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

(11) EP 2 578 137 A1

# (12) EUROPEAN PATENT APPLICATION
published in accordance with Art. 153(4) EPC

(43) Date of publication:
**10.04.2013 Bulletin 2013/15**

(21) Application number: **11789445.1**

(22) Date of filing: **31.05.2011**

(51) Int Cl.:
***A47L 15/46*** *(2006.01)*

(86) International application number:
**PCT/JP2011/003027**

(87) International publication number:
**WO 2011/152031 (08.12.2011 Gazette 2011/49)**

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

(30) Priority: **29.06.2010 JP 2010147075**
**16.06.2010 JP 2010136960**
**03.06.2010 JP 2010127472**

(71) Applicant: **Panasonic Corporation**
**Kadoma-shi**
**Osaka 571-8501 (JP)**

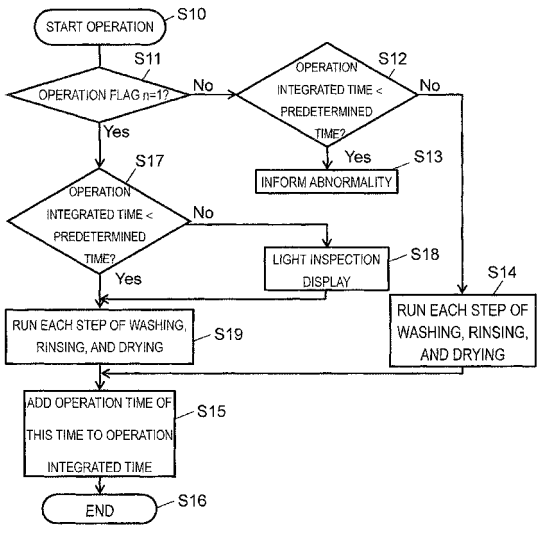
(72) Inventors:
- **NAKAYAMA, Kinya**
  **c/o Panasonic Corporation**
  **Intellectual Property Center**
  **IP Development Group**
  **Osaska 540-6207 (JP)**
- **SHOJI, Akira**
  **c/o Panasonic Corporation**
  **Intellectual Property Center**
  **IP Development Group**
  **Osaska 540-6207 (JP)**
- **IKESHIMA, Mamoru**
  **c/o Panasonic Corporation**
  **Intellectual Property Center**
  **IP Development Group**
  **Osaska 540-6207 (JP)**

(74) Representative: **Schwabe - Sandmair - Marx**
**Patentanwälte**
**Stuntzstraße 16**
**81677 München (DE)**

## (54) DISH WASHING MACHINE

(57) There is provided a dishwasher for washing an object to be washed, the dishwasher including an operation unit for inputting an instruction to the dishwasher; a control unit for carrying out an operation control of the dishwasher based on the instruction input by the operation unit; a display unit for displaying an operation status of the dishwasher; and a storage unit for storing information associated with an operation elapsed state, and enabling read and write of the information. The control unit performs a display of an inspection notifying that an inspection timing of the dishwasher is reached by the display unit when determined that an operation time greater than or equal to a first predetermined time has elapsed based on the information associated with the operation elapsed state stored in the storage unit. The display of the inspection is subsequently not performed again regardless of an operation elapsed state of the dishwasher by rewriting the information associated with the operation elapsed state stored in the storage unit at the time of the inspection.

FIG. 4




EP 2 578 137 A1

## Description

### TECHNICAL FIELD

**[0001]** The present invention relates to a dishwasher for washing an object to be washed such as dishes with washing water.

### BACKGROUND ART

**[0002]** Generally in a dishwasher, physical or chemical degradation of parts advances from influences of heating by a heater, detergent, oil washed off from the object to be washed, and the like through long-term usage. It is thus desirable to have a repair/inspection worker perform inspection at a predetermined operation integrated time and the like.

**[0003]** In an electrical device on which reliability and safety are demanded, on the other hand, there is proposed a technique of using a memory to store the counted operation time in the memory, and automatically issuing a warning or performing a display when the operation integrated time becomes greater than or equal to a predetermined value. According to such a technique, the user is informed of the inspection timing to urge preventive maintenance (refer to PTL 1, for example).

**[0004]** The predetermined operation integrated time can be detected by applying such a technique to a dishwasher, so that the warning or the display of the inspection timing can be provided to the user.

**[0005]** In such a technique, the warning or the display of the inspection timing is provided to the user when the predetermined operation integrated time is reached, and then the repair/inspection worker performs the inspection. In this case, the warning or the display of the inspection is canceled by clearing (set to "0") the operation integrated time, but the user continues to use the dishwasher even after the inspection is finished.

**[0006]** Thus, the dishwasher may issue the warning or perform the display for inspection to the user when the predetermined operation integrated time is again reached. When the inspection display is performed, the user has a possibility of determining that inspection is possible, but actually, the reliability and the safety are difficult to guarantee since the usage period in which the reliability and the safety of the product can be ensured is already past. Furthermore, in reality, the part to replace may not be manufactured even if there is a need for repair. Therefore, performing the display or issuing the warning of inspection again has a possibility of giving the user a false impression that use can be made over a long period of time as long as inspection is performed.

### Citation List

### Patent Literature

**[0007]** PTL 1: Japanese Patent No. 2666363

### SUMMARY OF THE INVENTION

**[0008]** The present invention provides a dishwasher that does not have the possibility of giving the user the false impression when the display or the warning of inspection is again preformed after the inspection is finished.

**[0009]** A dishwasher of the present invention is a dishwasher for washing an object to be washed, the dishwasher including an operation unit for inputting an instruction to the dishwasher; a control unit for carrying out an operation control of the dishwasher based on the instruction input by the operation unit; a display unit for displaying an operation status of the dishwasher; and a storage unit for storing information associated with an operation elapsed state, and enabling read and write of the information. The control unit performs a display of an inspection notifying that an inspection timing of the dishwasher is reached by the display unit when determined that an operation time greater than or equal to a first predetermined time has elapsed based on the information associated with the operation elapsed state stored in the storage unit. The display of the inspection is subsequently not performed again regardless of an operation elapsed state of the dishwasher by rewriting the information associated with the operation elapsed state stored in the storage unit at the time of the inspection.

**[0010]** The termination of the inspection is stored in the storage unit, and thereafter, the display of the inspection is not performed again regardless of the operation elapsed state, and hence false impression is not given to the user.

**[0011]** The term "inspection" used in the present specification means the preventive inspection on the breakdown caused by the long-term usage, and does not mean the inspection in the breakdown state.

### BRIEF DESCRIPTION OF DRAWINGS

**[0012]**

FIG. 1 is a cross-sectional view of a dishwasher according to a first exemplary embodiment of the present invention.

FIG. 2 is a function block diagram showing a configuration of a control device of the dishwasher according to the first exemplary embodiment of the present invention.

FIG. 3 is a view showing a configuration of an operation unit and a display unit of the dishwasher according to the exemplary embodiment of the present invention.

FIG. 4 is a flowchart showing an operation at the time of the operation of the dishwasher according to the first exemplary embodiment of the present invention.

FIG. 5 is a flowchart of a demonstration working operation at the time of repair/inspection of the dishwasher according to the first exemplary embodiment

of the present invention.

FIG. 6 is a crass-sectional view of a dishwasher according to a second exemplary embodiment of the present invention.

FIG. 7 is a function block diagram showing a configuration of a control device of the dishwasher according to the second exemplary embodiment of the present invention.

FIG. 8 is a flowchart showing an operation at the time of the operation of the dishwasher according to the second exemplary embodiment of the present invention.

FIG. 9 is a flowchart of a demonstration working operation at the time of repair/inspection of the dishwasher according to the second exemplary embodiment of the present invention.

FIG. 10 is a cross-sectional view of a dishwasher according to a third exemplary embodiment of the present invention.

FIG. 11 is a function block diagram showing a configuration of a control device of the dishwasher according to the third exemplary embodiment of the present invention.

FIG. 12 is a flowchart showing an operation at the time of the operation of the dishwasher according to the third exemplary embodiment of the present invention.

## DESCRIPTION OF EMBODIMENTS

**[0013]** Exemplary embodiments of the present invention will be hereinafter described with reference to the drawings. It should be noted that the present invention is not to be limited by such exemplary embodiments.

## FIRST EXEMPLARY EMBODIMENT

**[0014]** First, a configuration of dishwasher 50 according to a first exemplary embodiment of the present invention will be described.

**[0015]** FIG. 1 is a cross-sectional view of dishwasher 50 according to the first exemplary embodiment of the present invention.

**[0016]** As shown in FIG. 1, dishwasher 50 includes housing 1, which is accommodated in a built-in kitchen, and washing tub 4, which includes opening 2 on an upper side and which accommodates and washes dishes 3. Washing tub 4 is connected to water piping by way of water supply unit 5, and water is supplied into washing tub 4 at the time of operation. Operation unit 6 for carrying out ON/OFF of power supply, selection of operation course, and the like, and display unit 7 for making a display of each state are arranged on a front surface of housing 1.

**[0017]** Washing tub 4 can be freely pulled out in a front and back direction along rail 8 bridged substantially in a horizontal direction on an inner side of both side surfaces of housing 1.

**[0018]** Dish basket 9 for accommodating dishes 3 is arranged inside washing tub 4. Washing nozzle 10 is arranged in a freely rotating manner on a lower side of dish basket 9. Heating unit 11 such as a heater for heating the washing water is arranged inside washing tub 4, and drain outlet 12 is provided on a bottom of washing tub 4.

**[0019]** Temperature detection unit 13 configured by a thermistor, and the like for detecting the temperature of washing tub 4, and washing pump 15 equipped with motor 14 for feeding the washing water accumulated at drain outlet 12 to washing nozzle 10 are arranged on an outer side of washing tub 4. The washing water accumulated at drain outlet 12 is circulated by washing pump 15, and injected by washing nozzle 10 to wash dishes 3.

**[0020]** Lid body 16 for blocking opening 2 is arranged on an upper side of housing 1. Lid body 16 is supported in a freely up and down moving manner by a pair of left and right parallel link mechanisms 17 including a pair of front and back links. Seal member 18 of an elastic body for sealing opening 2 of washing tub 4 is fixed to lid body 16. According to such a configuration, seal member 18 escapes to the upper side so as not to interfere with the front and back movement of washing tub 4 when washing tub 4 is pulled out.

**[0021]** Washing tub 4 includes an exhaust port for discharging air in washing tub 4, and air blowing unit 20 for supplying outside air into washing tub 4, and is configured to discharge the moist air in washing tub 4 to outside washing tub 4 through the exhaust port at the time of drying step. Control device 24 for controlling the operation of dishwasher 50 is arranged on a front surface of a front wall portion of washing tub 4.

**[0022]** FIG. 2 is a function block diagram showing a configuration of control device 24 of dishwasher 50 according to the first exemplary embodiment of the present invention.

**[0023]** As shown in FIG. 2, control device 24 includes load driving unit 22, storage unit 23, and control unit 21.

**[0024]** Load driving unit 22 drives water supply unit 5, heating unit 11, washing pump 15, and the like. Storage unit 23 stores information associated with an operation elapsed state, and enables reading, writing, and erasing of information. Control unit 21 exchanges information with operation unit 6, display unit 7, load driving unit 22, and storage unit 23, and sequentially controls each step of washing, rinsing, and drying. The information associated with the operation elapsed state may use one of an operation integrated time of dishwasher 50, a number of operations, and a conduction time of control device 24. In the following description, description is made with the operation integrated time set as the information associated with the operation elapsed time.

**[0025]** The operation elapsed state stored in storage unit 23 can be displayed on display unit 7, and the information associated with the new operation elapsed state can be written to storage unit 23 by having the user apply a predetermined operation on operation unit 6.

**[0026]** FIG. 3 is a view showing a configuration of op-

eration unit 6 and display unit 7 of dishwasher 50 according to the first exemplary embodiment of the present invention. FIG. 4 is a flowchart showing an operation at the time of the operation of dishwasher 50 according to the first exemplary embodiment of the present invention. FIG. 5 is a flowchart of demonstration working operation at the time of repair/inspection of dishwasher 50 according to the first exemplary embodiment of the present invention. The operation and the effects of control device 24 of dishwasher 50 will now be described using such drawings.

**[0027]** First, the operation and the effect in a normal usage state of dishwasher 50 by a user will be described with reference to FIG. 3 and FIG. 4.

**[0028]** First, the user pushes a "power OFF/ON" switch of operation unit 6. Then, a "pause/start" switch is pushed to start the operation (step S10).

**[0029]** Control unit 21 determines whether or not an operation flag n, which indicates if the working operation is to be started, stored in advance in storage unit 23 is n=1 (step S11).

**[0030]** The operation flag n=1 is assumed to be written in storage unit 23 if dishwasher 50 is normal when subjected to examination at the time of factory shipment. If the operation flag is n=0 in step S11, control unit 21 determines whether or not an operation integrated time is smaller than a predetermined time (first predetermined time) (step S12).

**[0031]** If the operation flag is n=0 and the operation integrated time is smaller than the predetermined time, control unit 21 determines as abnormal, and displays abnormality on display unit 7 and also disables the operation (step S13).

**[0032]** For example, if control device 24 is replaced by repairing, the operation flag n is remained at "0", which is an initial value since examination is not carried out at the time of factory shipment. The operation integrated time is smaller than the predetermined time as it is immediately after control device 24 is replaced. When replacing control device 24 by repairing, or the like, the operation flag needs to be set to n=1 or n=0 in accordance with the operation integrated time through a method (see FIG. 5) described later.

**[0033]** The operation integrated time in which inspection by the repair/inspection worker is necessary due to long-term usage is set for the predetermined time (first predetermined time). For example, a time (7000 hours) corresponding to use for ten years is set for the predetermined time.

**[0034]** If the operation flag is n=0 and the operation integrated time of dishwasher 50 is greater than or equal to the predetermined time, determination is made as normal, and control unit 21 runs each step of washing, rinsing, and drying (step S14).

**[0035]** After the operation, control unit 21 adds the operation time of this time to the operation integrated time stored in storage unit 23, and stores the same in storage unit 23 (step S15). Thereafter, the operation is terminated (step S16).

**[0036]** If the operation flag is n=1 in step S11, control unit 21 determines whether the operation integrated time is smaller than the predetermined time (first predetermined time) (step S17). If the operation integrated time is greater than or equal to the predetermined time, control unit 21 lights an "inspection" lamp of display unit 7 to warn and display to the user that the inspection is necessary due to long-term usage (step S18). If the operation integrated time is smaller than the predetermined time, the process proceeds to step S19.

**[0037]** Control unit 21 then runs each step of washing, rinsing, and drying (step S19), and adds the operation time of this time to the operation integrated time and stores the same in storage unit 23 (step S15). Thereafter, the operation is terminated (step S16).

**[0038]** Thus, when the operation integrated time is greater than or equal to the predetermined time in a state (operation flag is n=1) at the time of the factory shipment, dishwasher 50 displays the "inspection" lamp on a constant basis and continues to warn and display to the user. The user thereby notices the inspection display, and requests for an inspection to the repair/inspection worker. After the inspection is completed, the repair/inspection worker sets the operation flag to n=0, so that the subsequent inspection lamp is not displayed.

**[0039]** The setting of the operation flag n=1 in the demonstration working at the time of the factory shipment, and the setting of the operation flag n=0 in the inspection work carried out by the repair/inspection worker when the "inspection" lamp is lighted by the long-term usage will now be described with reference to FIG. 3 and FIG. 5.

**[0040]** The repair/inspection worker performs a predetermined operation with operation unit 6 to start the demonstration working (step S50). For example, the demonstration working is started by pushing the "power OFF/ON" switch while simultaneously pushing a "course" switch and a "pause/start" switch of operation unit 6, and then pushing the "course" switch a few more times. A dedicated switch may be arranged, but this leads to increase in cost, and hence a method in which the user cannot easily operate using the switch that is usually used in the normal operation is selected.

**[0041]** Control unit 21 displays a state of the operation flag using a display lamp of display unit 7 (step S51). For example, if the operation flag is n=1, a "high power" lamp of display unit 7 is lighted, and if n=0, the lamp is not lighted. The repair/inspection worker thus can easily check the operation flag with his/her eyes.

**[0042]** Control unit 21 then displays the operation integrated time by display unit 7 (step S52). In the display method, for example, a "dry" lamp is lighted when the operation integrated time is greater than or equal to 1000 hours, a "reservation" lamp is lighted when greater than or equal to 2000 hours, a "standard" lamp is lighted when greater than or equal to 4000 hours, and a "small amount" lamp is lighted when greater than or equal to 8000 hours. The operation integrated time can be displayed by the

combination of lighting/non-lighting of the four display lamps. The operation integrated time in a case where the "small amount" and the "dry" lamps are lighted and the other lamps are not lighted is greater than or equal to 9000 hours and smaller than 10000 hours. The operation integrated time can be more finely displayed by increasing the number of display lamps.

**[0043]** Control unit 21 then determines whether or not the previously displayed operation flag is n=0 (step S53), and determines whether a write mode of a memory, which is storage unit 23, if n=0 (step S54).

**[0044]** The demonstration working is also used when control device 24 is being replaced in repairing at the time of normal breakdown other than in the step demonstration at the time of factory shipment and the inspection by the repair/inspection worker at the time of ordinary use. When replacing control device 24 due to breakdown after using dishwasher 50 for a few years, the operation integrated time needs to be read out from storage unit 23 (memory) of old control device 24 and written to storage unit 23 (memory) of new control device 24 to carry on the data to perform the inspection display.

**[0045]** The repair/inspection worker can read out, display, and write the operation integrated time easily and in one work by carrying out the demonstration working. Therefore, mistakes also do not occur. The demonstration working is terminated when not in the write mode of the memory but only in the display of the operation integrated time (step S55).

**[0046]** When replacing control device 24 for repair and writing the operation integrated time, a predetermined operation is performed by operation unit 6 to have storage unit 23 (memory) in the write mode in step S54. For example, change can be made to the memory write mode by pushing the "pause/start" switch once during the demonstration working.

**[0047]** The operation integrated time is input by performing a predetermined operation on operation unit 6 (step S56). For example, the operation integrated time is changed as 1000 $\rightarrow$ 2000 $\rightarrow$ 3000 $\rightarrow$ .... $\rightarrow$ 8000 (hours) every time the "course" switch is pushed. The input operation integrated time is displayed similar to the display method of the operation integrated time described above by display unit 7 (step S57). If the written operation integrated time is correct, the write of the memory is completed by performing a predetermined operation of operation unit 6, for example, by pushing the "pause/start" switch once (step S58).

**[0048]** Control unit 21 then determines whether the written operation integrated time is smaller than the predetermined time (step S59). If smaller than the predetermined time, control unit 21 sets the operation flag to n=1, and writes the same to the memory (steps S60, S01). This is because if new control device 24 is used for repair, the operation flag n is set to "0" in such a state and the normal operation cannot be carried out. When the operation integrated time is smaller than the predetermined time, inspection annunciation needs to be made on the user in the use after the replacement of control device 24. The operation flag is thus set to n=1, similarly to the time of factory shipment. Therefore, even if the repair is carried out when the operation integrated time is smaller than the predetermined time, the inspection display due to the long-term usage may be integrated and the inspection lamp may be lighted in about ten years.

**[0049]** The setting of the operation flag n=1 at the time of the factory shipment may be carried out at an arbitrary timing by another means, but may be carried out as step S60 in the demonstration working described above.

**[0050]** If the operation integrated time written at the time of repairing (step S56) is greater than or equal to the predetermined time in step S59, the demonstration working is terminated with the operation flag at n=0 since the inspection repair is already terminated once. This is so that the "inspection" lamp is not displayed again even when the operation integrated time becomes greater than or equal to the predetermined time once the inspection repair is terminated.

**[0051]** At the time of the inspection, when the inspection worker checks the operation flag n by demonstration working, it is normally n=1 in the determination of step S53. When carrying out inspection according to the inspection annunciation, the operation integrated time is greater than or equal to the predetermined time, and thus control unit 21 sets the operation flag to n=0 by the determination of step S62 (step S63), writes the same to the memory (step S64), and then terminates the demonstration working (step 555). This is so that the "inspection," lamp is not displayed again even when the operation integrated time becomes greater than or equal to the predetermined time once the inspection repair is terminated.

**[0052]** In the conventional dishwasher, the memory of storage unit 23 is cleared at the time of the inspection to return the operation integrated time to "0". The "inspection," lamp is thus lighted after elapse of about another ten years after the inspection is completed, which may give the user a false impression. Normally, there is a high possibility the maintenance repairing parts may not exist after twenty years, and thus a drawback in that a mistaken message that repair or inspection can be carried out is sent to the user may arise.

**[0053]** In the present invention, the operation flag is set to n=0 in step S63 with the operation integrated time as is, so that the "inspection" lamp is not again lighted. If the operation integrated time is smaller than the predetermined time at the time of the inspection, the inspection annunciation needs to be made subsequently and hence the demonstration working is terminated without changing the operation flag n from n=1 after the determination of step S62.

**[0054]** In the present exemplary embodiment, the operation flag n takes two values of "0" and "1", but may take two or more values to distinguish two or more states. For example, the operation flag n may take three values, so that three states can be distinguished depending on

whether or not the operation integrated time exceeded the first predetermined time, and whether or not the operation integrated time exceeded the second predetermined time. A more fine inspection repair support thus can be made.

**[0055]** As described above, according to dishwasher 50 of the present exemplary embodiment, the replacement of control device 24 at the time of repairing due to breakdown, the operation of non-display of the inspection lamp at the time of the inspection in long-term usage, and furthermore, the write of the operation flag can all be carried out with a simple method of demonstration working. The breakdown-inspection worker thus can easily carry out the repair and inspection work without mistakenly operating or without performing a plurality of methods and means.

**[0056]** Furthermore, once the "inspection" lamp is lighted and the repair/inspection worker completes the inspection, the "inspection" lamp can be prevented from being lighted again thereafter so as not to give a false impression to the user. Moreover, the data can be saved since the data of the operation integrated time is not reset even after the inspection is terminated.

**[0057]** The operation flag n is used in which two values of "0" or "1" can be selectively set in correspondence with whether or not the operation time of greater than or equal to the predetermined time has elapsed for the information associated with the operation elapsed state stored in storage unit 23. The operation elapsed state can be determined by a digital operation flag n with the actual data such as the operation integrated time, so that control device 24 can be simply and inexpensively configured and caused to perform a reliable and stable control operation.

**[0058]** At the time of the normal operation by the user, when the operation time of greater than or equal to the predetermined time has elapsed, display and non-display of the inspection by display unit 7 are differed in accordance with the value of the operation flag n. An excessive false impression is thus not given to the user even if dishwasher 50 is continuously used after the termination of the inspection carried out by the repair/inspection worker.

**[0059]** At the time of the inspection repair by the repair/inspection worker, whether or not the operation time of greater than or equal to the predetermined time has elapsed can be notified to the repair/inspection worker based on the value of the operation flag n. The tasks such as the setting of the operation flag involved in the inspection repair by the repair/inspection worker thus can be reliably carried out without mistakes.

**[0060]** Furthermore, when storage unit 23 is replaced at the time of the inspection repair (described as replacement of entire control device 24 mounted with storage unit 23 in the present exemplary embodiment), the information associated with the operation elapsed state stored in storage unit 23 before the replacement is written to new storage unit 23 after the replacement to be carried on. The information associated with the appropriate operation elapsed state corresponding to the operation elapsed state up to the relevant point can be set even when storage unit 23 is replaced in the inspection repair by changing the value of the operation flag n in accordance with the information associated with the operation elapsed state.

**[0061]** In the present exemplary embodiment, the operation integrated time is stored in storage unit 23, but similar effects can be obtained even when the number of operations or the conduction time to control device 24 is assumed as the information associated with the operation elapsed state.

**[0062]** In the present exemplary embodiment, an example in which display unit 7 is configured by a plurality of display lamps is shown, but the operation integrated time can be more specifically displayed by using, for example, a seven segment number display lamp, and the like.

**[0063]** In the present exemplary embodiment, an example in which the demonstration working is carried out by a predetermined operation of operation unit 6 is shown, but a dedicated switch for carrying out the demonstration working may be arranged in control device 24.

**[0064]** The rewrite setting of the operation flag, the carry-on process and the write process of the operation integrated time, and the like involved in the replacement of control device 24 are carried out by a predetermined operation of operation unit 6. However, the present invention is not limited to such an example, and the dedicated switch may be arranged in control device 24, or the above-described processes may be carried out from an externally connected device such as a memory writer.

## SECOND EXEMPLARY EMBODIMENT

**[0065]** Dishwasher 51 according to a second exemplary embodiment of the present invention will now be described.

**[0066]** FIG. 6 is a cross-sectional view of dishwasher 51 according to the second exemplary embodiment of the present invention. In FIG. 6, the same reference numerals are denoted on the same configuring elements as dishwasher 50 described in the first exemplary embodiment to omit the description thereof.

**[0067]** Dishwasher 51 differs from dishwasher 50 described in the first exemplary embodiment of the present invention in that control unit 31 of control device 34 performs a control different from control unit 21 of dishwasher 50.

**[0068]** FIG. 7 is a function block diagram showing a configuration of control device 34 of dishwasher 51 according to the second exemplary embodiment of the present invention.

**[0069]** As shown in FIG. 7, control device 34 includes load driving unit 22, storage unit 23, and control unit 31.

**[0070]** Load driving unit 22 drives water supply unit 5, heating unit 11, washing pump 15, and the like. Storage unit 23 stores the information associated with the oper-

ation elapsed state, and enables reading, writing, and erasing of information. Control unit 31 exchanges information with operation unit 6, display unit 7, load driving unit 22, and storage unit 23 to sequentially control each step of washing, rinsing, and drying. The information associated with the operation elapsed state may use one of an operation integrated time of dishwasher 51, a number of operations, and a conduction time of control device 34. In the following description, description is made with the operation integrated time set as the information associated with the operation elapsed state.

**[0071]** The operation elapsed state stored in storage unit 23 can be displayed on display unit 7, and the information associated with the new operation elapsed state can be written to storage unit 23 by having the user apply a predetermined operation on operation unit 6.

**[0072]** Dishwasher 51 of the present exemplary embodiment also includes operation unit 6 and display unit 7 having the configuration shown in FIG. 3.

**[0073]** FIG. 8 is a flowchart showing an operation at the time of the operation of dishwasher 51 according to the second exemplary embodiment of the present invention. FIG. 9 is a flowchart of demonstration working operation at the time of repair/inspection of dishwasher 51 according to the second exemplary embodiment of the present invention. The operation and the effects of control device 34 of dishwasher 51 will now be described using such drawings.

**[0074]** First, the operation and the effect in a normal usage state of dishwasher 51 by a user will be described with reference to FIG. 3 and FIG. 8.

**[0075]** First, the user pushes a "power OFF/ON" switch of operation unit 6. Then, a "pause/start" switch is pushed to start the operation (step S110).

**[0076]** Control unit 31 determines whether or not the operation flag n, which indicates if the working operation is to be started, stored in advance in storage unit 23 is n=1 (step S111).

**[0077]** The operation flag n=1 is assumed to be written in storage unit 23 if dishwasher 51 is normal when subjected to examination at the time of factory shipment.

**[0078]** If the operation flag is n=0, control unit 31 determines as abnormal, and displays abnormality with display unit 7 and disables the operation (step S112).

**[0079]** For example, if control device 34 is replaced by repairing, the operation flag n is "0", which is an initial value, since the examination at the time of factory shipment is not performed. Therefore, when replacing control device 34 by repairing and the like, the operation flag needs to be set to n=1 through a method described later (see FIG. 9).

**[0080]** Control unit 31 determines whether or not the operation integrated time of dishwasher 51 is smaller than a first predetermined time (step S113). An operation integrated time in which inspection by the repair/inspection worker is necessary due to long-term usage is set for the first predetermined time. For example, a time (7000 hours) corresponding to use over about ten years is set for the predetermined time.

**[0081]** If the operation integrated time is greater than or equal to the first predetermined time in step S113, control unit 31 determines whether or not the operation integrated time is smaller than a second predetermined time (step S114).

**[0082]** A maximum value of the operation integrated time that can be stored in storage unit 23 is set for the second predetermined time. For example, 15000 hours, and the like are set for the second predetermined time. The memory, which is storage unit 23, becomes more expensive as the storable capacity becomes greater, and hence the maximum value of the operation integrated time is also limited according to the capacity of the memory to use.

**[0083]** Control unit 31 runs each step of washing, rinsing, and drying without performing inspection display since storage unit 23 is full when the operation integrated time is greater than or equal to the second predetermined time in step S114 (step S115), and then terminates the operation (step S116).

**[0084]** If the operation integrated time is smaller than the second predetermined time in step S114, control unit 31 lights the "inspection" lamp of display unit 7 to warn or display to the user that the inspection due to long-term usage is necessary (step S117).

**[0085]** Thereafter, control unit 31 runs each step of washing, rinsing, and drying (step S118), adds the operation time of this time to the operation integrated time (step S119), and terminates the operation (step S116).

**[0086]** Thus, in dishwasher 51 according to the present exemplary embodiment, when the operation integrated time is greater than or equal to the first predetermined time and smaller than the second predetermined time, the "inspection" lamp is displayed on a constant basis, and warning and display continue to be made to the user. The user then can notice the inspection display and request for an inspection to the repair/inspection worker, where the inspection lamp is no longer displayed through a method (see FIG. 9) described later after the inspection is completed.

**[0087]** The operation of dishwasher 51 when the "inspection" lamp is lighted due to long-term usage and the repair/inspection worker performs the inspection work will now be described with reference to FIG. 3 and FIG. 9.

**[0088]** The repair/inspection worker performs a predetermined operation with operation unit 6 to start the demonstration working of dishwasher 51 (step S150). For example, the demonstration working is started by pushing the "power OFF/ON" switch while simultaneously pushing a "course" switch and a "pause/start" switch of operation unit 6, and then pushing the "course" switch a few more times. A dedicated switch may be arranged, but this leads to increase in cost, and hence a method in which the user cannot easily operate using the switch that is used in the usual operation is selected.

**[0089]** Control unit 31 displays a state of the operation flag using a display lamp of display unit 7 (step S151).

For example, if the operation flag is n=1, a "high power" lamp of display unit 7 is lighted, and if n=0, the lamp is not lighted. The repair/inspection worker thus can easily check the operation flag with his/her eyes.

**[0090]** Control unit 31 then displays the operation integrated time by display unit 7 (step S152). In the display method, for example, a "dry" lamp is lighted when the operation integrated time is greater than or equal to 1000 hours, a "reservation" lamp is lighted when greater than or equal to 2000 hours, a "standard" lamp is lighted when greater than or equal to 4000 hours, and a "small amount" lamp is lighted when greater than or equal to 8000 hours. The operation integrated time can be displayed by the combination of lighting/non-lighting of the four display lamps. The operation integrated time in a case where the "small amount" and the "dry" lamps are lighted and the other lamps are not lighted is greater than or equal to 9000 hours and smaller than 10000 hours. The operation integrated time can be more finely displayed by increasing the number of display lamps. The repair/inspection worker can check and grasp the operation integrated time up to the relevant point.

**[0091]** Control unit 31 then determines whether a write mode of the memory, which is storage unit 23, (step S153).

**[0092]** The demonstration working is also used when replacing control device 34 in the repair at the time of the normal breakdown, and the like. When replacing control device 34 due to breakdown after using dishwasher 51 for a few years, the operation integrated time needs to be read out from storage unit 23 (memory) of old control device 34 and written to storage unit 23 (memory) of new control device 34 to carry out the inspection display.

**[0093]** The repair/inspection worker can read out, display, and grasp the operation integrated time, and write a new value to storage unit 23 easily and in one work by carrying out the demonstration working. Therefore, mistakes also do not occur. The demonstration working is terminated when not in the write mode of the memory but only in the display of the operation integrated time (step S154).

**[0094]** When performing the inspection work at the time of long-term usage or when replacing control device 34 and writing the operation integrated time for repair, a predetermined operation is performed by operation unit 6 to have storage unit 23 (memory) in the write mode in step S153. For example, change can be made to the memory write mode by pushing the "pause/start" switch once during the demonstration working.

**[0095]** The operation flag n=1 is then set to storage unit 23 (step S155). This is because if new control device 34 is used for repair, the operation flag n is set to "0" in such a state and the normal operation cannot be carried out. In the flow of FIG. 9, the operation flag n=1 cannot be set (write to memory is not completed) unless the write of the operation integrated time is carried out, and thus the operation of normal dishwasher 51 cannot be carried out. The repair/inspection worker thus can prevent the operation integrated time from being forgotten to be written when control device 34 is replaced at the time of the repair. Furthermore, the inspection lamp can be lighted in about ten years of the inspection display due to the long-term usage even if the repair is carried out.

**[0096]** The repair/inspection worker determines whether the operation integrated time input to the memory is smaller than the first predetermined time (7000 hours) (step S156), where the input of the operation integrated time is carried out through a predetermined operation of operation unit 6 and the operation integrated time up to the relevant point is carried on if smaller than the first predetermined time (step S157). For example, the operation integrated time is changed as 1000 $\rightarrow$ 2000 $\rightarrow$ 3000 $\rightarrow$ .... $\rightarrow$ 8000 (hours) every time the "course" switch is pushed. The input operation integrated time is displayed similarly to the display method of the operation integrated time described above by display unit 7. The repair/inspection worker thus can check the written operation integrated time, and determine whether correct or not (step S158). If the written operation integrated time is correct, the write of the memory is completed by performing a predetermined operation of operation unit 6, for example, by pushing the "pause/start" switch once (step S159). The demonstration working is then terminated (step S154).

**[0097]** If the operation integrated time input to the memory is greater than or equal to the first predetermined time in step S156, the repair/inspection worker inputs a value greater than or equal to the second predetermined time (15000 hours), for example, 16000 hours as the operation integrated time (step S160), control unit 31 displays the input operation integrated time, and the repair/inspection worker checks the display content (step S158).

**[0098]** Control unit 31 then completes the write to the memory (step S159), and terminates the demonstration working (step S154).

**[0099]** In the repair due to breakdown, the operation integrated time is normally smaller than the first predetermined time, and thus the demonstration working is terminated. However, in the case of the inspection after the inspection display, the operation integrated time is set to the value greater than or equal to the maximum value 15000 hours of the memory of storage unit 23 in step S160, so that the "inspection" lamp is not subsequently lighted in the normal operation after the inspection is completed.

**[0100]** In the present exemplary embodiment, an example of simplifying the configuration of control unit 31 for controlling the flow of the demonstration working described above by having the repair/inspection worker carry out the determination of step S156 is shown, but all the steps including step S156 may be automatically carried out by control unit 31.

**[0101]** In the conventional dishwasher, the memory of storage unit 23 is cleared at the time of the inspection to return the operation integrated time to "0". The "inspec-

tion" lamp is lighted if about another ten years have elapsed after the inspection is completed, which may give the user a false impression. Normally, there is a high possibility the maintenance repairing parts may not exist after twenty years, and thus a drawback in that a mistaken message that repair or inspection can be carried out is sent to the user may arise.

**[0102]** According to dishwasher 51 of the present exemplary embodiment, if the operation integrated time is greater than or equal to the first predetermined time at the time of the inspection, a value greater than or equal to the second predetermined time is written intentionally as the operation integrated time in step S160 so that the "inspection" lamp is not lighted again.

**[0103]** The replacement of control device 34 at the time of repairing due to breakdown, the operation of non-display of the inspection lamp at the time of the inspection in long-term usage, and furthermore, the write of the operation flag can all be carried out with a simple method of demonstration working. The breakdown-inspection worker thus can easily carry out the repair and inspection work without mistakenly operating or without performing a plurality of methods and means.

**[0104]** Furthermore, once the "inspection" lamp is lighted and the repair/inspection worker completes the inspection, the "inspection" lamp can be prevented from being lighted again thereafter so as not to give a false impression to the user.

**[0105]** In the present exemplary embodiment, the operation integrated time is stored in storage unit 23, but similar effects can be obtained even when the number of operations or the conduction time to control device 34 is assumed as the information associated with the operation elapsed state.

**[0106]** In the present exemplary embodiment, an example in which display unit 7 is configured by a plurality of display lamps is shown, but the operation integrated time can be more specifically displayed by using, for example, a seven segment number display lamp, and the like.

**[0107]** In the present exemplary embodiment, an example in which the demonstration working is carried out by a predetermined operation of operation unit 6 is shown, but a dedicated switch for carrying out the demonstration working may be arranged in control device 34.

**[0108]** The rewrite setting of the operation flag, the carry-on process and the write process of the operation integrated time, and the like involved in the replacement of control device 34 are carried out by a predetermined operation of operation unit 6. However, the present invention is not limited to such an example, and the dedicated switch may be arranged in control device 34, or the above-described processes may be carried out from an externally connected device such as a memory writer.

## THIRD EXEMPLARY EMBODIMENT

**[0109]** Dishwasher 52 according to a third exemplary embodiment of the present invention will now be described.

**[0110]** FIG. 10 is a cross-sectional view of dishwasher 52 according to the third exemplary embodiment of the present invention. In FIG. 10, the same reference numerals are denoted on the same configuring elements as dishwasher 50 described in the first exemplary embodiment or dishwasher 51 described in the second exemplary embodiment to omit the description thereof.

**[0111]** Dishwasher 52 differs from dishwasher 50 described in the first exemplary embodiment and dishwasher 51 described in the second exemplary embodiment of the present invention in that control unit 41 of control device 44 performs a control different from control unit 21 of dishwasher 50 and control unit 31 of dishwasher 51.

**[0112]** FIG. 11 is a function block diagram showing a configuration of control device 44 of dishwasher 52 according to the third exemplary embodiment of the present invention.

**[0113]** As shown in FIG. 11, control device 44 includes load driving unit 22, storage unit 23, and control unit 41.

**[0114]** Load driving unit 22 drives water supply unit 5, heating unit 11, washing pump 15, and the like. Storage unit 23 stores the information associated with the operation elapsed state, and enables reading, writing, and erasing of information. Control unit 41 exchanges information with operation unit 6, display unit 7, load driving unit 22, and storage unit 23 to sequentially control each step of washing, rinsing, and drying. The information associated with the operation elapsed state may use one of an operation integrated time of dishwasher 52, a number of operations, and a conduction time of control device 44. In the following description, description is made with the operation integrated time set as the information associated with the operation elapsed state.

**[0115]** The operation elapsed state stored in storage unit 23 can be displayed on display unit 7, and the information associated with the new operation elapsed state can be written to storage unit 23 by having the user apply a predetermined operation on operation unit 6.

**[0116]** Dishwasher 52 of the present exemplary embodiment also includes operation unit 6 and display unit 7 shown in FIG. 3.

**[0117]** FIG. 12 is a flowchart showing an operation at the time of the operation of dishwasher 52 according to the third exemplary embodiment of the present invention. The operation and the effects of control device 44 of dishwasher 52 will be described using such drawings.

**[0118]** First, the operation and the effect in a normal usage state of dishwasher 52 by a user will be described with reference to FIG. 3 and FIG. 12.

**[0119]** First, the user pushes a "power OFF/ON" switch of operation unit 6. Then, a "pause/start" switch is pushed to start the operation (step S210).

**[0120]** Control unit 41 determines whether or not the operation flag n, which indicates if the working operation is to be started, stored in advance in storage unit 23 is n=1 (step S211).

**[0121]** The operation flag n=1 is assumed to be written in storage unit 23 if dishwasher 52 is normal when subjected to examination at the time of factory shipment.

**[0122]** If the operation flag is n=0, control unit 41 determines whether or not the operation integrated time stored in storage unit 23 is smaller than the first predetermined time (step S212).

**[0123]** Control unit 41 determines as abnormal if the operation flag is n=0 and the operation integrated time is smaller than the first predetermined time, and displays abnormality with display unit 7 and disables the operation (step S213).

**[0124]** For example, if control device 44 is replaced by repairing, the operation flag n is "0" , which is an initial value, since the examination at the time of factory shipment is not performed. The operation integrated time is smaller than the first predetermined time since it is immediately after the replacement of control device 44.

**[0125]** An operation integrated time in which inspection by the repair/inspection worker is necessary due to long-term usage is set for the first predetermined time. For example, a time (7000 hours) corresponding to use over about ten years is set. When replacing control device 24 by repairing, or the like, the operation flag needs to be set to n=1 or n=0 through a method (see FIG. 5) to be described later.

**[0126]** Control unit 41 determines as normal if the operation integrated time is greater than or equal to the first predetermined time in step S212. Each step of washing, rinsing, and drying is normally run (step S216) if the operation integrated time is smaller than the second predetermined time (step S214).

**[0127]** After the running of each step is finished, control unit 41 adds the operation time of this time to the operation integrated time and stores the same in storage unit 23 (step S217). The operation is thereafter terminated (step S218).

**[0128]** 7000 hours corresponding to about ten years is set for the first predetermined time, but 9000 hours corresponding to about 12 years may be set for the second predetermined time, and 11000 hours corresponding to about 15 years may be set for the third predetermined time.

**[0129]** If the operation flag is n=1 in step S211, control unit 41 determines whether or not the operation integrated time is smaller than the first predetermined time (step S219). If the operation integrated time is greater than or equal to the first predetermined time, the inspection lamp of display unit 7 is lighted to warn and display to the user that the inspection due to long-term usage is necessary (step S220).

**[0130]** When determining that the operation integrated time is smaller than the second predetermined time (step S214), control unit 41 normally runs each step of washing, rinsing, and drying (step S216).

**[0131]** After running of each step is finished, control unit 41 adds the operation time of this time to the operation integrated time and stores the same in storage unit 23 (step S217). The operation is then terminated (step S218).

**[0132]** As described above, in dishwasher 52 of the present exemplary embodiment, when the operation integrated time is greater than or equal to the first predetermined time in the state (operation flag n=1) at the time of the factory shipment, the inspection lamp is displayed on a constant basis, and warning and display continue to be made to the user. The user then can notice the inspection display and request for an inspection to the repair/inspection worker. When inspection is completed, the repair/inspection worker sets the operation flag to n=0 so that the subsequent inspection lamp is not displayed.

**[0133]** The subsequent operation when the operation integrated time becomes greater than or equal to the second predetermined time will now be described. When control unit 41 determines that the operation integrated time is greater than or equal to the second predetermined time and smaller than the third predetermined time (steps S214, S215), the washing and rinsing steps are normally run, but the drying step is run with the heater temperature at the time of drying lowered by 20% and the operation time extended by 20% instead (step S221). After the running is finished, control unit 41 adds the operation time of this time to the operation integrated time and stores the same in storage unit 23 (step S217). Thereafter, the operation is terminated (step S218).

**[0134]** Furthermore, when determining that the operation integrated time is greater than or equal to the third predetermined time (step S215), control unit 41 normally runs the washing and rinsing steps, but runs the drying step with the heater temperature at the time of drying lowered by 50% and the operation time extended by 50% instead (step S222). After the running is finished, control unit 41 adds the operation time of this time to the operation integrated time and stores the same in storage unit 23 (step S217). Thereafter, the operation is terminated (step S218).

**[0135]** The setting of the operation flag n=1 in the demonstration working at the time of the factory shipment in dishwasher 52, and the setting of the operation flag n=0 in the inspection work carried out by the repair/inspection worker when the "inspection" lamp is lighted by the long-term usage will now be described. In this case, dishwasher 52 executes each step of FIG. 5, similarly to dishwasher 50 described in the first exemplary embodiment. In dishwasher 52, control unit 41 performs the operation of control unit 21 in FIG. 5. In step S59 and step S62, whether or not the operation integrated time is smaller than the first predetermined time is determined.

**[0136]** Thus, even in dishwasher 52 of the present exemplary embodiment as well, the replacement of control device 44 at the time of repairing due to breakdown, the operation of non-display of the inspection lamp at the time of the inspection in long-term usage, and furthermore, the write of the operation flag at the time of the factory shipment of dishwasher 52 can all be carried out

with a simple method of demonstration working. The breakdown-inspection worker thus can easily carry out the repair and inspection work without mistakenly operating or without performing a plurality of methods and means.

**[0137]** Furthermore, once the "inspection" lamp is lighted and the repair/inspection worker completes the inspection, the "inspection" lamp can be prevented from being lighted again thereafter so as not to give a false impression to the user. Moreover, the data can be saved since the data of the operation integrated time is not reset even after the inspection is terminated.

**[0138]** In dishwasher 52 of the present exemplary embodiment, if the user continues to use after the inspection is completed, the operation performance is thereafter lowered (e.g., lower heater temperature at time of drying) in two stages at the time of elapse of the second predetermined time and the third predetermined time. In this case, the user can recognize that the durability period of the dishwasher is coming to an end by extending the operation time instead. The user can be motivated that it is a replacement timing of dishwasher 52 without again making the inspection display. Since dishwasher 52 is already past the usage period in which the reliability and the safety can be ensured, notification is made to the user that reliability and safety are difficult to guarantee thus eliminating a case of giving false impression to the user.

**[0139]** In the present exemplary embodiment, the operation performance is lowered in two stages at the time of elapse of the second predetermined time and the time of elapse of the third predetermined time, so that operation is carried out over a longer time than usual and the user can easily notice the excess of the usage time sensuously. However, the present invention is not limited to such an example, and similar effect can be obtained even if performed in one stage. The operation performance and the operation time may be changed in greater number of stages by providing a determination time for elapse of a predetermined time such as fourth predetermined time and fifth predetermined time.

**[0140]** In the present exemplary embodiment, the operation performance to lower is the lowering in the heater temperature at the time of drying, but similar effect can be obtained by extending the operation time even for lowering in the number of rotations of a drying fan or lowering in the temperature of heating and rinsing.

**[0141]** In the present exemplary embodiment, the operation integrated time is stored in storage unit 23, but similar effect can be obtained even when the number of operations or the conduction time to control device 44 is the information associated with the operation elapsed state.

**[0142]** Furthermore, in the present exemplary embodiment, an example in which display unit 7 is configured by a plurality of display lamps is shown, but the operation integrated time can be more specifically displayed by using, for example, a seven segment number display lamp, and the like.

**[0143]** In the present exemplary embodiment, an example in which the demonstration working is carried out by a predetermined operation of operation unit 6 is shown, but a dedicated switch for carrying out the demonstration working may be arranged in control device 44.

**[0144]** The rewrite setting of the operation flag, the carry-on process and the write process of the operation integrated time, and the like involved in the replacement of control device 44 are carried out by a predetermined operation of operation unit 6. However, the present invention is not limited to such an example, and the dedicated switch may be arranged in control device 44, or the above-described processes may be carried out from an externally connected device such as a memory writer.

**[0145]** As described above, according to the dishwasher of the present invention, the inspection display is prevented from being made without depending on the subsequent operation time or the number of operations of the dishwasher at the time of the inspection performed by the repair/inspection worker, and hence complaints arising from the false impression to the user or lack of replacement part does not arise.

## INDUSTRIAL APPLICABILITY

**[0146]** As described above, according to the dishwasher of the present invention, the termination of the inspection is stored in the storage unit, and the display of the inspection is not again carried out regardless of the operation elapsed state although the information associated with the operation elapsed state is continued thereafter, and hence a significant effect in that false impression is not given to the user can be achieved. It is thus useful as a dishwasher or the like for washing objects to be washed such as dishes with the washing water.

## REFERENCE MARKS IN THE DRAWINGS

**[0147]**

| | |
|---|---|
| 1 | housing |
| 2 | opening |
| 3 | dishes |
| 4 | washing tub |
| 5 | water supply unit |
| 6 | operation unit |
| 7 | display unit |
| 8 | rail |
| 9 | dish basket |
| 10 | washing nozzle |
| 11 | heating unit |
| 12 | drain outlet |
| 13 | temperature detection unit |
| 14 | motor |
| 15 | washing pump |
| 16 | lid body |
| 17 | parallel link mechanism |

| | |
|---|---|
| 18 | seal member |
| 20 | air blowing unit |
| 21, 31, 41 | control unit |
| 22 | load driving unit |
| 23 | storage unit (memory) |
| 24, 34, 44 | control device |
| 50, 51, 52 | dishwasher |

## Claims

**1.** A dishwasher for washing an object to be washed, the dishwasher comprising:

an operation unit for inputting an instruction to the dishwasher;
a control unit for carrying out an operation control of the dishwasher based on the instruction input by the operation unit;
a display unit for displaying an operation status of the dishwasher; and
a storage unit for storing information associated with an operation elapsed state, and enabling read and write of the information; wherein
the control unit performs a display of an inspection notifying that an inspection timing of the dishwasher is reached by the display unit when determined that an operation time greater than or equal to a first predetermined time has elapsed based on the information associated with the operation elapsed state stored in the storage unit, and subsequently does not perform the display of the inspection again regardless of an operation elapsed state of the dishwasher by rewriting the information associated with the operation elapsed state stored in the storage unit at the time of the inspection.

**2.** The dishwasher according to claim 1, wherein the information associated with the operation elapsed state stored in the storage unit includes an operation flag, which is selectively set from at least two values, in correspondence with whether or not the operation time of the dishwasher has elapsed by greater than or equal to the first predetermined time.

**3.** The dishwasher according to claim 2, wherein when the operation time of the dishwasher has elapsed by greater than or equal to the first predetermined time in the normal operation, the control unit differs display and non-display of the inspection by the display unit in accordance with the value of the operation flag.

**4.** The dishwasher according to claim 2, wherein the control unit displays on the display unit whether or not the operation time of the dishwasher has elapsed by greater than or equal to the first predetermined time based on the value of the operation flag at the time of the inspection and/or repair.

**5.** The dishwasher according to any one of claims 2 to 4, wherein
the control unit is configured to carry on the information associated with the operation elapsed state stored in the storage unit before replacement to the storage unit after replacement when the storage unit is replaced, and change the value of the operation flag in accordance with the information associated with the operation elapsed state.

**6.** The dishwasher according to claim 1, wherein
the control unit notifies that the inspection timing of the dishwasher is reached by the display unit when determining that the operation time of the dishwasher has elapsed by greater than or equal to the first predetermined time and smaller than a second predetermined time from the information associated with the operation elapsed state stored in the storage unit, and does not subsequently perform the display of the inspection again regardless of the operation elapsed state of the dishwasher by rewriting the information associated with the operation elapsed state stored in the storage unit with a value greater than or equal to the second predetermine time at the time of the inspection.

**7.** The dishwasher according to claim 1 or 6, wherein the control unit operates over a time longer than usual with an operation performance lowered when determining that the operation time of the dishwasher has elapsed by greater than or equal to the second predetermined time after the inspection.

FIG. 1

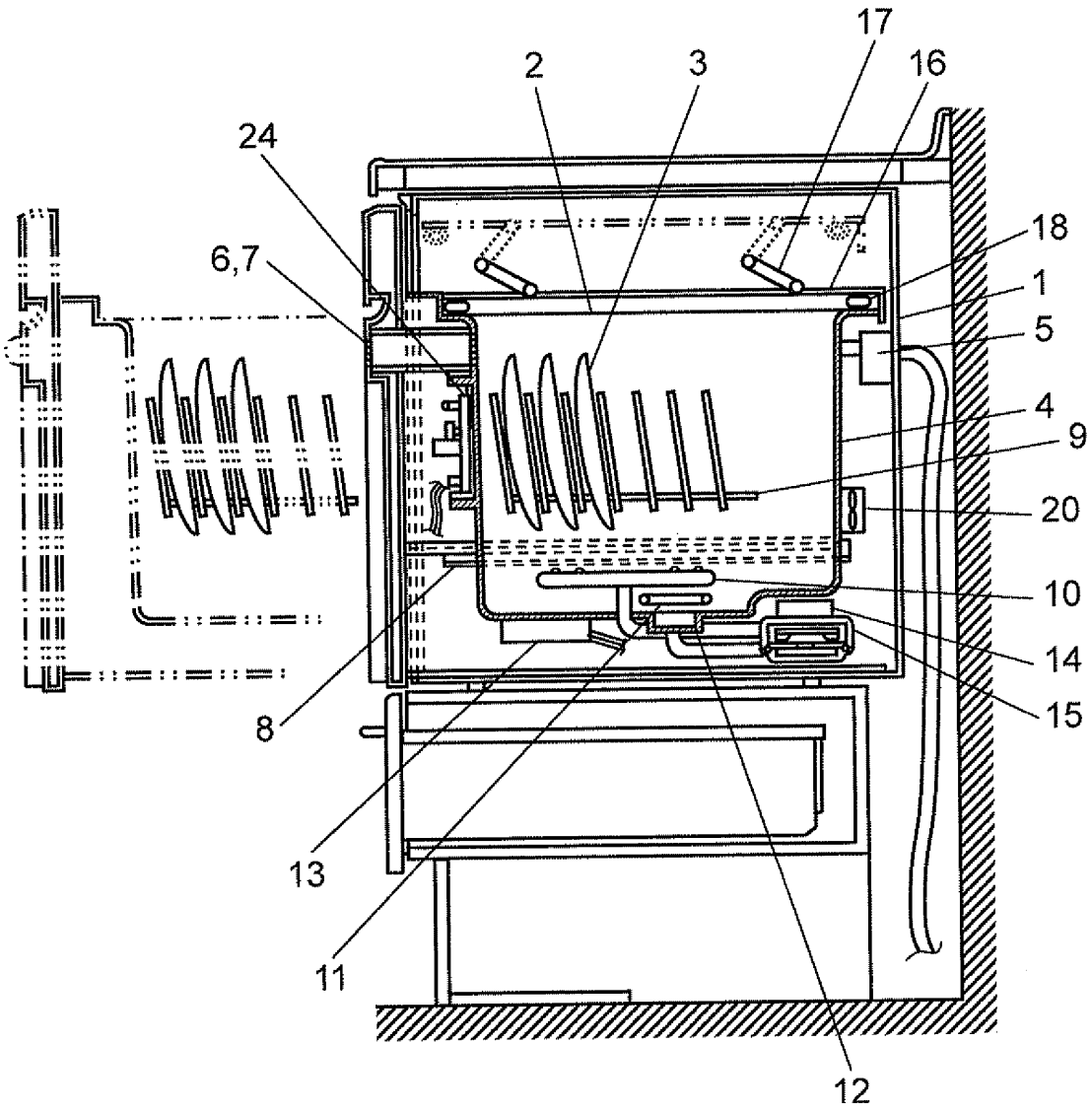


FIG. 2

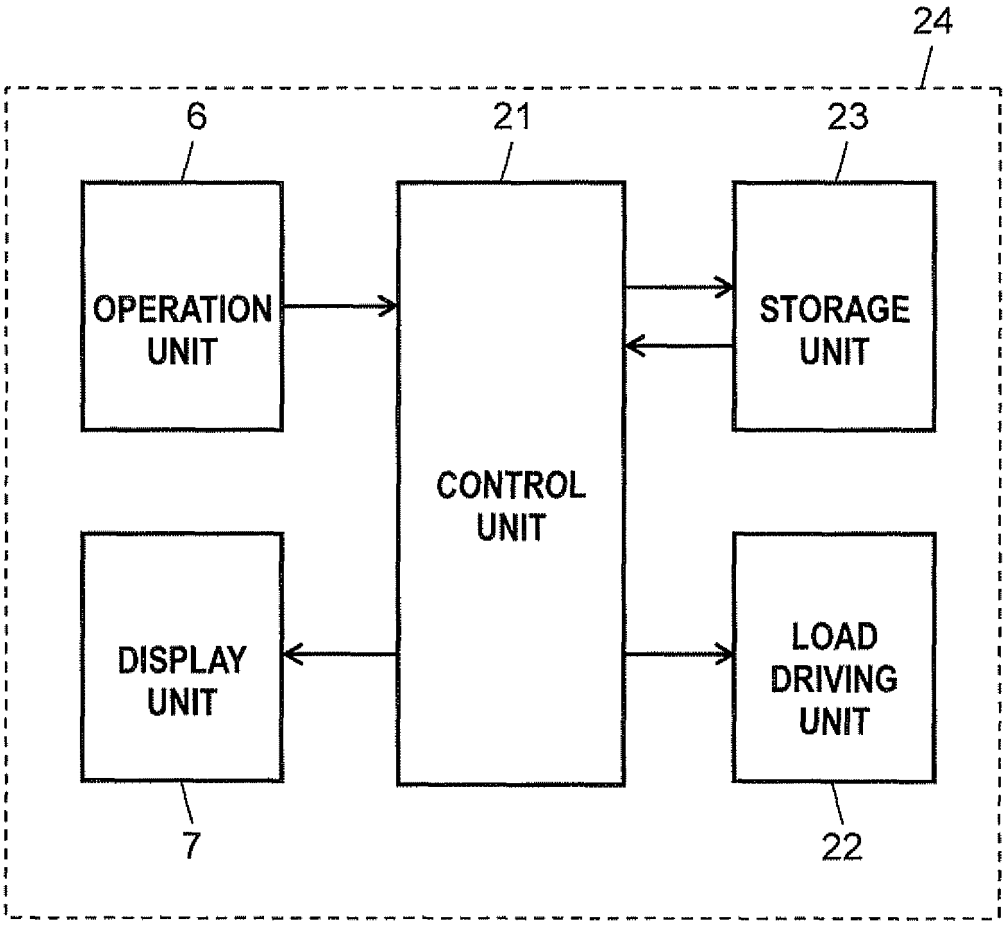

24
6
21
23
OPERATION UNIT
CONTROL UNIT
STORAGE UNIT
DISPLAY UNIT
LOAD DRIVING UNIT
7
22

FIG. 3

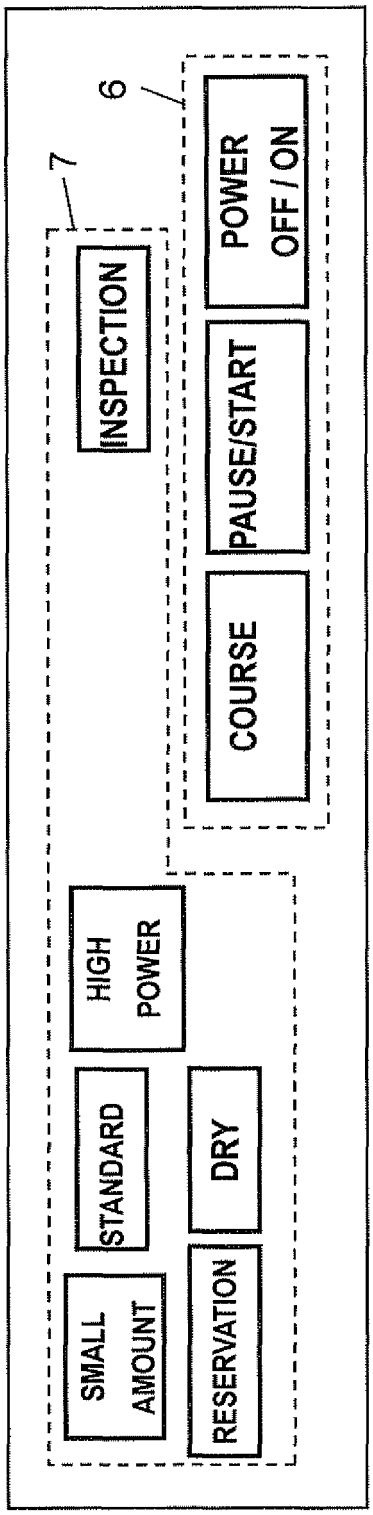

6
7
INSPECTION
POWER OFF / ON
PAUSE/START
COURSE
HIGH POWER
STANDARD
DRY
SMALL AMOUNT
RESERVATION

FIG. 4

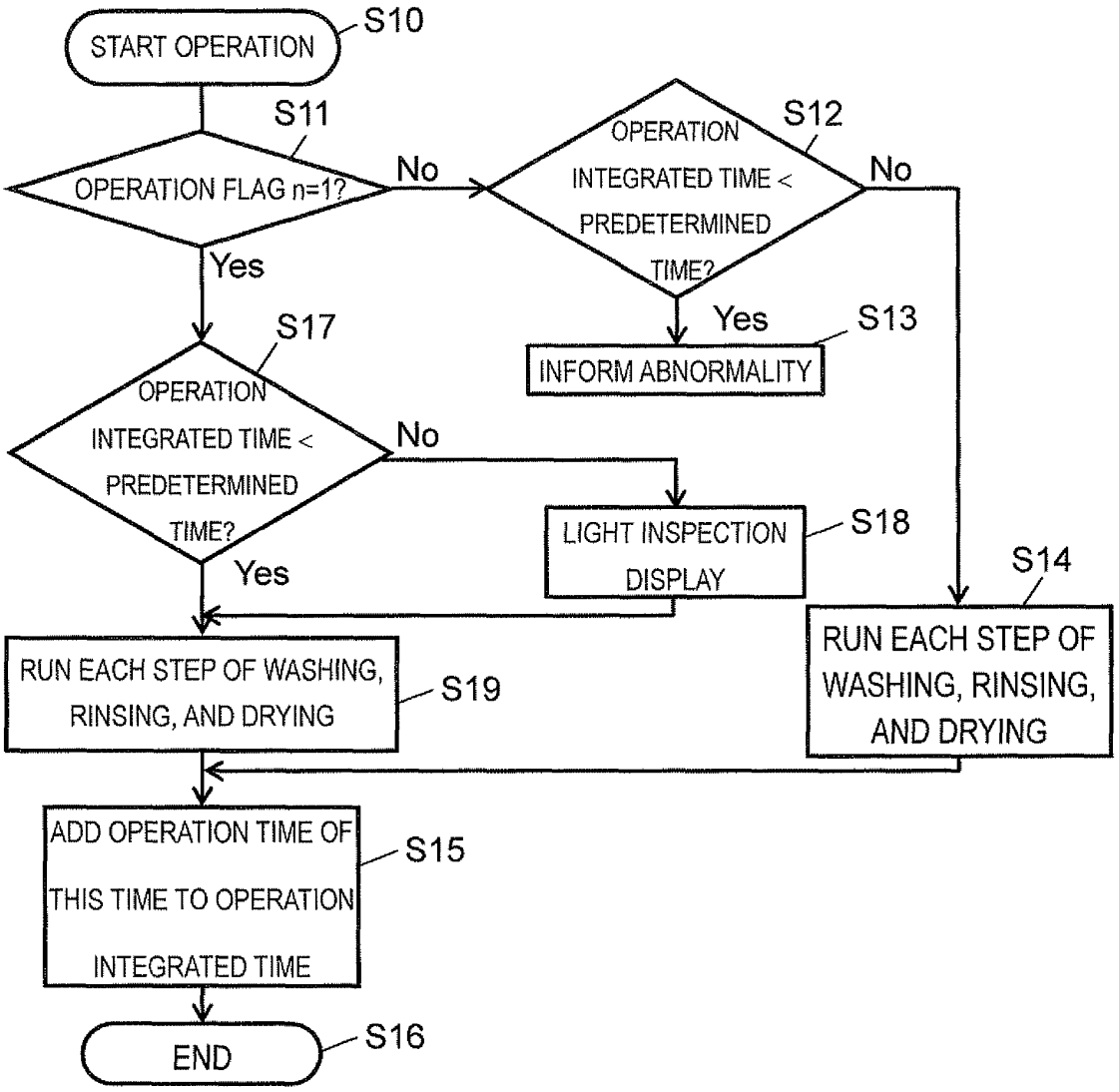

START OPERATION
S10
S11
OPERATION FLAG n=1?
No
Yes
S12
OPERATION INTEGRATED TIME < PREDETERMINED TIME?
No
Yes
S13
INFORM ABNORMALITY
S17
OPERATION INTEGRATED TIME < PREDETERMINED TIME?
No
Yes
LIGHT INSPECTION DISPLAY
S18
S14
RUN EACH STEP OF WASHING, RINSING, AND DRYING
RUN EACH STEP OF WASHING, RINSING, AND DRYING
S19
ADD OPERATION TIME OF THIS TIME TO OPERATION INTEGRATED TIME
S15
END
S16

FIG. 5

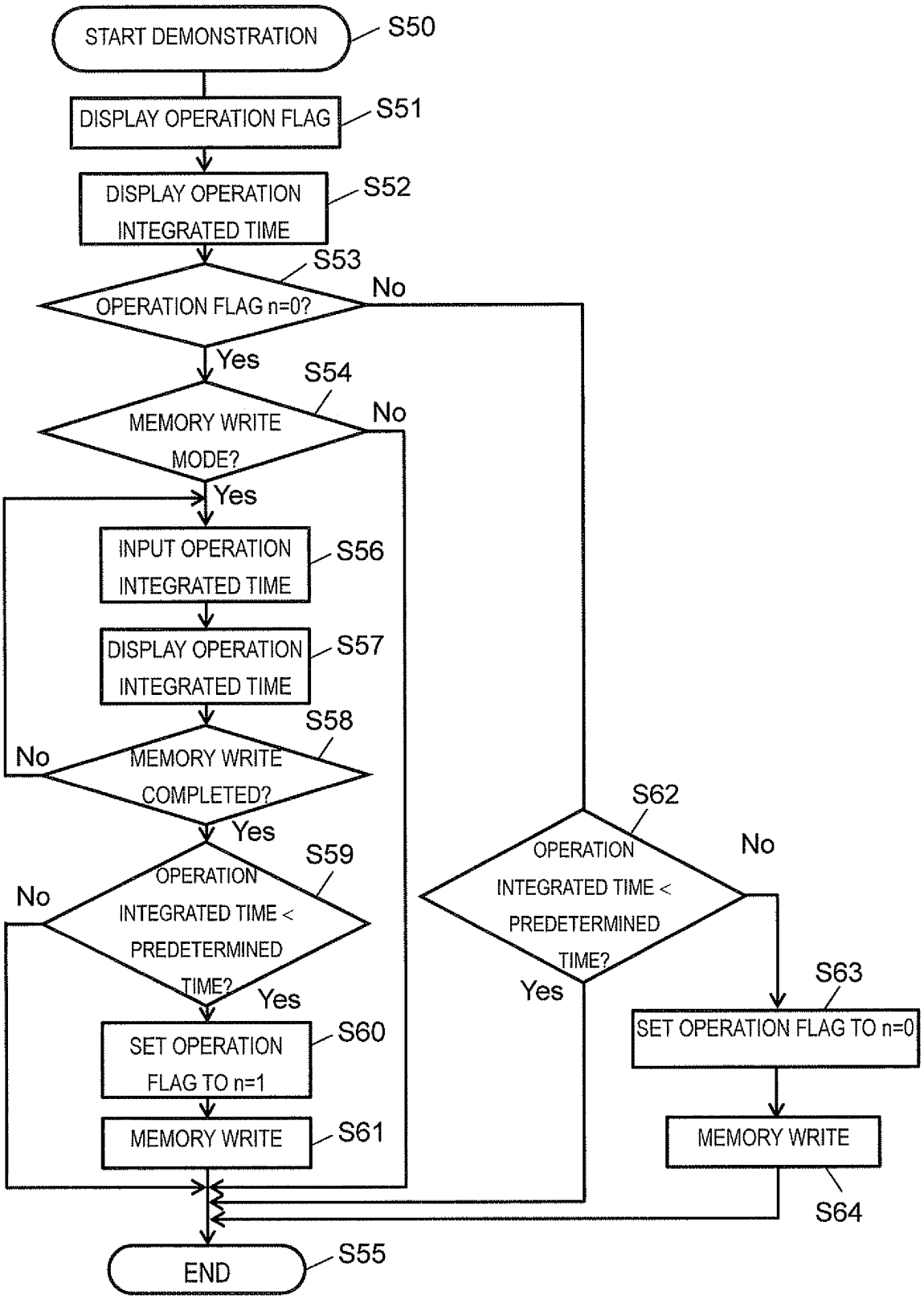

START DEMONSTRATION
S50
DISPLAY OPERATION FLAG
S51
DISPLAY OPERATION INTEGRATED TIME
S52
OPERATION FLAG n=0?
S53
No
Yes
MEMORY WRITE MODE?
S54
No
Yes
INPUT OPERATION INTEGRATED TIME
S56
DISPLAY OPERATION INTEGRATED TIME
S57
MEMORY WRITE COMPLETED?
S58
No
Yes
OPERATION INTEGRATED TIME < PREDETERMINED TIME?
S59
No
Yes
SET OPERATION FLAG TO n=1
S60
MEMORY WRITE
S61
OPERATION INTEGRATED TIME < PREDETERMINED TIME?
S62
No
Yes
SET OPERATION FLAG TO n=0
S63
MEMORY WRITE
S64
END
S55

FIG. 6

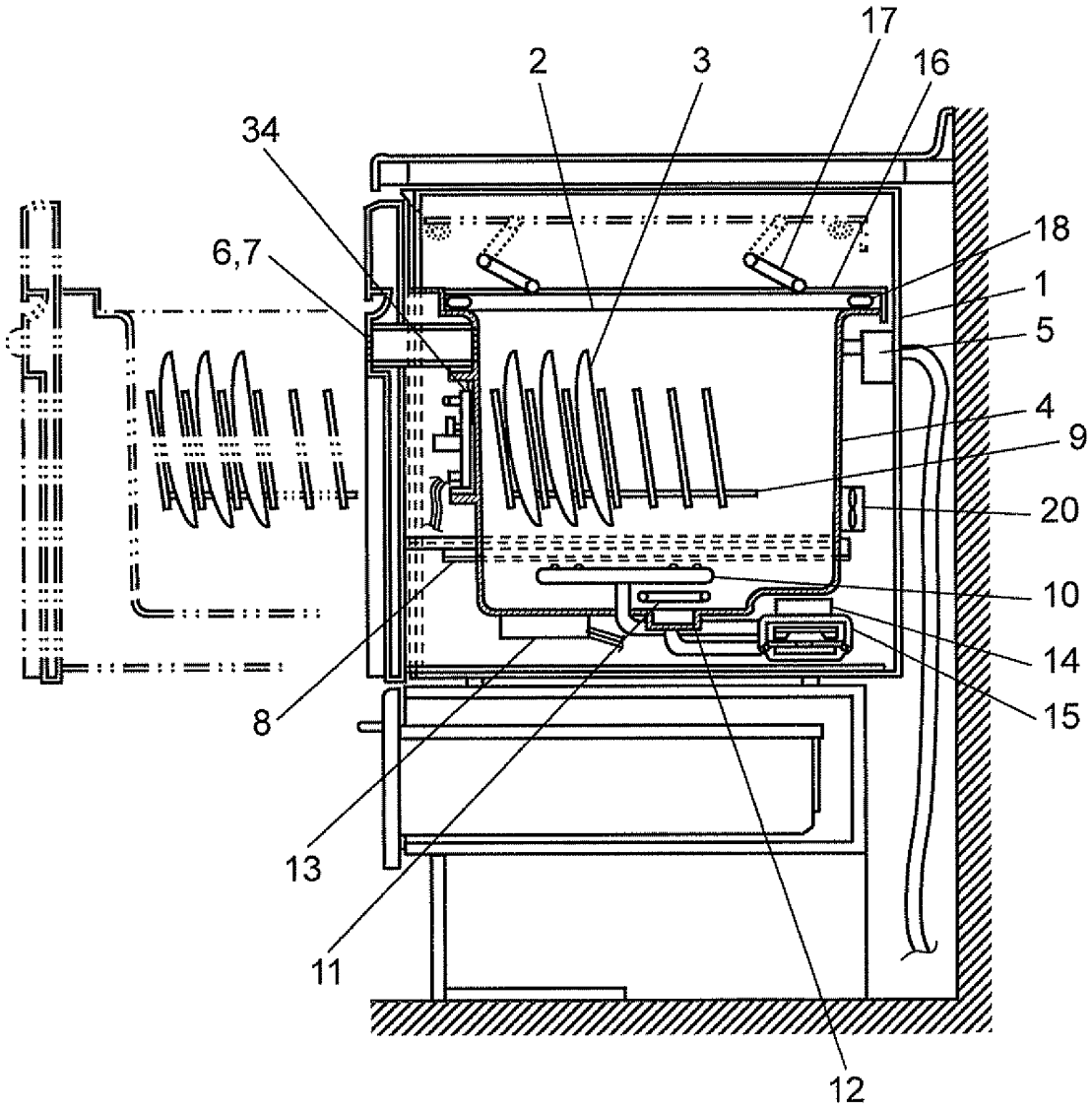


FIG. 7

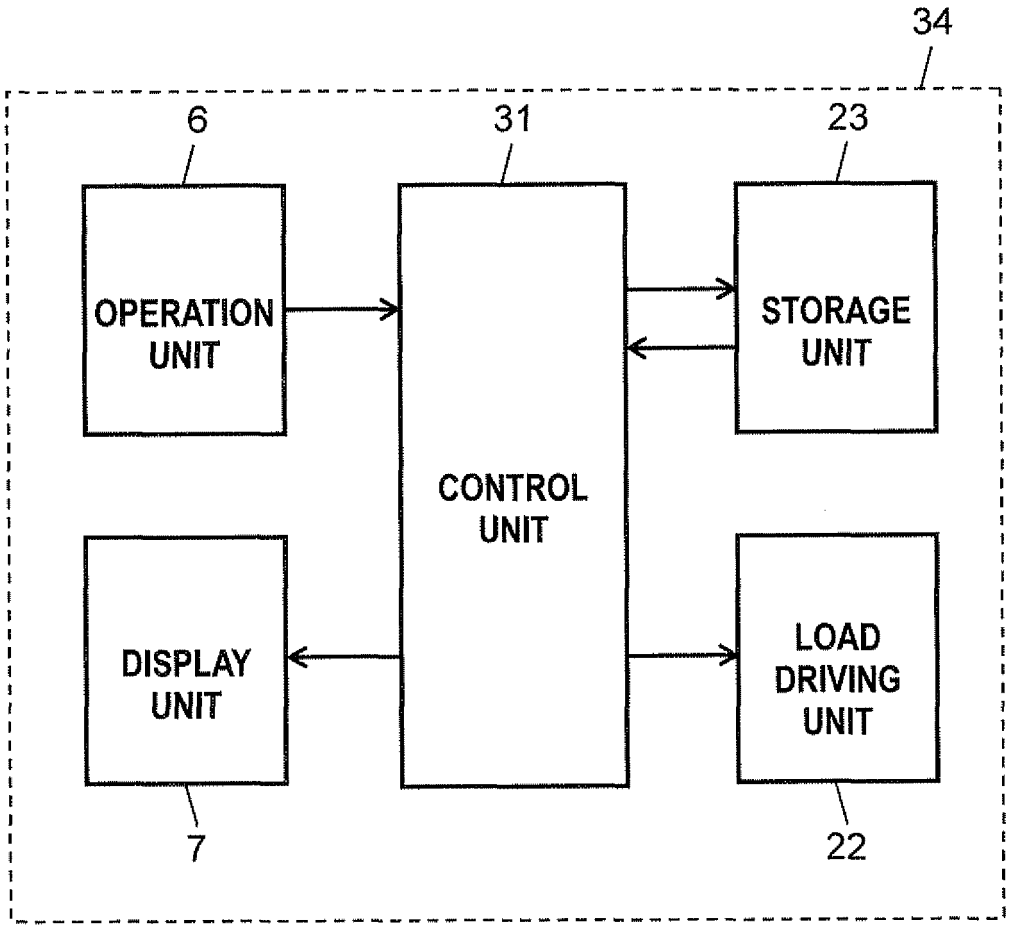

34
6
31
23
OPERATION UNIT
CONTROL UNIT
STORAGE UNIT
DISPLAY UNIT
LOAD DRIVING UNIT
7
22

FIG. 8

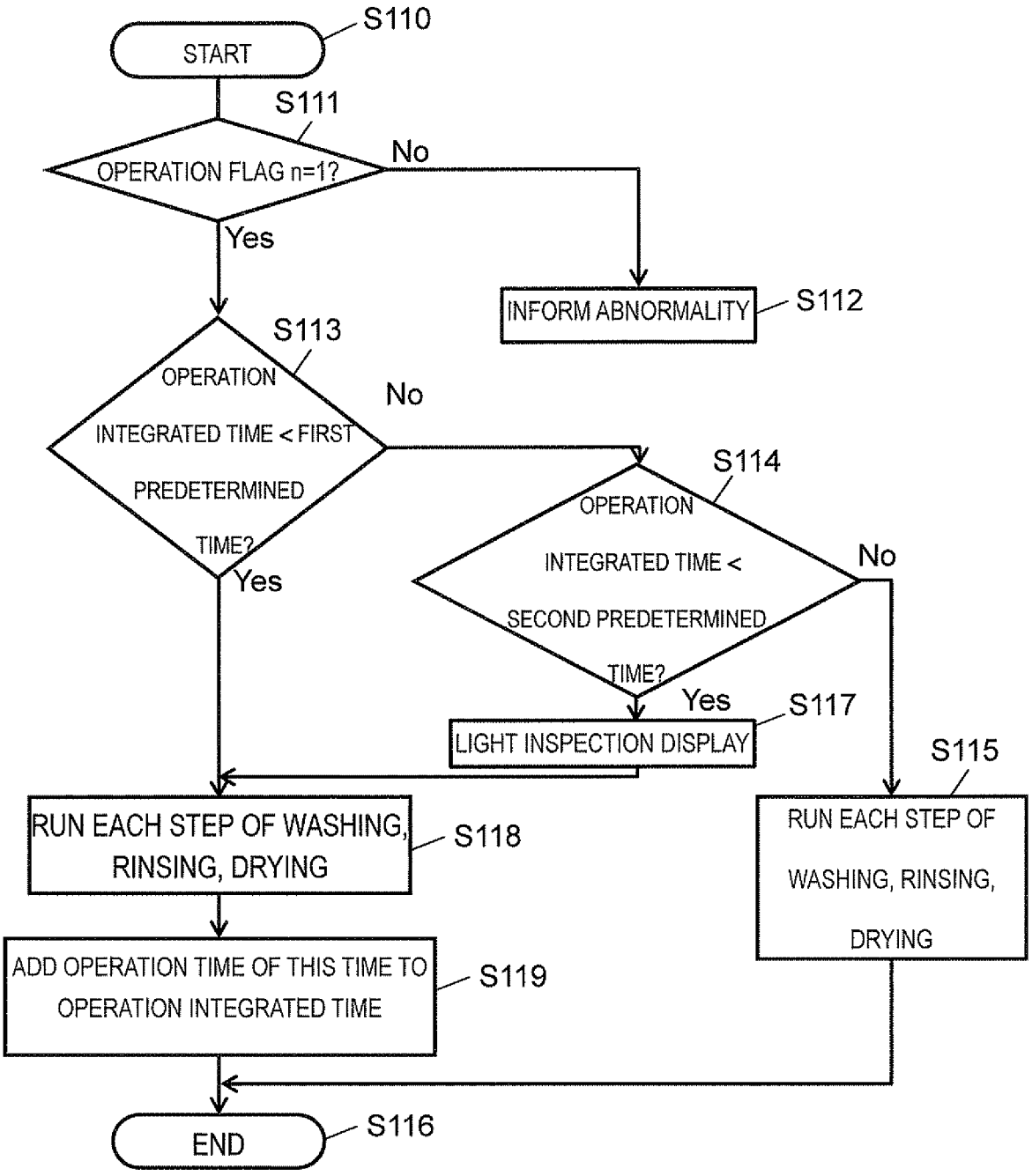

START
S110
S111
OPERATION FLAG n=1?
No
Yes
INFORM ABNORMALITY
S112
S113
OPERATION INTEGRATED TIME < FIRST PREDETERMINED TIME?
No
Yes
S114
OPERATION INTEGRATED TIME < SECOND PREDETERMINED TIME?
No
Yes
S117
LIGHT INSPECTION DISPLAY
S115
RUN EACH STEP OF WASHING, RINSING, DRYING
S118
RUN EACH STEP OF WASHING, RINSING, DRYING
ADD OPERATION TIME OF THIS TIME TO OPERATION INTEGRATED TIME
S119
END
S116

FIG. 9

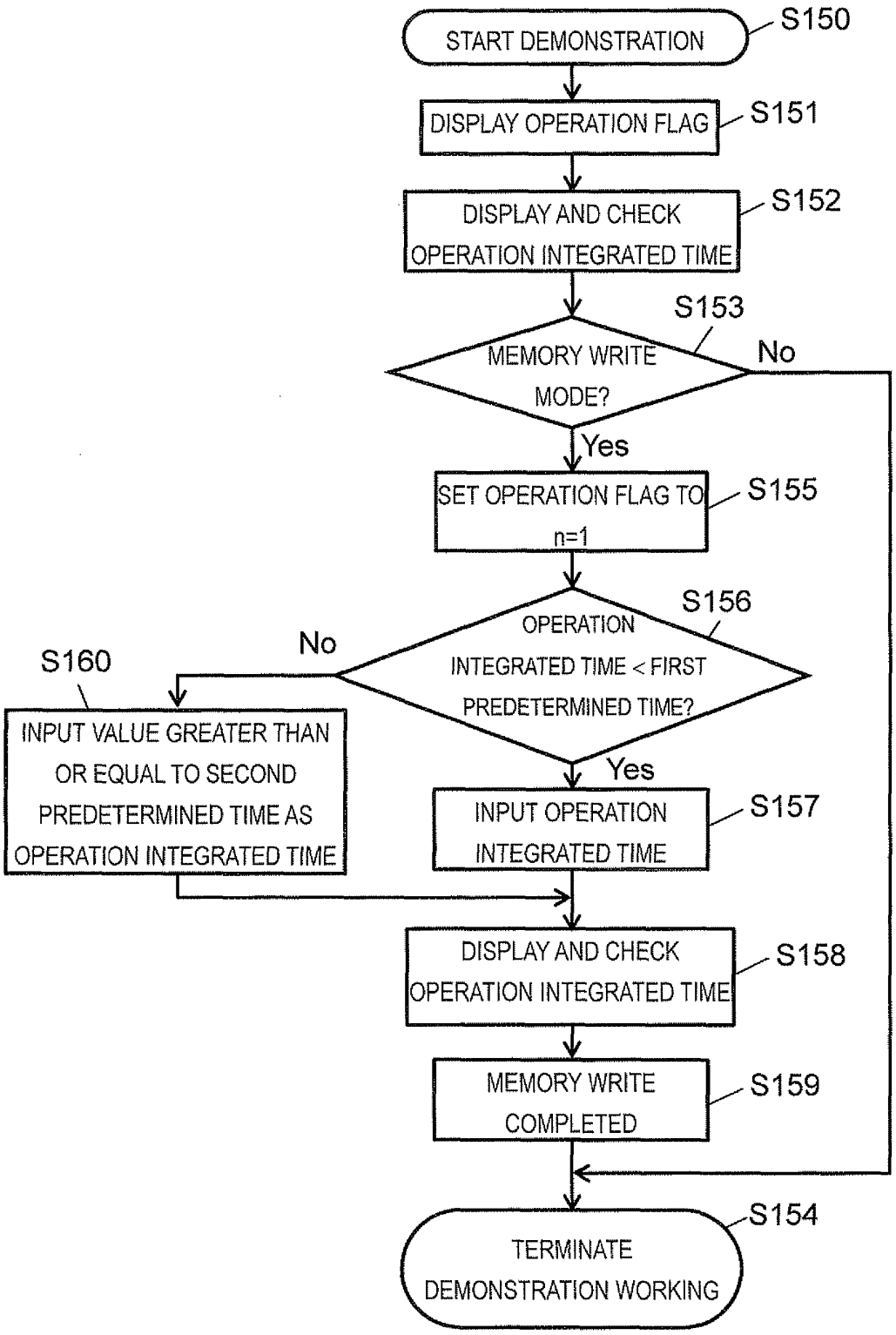

START DEMONSTRATION
S150
DISPLAY OPERATION FLAG
S151
DISPLAY AND CHECK OPERATION INTEGRATED TIME
S152
MEMORY WRITE MODE?
S153
No
Yes
SET OPERATION FLAG TO n=1
S155
OPERATION INTEGRATED TIME < FIRST PREDETERMINED TIME?
S156
No
Yes
S160
INPUT VALUE GREATER THAN OR EQUAL TO SECOND PREDETERMINED TIME AS OPERATION INTEGRATED TIME
INPUT OPERATION INTEGRATED TIME
S157
DISPLAY AND CHECK OPERATION INTEGRATED TIME
S158
MEMORY WRITE COMPLETED
S159
TERMINATE DEMONSTRATION WORKING
S154

FIG. 10

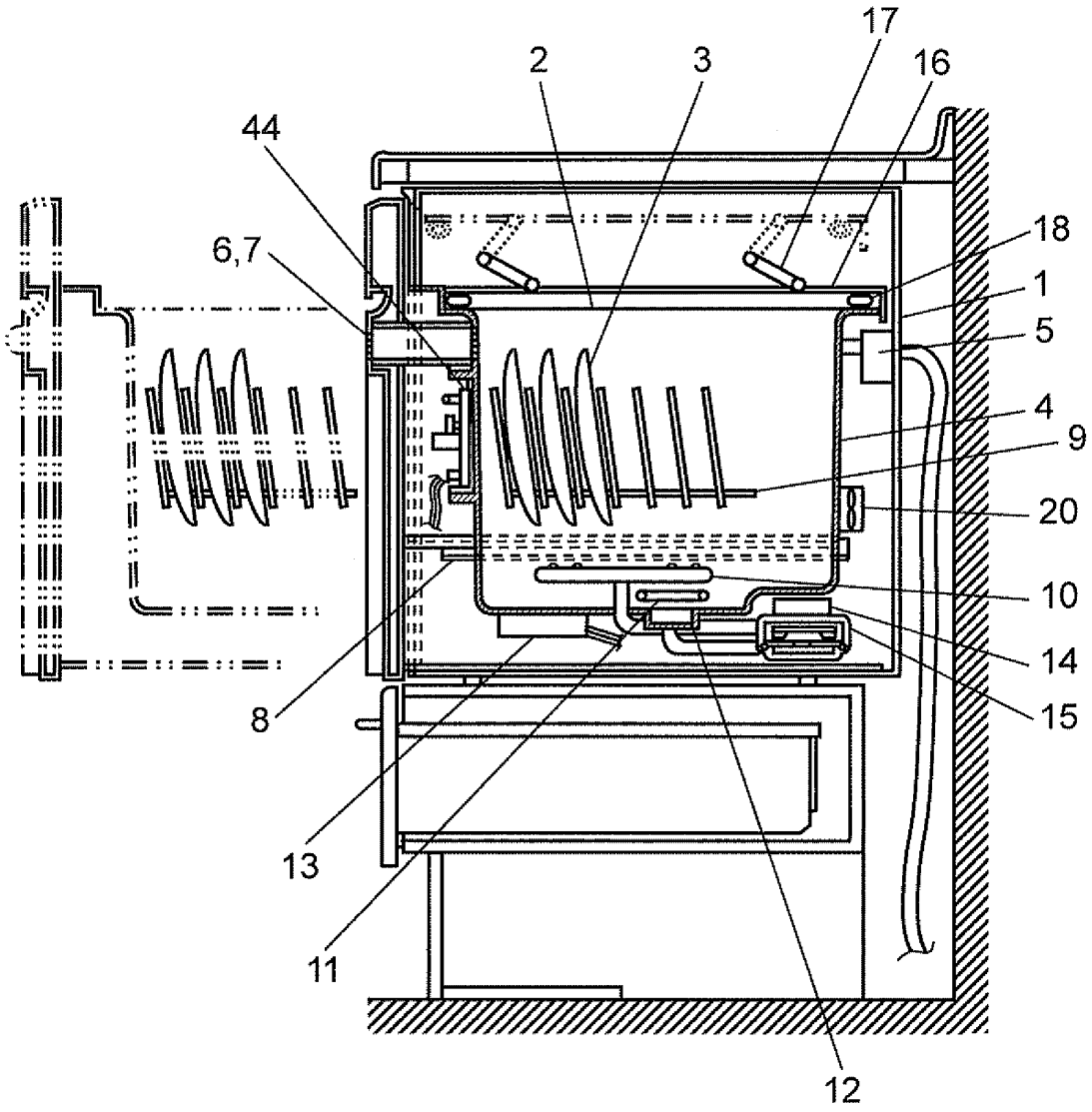


FIG. 11

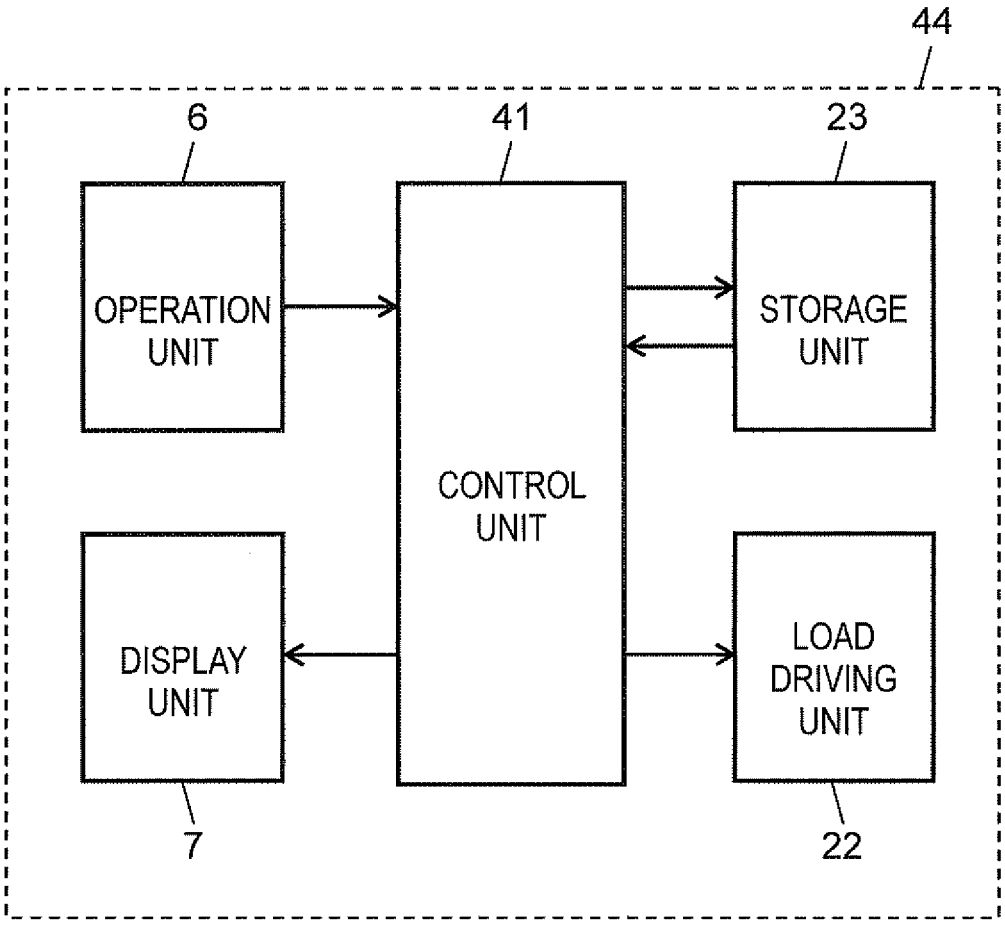
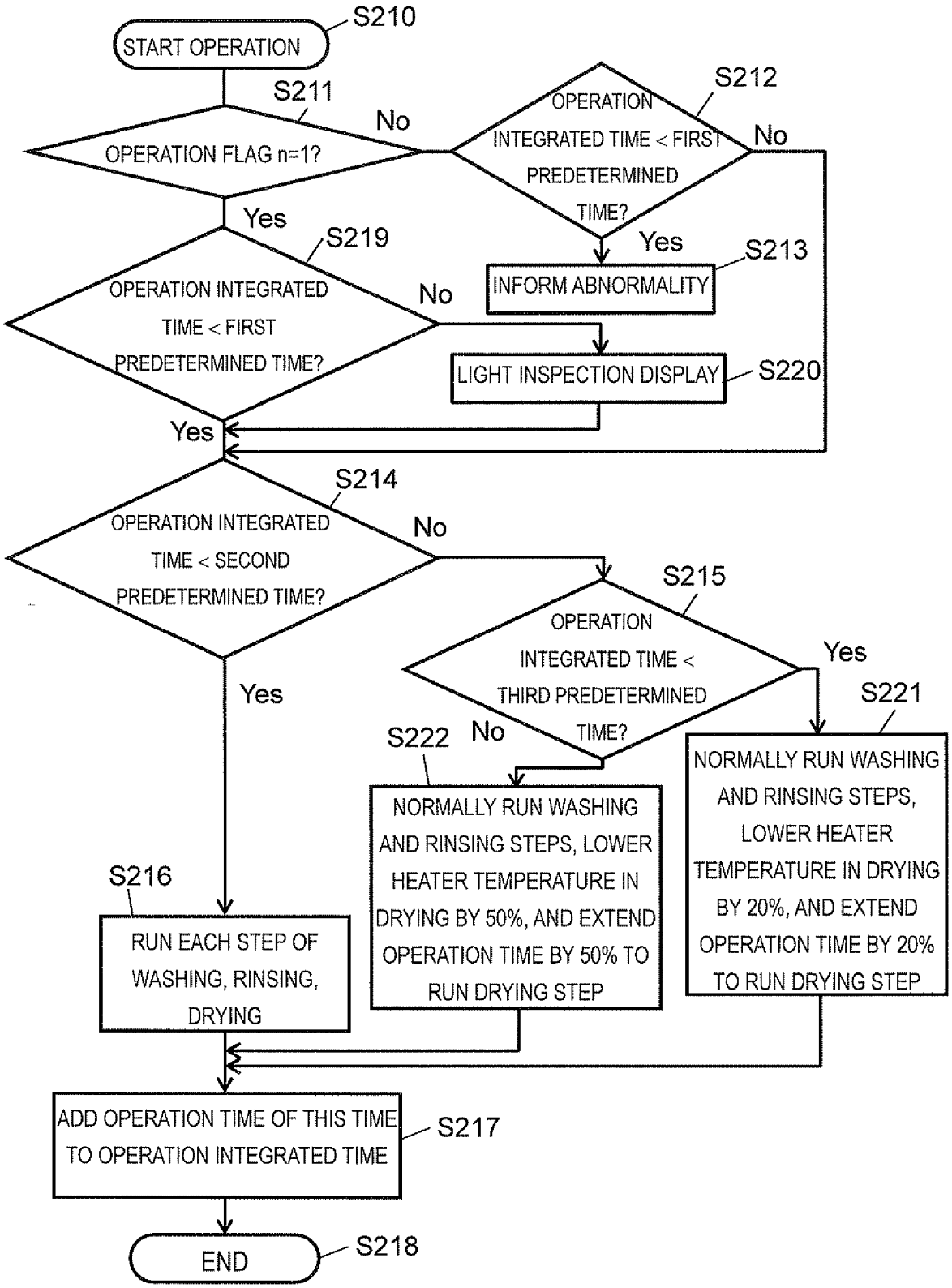

44
6
41
23
OPERATION UNIT
CONTROL UNIT
STORAGE UNIT
DISPLAY UNIT
LOAD DRIVING UNIT
7
22

FIG. 12


S210
START OPERATION
S211
OPERATION FLAG n=1?
No
Yes
S212
OPERATION INTEGRATED TIME < FIRST PREDETERMINED TIME?
No
Yes
S213
INFORM ABNORMALITY
S219
OPERATION INTEGRATED TIME < FIRST PREDETERMINED TIME?
No
Yes
LIGHT INSPECTION DISPLAY
S220
Yes
S214
OPERATION INTEGRATED TIME < SECOND PREDETERMINED TIME?
No
Yes
S215
OPERATION INTEGRATED TIME < THIRD PREDETERMINED TIME?
Yes
No
S221
S222
NORMALLY RUN WASHING AND RINSING STEPS, LOWER HEATER TEMPERATURE IN DRYING BY 50%, AND EXTEND OPERATION TIME BY 50% TO RUN DRYING STEP
NORMALLY RUN WASHING AND RINSING STEPS, LOWER HEATER TEMPERATURE IN DRYING BY 20%, AND EXTEND OPERATION TIME BY 20% TO RUN DRYING STEP
S216
RUN EACH STEP OF WASHING, RINSING, DRYING
ADD OPERATION TIME OF THIS TIME TO OPERATION INTEGRATED TIME
S217
END
S218

**INTERNATIONAL SEARCH REPORT**

International application No.
PCT/JP2011/003027

A. CLASSIFICATION OF SUBJECT MATTER
*A47L15/46*(2006.01)i

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
A47L15/46

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
Jitsuyo Shinan Koho 1922-1996 Jitsuyo Shinan Toroku Koho 1996-2011
Kokai Jitsuyo Shinan Koho 1971-2011 Toroku Jitsuyo Shinan Koho 1994-2011

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

C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category* | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|---|---|---|
| A | JP 2008-131973 A (Matsushita Electric Industrial Co., Ltd.), 12 June 2008 (12.06.2008), paragraphs [0018] to [0027]; fig. 1, 2 (Family: none) | 1-7 |
| A | JP 2005-218489 A (Zojirushi Corp.), 18 August 2005 (18.08.2005), paragraphs [0014] to [0027]; fig. 2 (Family: none) | 1-7 |
| A | JP 2007-268163 A (Hitachi, Ltd.), 18 October 2007 (18.10.2007), entire text; all drawings (Family: none) | 1-7 |

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

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

| Date of the actual completion of the international search | Date of mailing of the international search report |
|---|---|
| 29 August, 2011 (29.08.11) | 06 September, 2011 (06.09.11) |
| Name and mailing address of the ISA/ Japanese Patent Office<br>Facsimile No. | Authorized officer<br>Telephone No. |

Form PCT/ISA/210 (second sheet) (July 2009)

**INTERNATIONAL SEARCH REPORT**

International application No.
PCT/JP2011/003027

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

| Category* | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|---|---|---|
| A | JP 2009-273631 A (Tiger Corp.), 26 November 2009 (26.11.2009), paragraphs [0019] to [0049]; fig. 4, 5 (Family: none) | 1-7 |
| A | JP 2009-172143 A (Toshiba Corp.), 06 August 2009 (06.08.2009), paragraphs [0018] to [0027]; fig. 4 to 7 & CN 101492877 A & KR 10-2009-0082095 A | 7 |

Form PCT/ISA/210 (continuation of second sheet) (July 2009)

## REFERENCES CITED IN THE DESCRIPTION

*This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.*

### Patent documents cited in the description


- JP 2666363 B **[0007]**