying the washing information has been described only as applied to a washing machine in the above the embodiments, the display unit may be variously applied to any other apparatuses requiring visual inspection of their interiors and input and display of control commands, such as a dish washer.
- [120] Various embodiments have been described in the best mode for carrying out the invention.
- [121] It will be apparent to those skilled in the art that various modifications and variations can be made in the present invention without departing from the spirit or scope of the invention. Thus, it is intended that the present invention cover the modifications and variations of this invention provided they come within the scope of the appended claims and their equivalents.

Claims

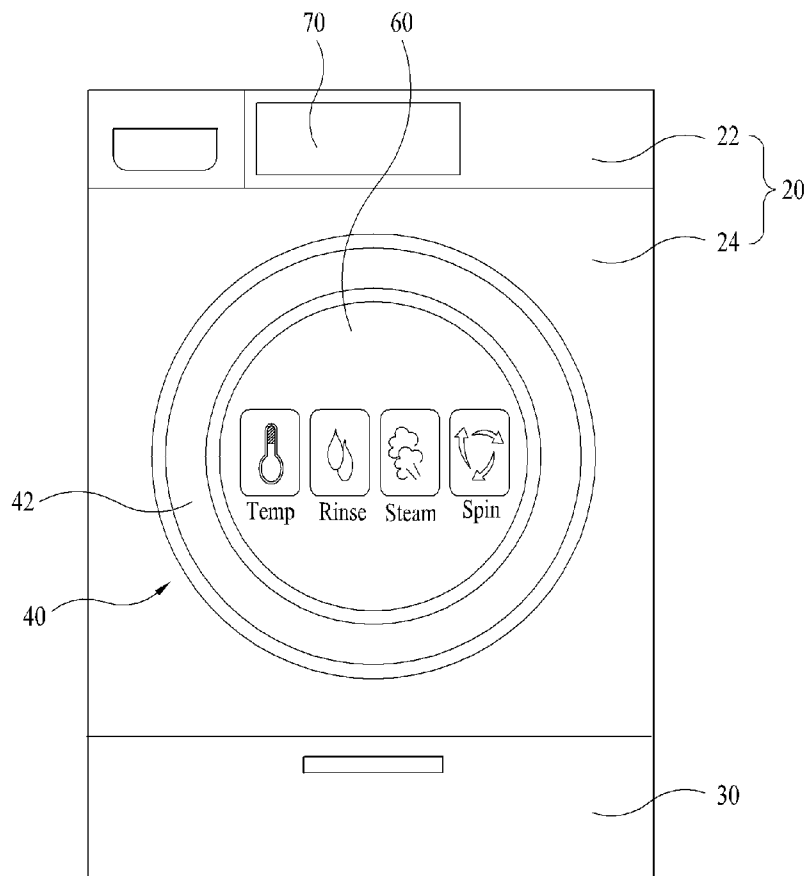
- [Claim 1] A washing machine comprising:
a cabinet forming an exterior appearance of the washing machine and including an opening;
a drum rotatably mounted in the cabinet and supplied with laundry through the opening;
a door mounted at the cabinet to open and close the opening; and
a display unit provided at the door to display washing information.
- [Claim 2] The washing machine according to claim 1, wherein the display unit is disposed at a position corresponding to the opening.
- [Claim 3] The washing machine according to claim 2, wherein the display unit comprises a transparent display panel which transmits light from inside of the drum.
- [Claim 4] The washing machine according to claim 3, wherein the display unit further comprises an input unit to select the washing information being displayed on the transparent display panel.
- [Claim 5] The washing machine according to claim 4, wherein the input unit comprises a touch panel formed on a surface of the transparent display panel.
- [Claim 6] The washing machine according to claim 4, wherein the door comprises a door frame shaped corresponding to the opening, and the input unit is formed along an outer circumference of the door frame.
- [Claim 7] The washing machine according to claim 6, wherein the input unit is a button-type input unit comprising operation buttons.
- [Claim 8] The washing machine according to claim 7, further comprising:
a light emitting unit disposed under the buttons to emit light.
- [Claim 9] The washing machine according to claim 2, further comprising:
a light transmission unit which transmits light from inside of the drum, wherein the opening is partitioned by the light transmission unit and the display unit.
- [Claim 10] The washing machine according to claim 9, wherein the display unit is a touch screen comprising a transparent display panel transmitting the light from inside of the drum, and a touch panel disposed on an upper surface of the transparent display panel.
- [Claim 11] The washing machine according to claim 1, wherein the door comprises a door frame shaped corresponding to a front outer circumference of the cabinet, and a door glass fixed to an upper surface of the door

- frame, thereby forming a front exterior appearance of the cabinet, and the display unit is provided to the door glass.
- [Claim 12] The washing machine according to claim 11, wherein the door glass includes a penetration part into which the display unit is inserted, and the display unit is supported by the door frame and exposed out of the door glass through the penetration part.
- [Claim 13] The washing machine according to claim 11, wherein the display unit is disposed at a position corresponding to the opening.
- [Claim 14] The washing machine according to claim 13, wherein the display unit is a transparent display panel which transmits light from inside of the drum.
- [Claim 15] The washing machine according to claim 14, wherein the display unit further comprises an input unit to select the washing information being displayed on the transparent display panel.
- [Claim 16] The washing machine according to claim 15, wherein the input unit comprises a touch panel formed on a surface of the transparent display panel.
- [Claim 17] The washing machine according to claim 1, wherein the display unit supplies respectively different user interfaces to different users based on user information input in advance.
- [Claim 18] The washing machine according to claim 17, wherein the user information includes at least one of a user's age, gender, living environment, and family members.
- [Claim 19] The washing machine according to claim 17, wherein the display unit displays letters or icons of the user interface in different sizes according to the user's age input as the user information.

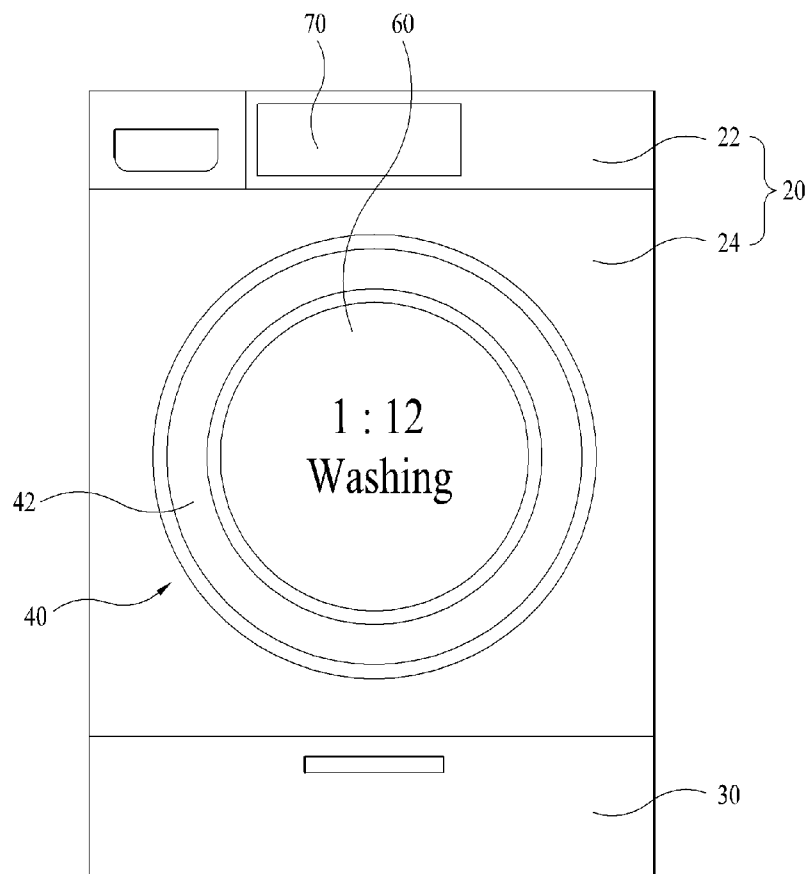
[Fig. 1]



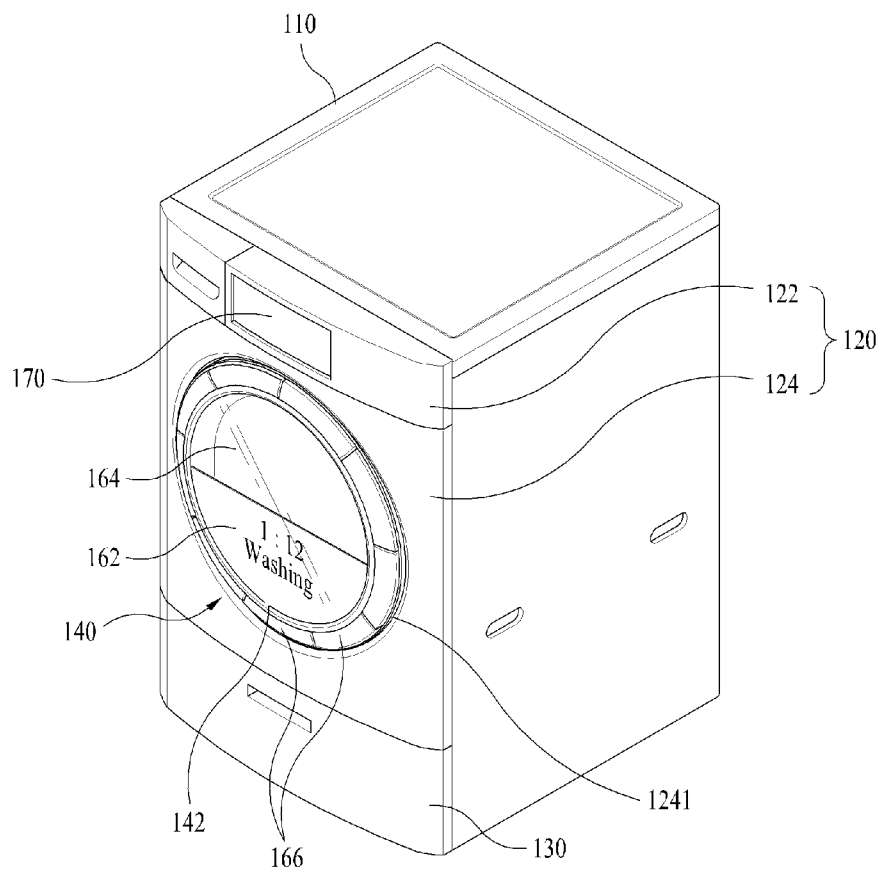
[Fig. 2]



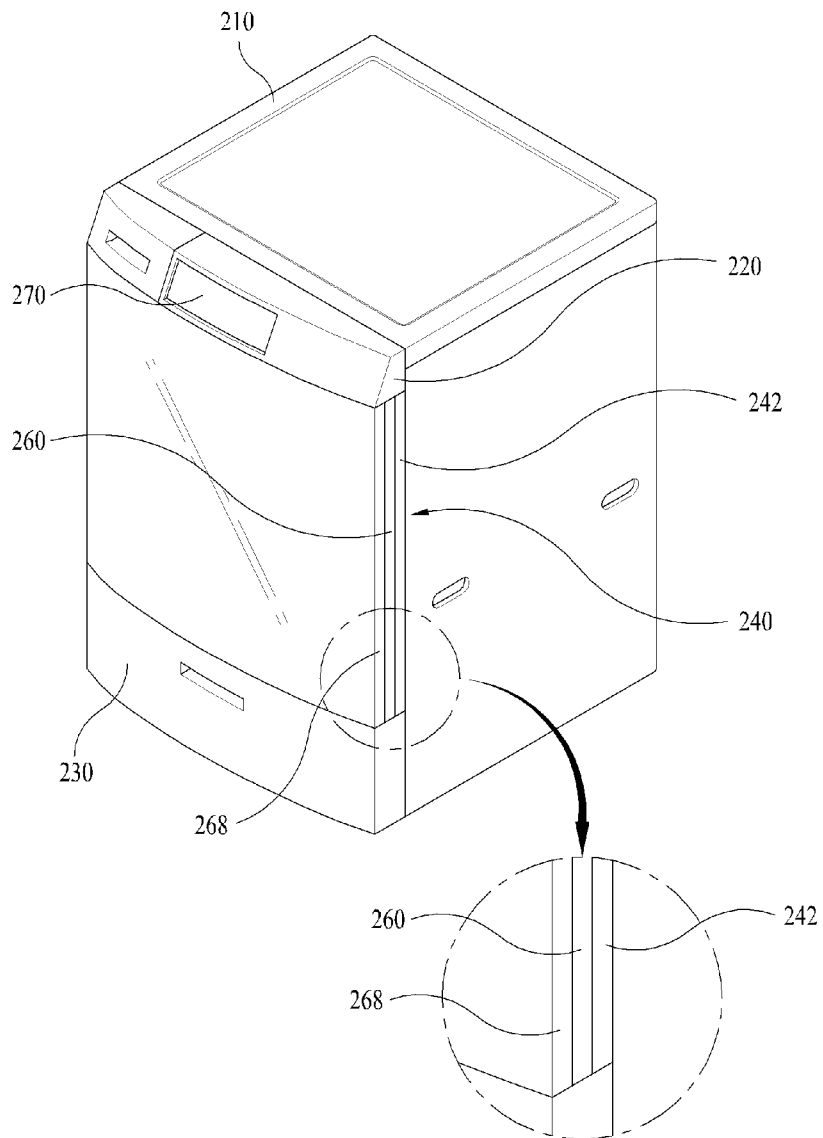
[Fig. 3]



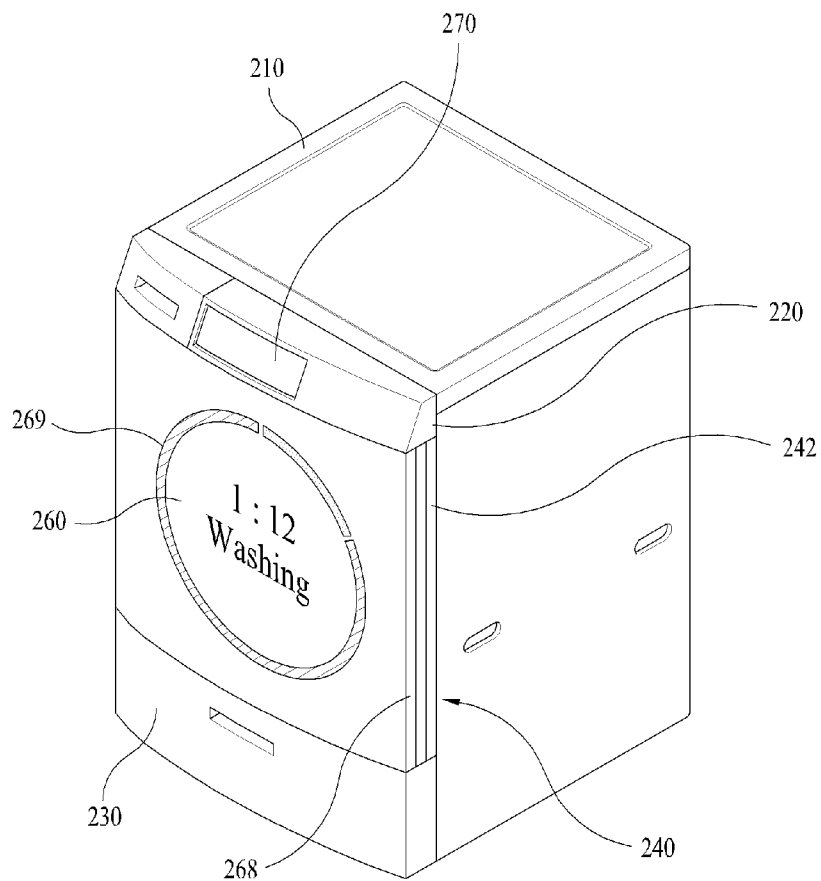
[Fig. 4]



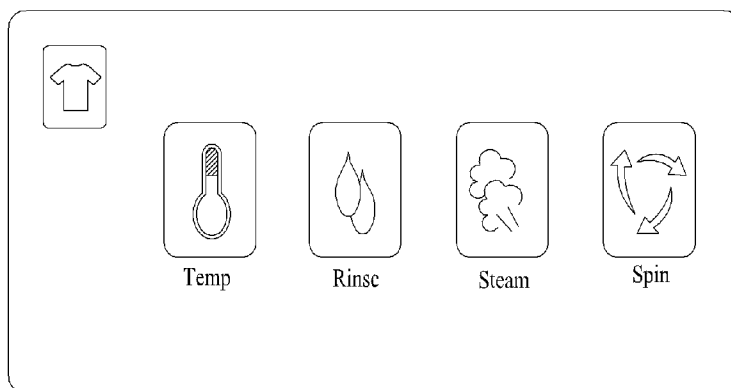
[Fig. 5]



[Fig. 6]



[Fig. 7]



[Fig. 8]

