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

(11) **EP 3 401 431 A1**

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

(43) Date of publication:
14.11.2018 Bulletin 2018/46

(21) Application number: **17735861.1**

(22) Date of filing: **06.01.2017**

(51) Int Cl.:
D06F 31/00 *(2006.01)* ***D06F 39/00*** *(2006.01)*

(86) International application number:
PCT/CN2017/070496

(87) International publication number:
WO 2017/118423 (13.07.2017 Gazette 2017/28)

(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
Designated Extension States:
BA ME
Designated Validation States:
MA MD

(30) Priority: **06.01.2016 CN 201610005447**

(71) Applicant: **Qingdao Haier Washing Machine Co., Ltd.**
Shandong 266101 (CN)

(72) Inventors:
- **LI, Wenwei**
  Qingdao
  Shandong 266101 (CN)
- **WU, Jun**
  Qingdao
  Shandong 266101 (CN)
- **WANG, Haibo**
  Qingdao
  Shandong 266101 (CN)
- **WANG, Jinkai**
  Qingdao
  Shandong 266101 (CN)
- **CAI, Rongshuai**
  Qingdao
  Shandong 266101 (CN)
- **NING, Xiao**
  Qingdao
  Shandong 266101 (CN)

(74) Representative: **Pfenning, Meinig & Partner mbB**
Patent- und Rechtsanwälte
Theresienhöhe 11a
80339 München (DE)

(54) MULTI-DRUM WASHING MACHINE AND CONTROL METHOD THEREFOR

(57) Provided are a multi-drum washing machine and a control method therefor, and the multi-drum washing machine includes: at least two independent washing drums, a control panel (3), an integrated circuit (IC) controller and a driving circuit board; the control panel (3) has a plurality of input control elements (9) and a plurality of output display elements (10), the input control elements (9) are configured for inputting laundry parameters; the output display elements (10) are configured for displaying states in a washing process; and the IC controller and the driving circuit board are connected to the control panel (3) and control an operation of the washing drums.

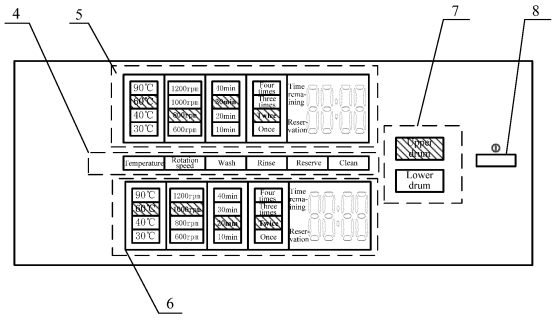

FIG. 3

EP 3 401 431 A1

Description

TECHNICAL FIELD

[0001] The present disclosure relates to a technical field of design and manufacture of washing machines, in particular relates to a multi-drum washing machine and a control method therefor.

BACKGROUND

[0002] An ordinary drum washing machine is a single-drum washing machine. In order to meet the requirements of washing all the family clothes, a washing machine with a large capacity, such as a large washing machine over 6 kg, is generally selected by a family. With the progress of the times and the improvement of people's living standards, the pace of life is getting faster and faster. Then, many problems occur in the use of the above-mentioned washing machines. For example, clothes may be divided into adult clothes, underwear and children's clothes. The washing machines are used for several times just for performing separated washings, which requires a lot of washing time and consumes a lot of energy. When the energy saving is taken into account, the washing process set in a large washing machine generally consumes a large amount of water and a large amount of electricity as well. When a small amount of laundry is washed, a large washing machine generally is not a good choice, and at the same time, the washing time is relatively long due to the large amount of laundry expected during the washing process. In addition, the washing process set by the large washing machine is expected to be mainly general clothes, and may not be suitable for washing fine clothes such as underwear or children's clothing, etc.

[0003] In order to solve the above problems, a double-drum washing machine has been developed in a related art. Such a double-drum washing machine has a large-capacity washing drum and a small-capacity washing drum that are driven individually or simultaneously, and performs separate washing operations in each drum. It is as if that the user should use two drum washing machines with different capacities at the same time, without occupying additional physical space. It is possible to flexibly perform washings simultaneously or separately according to the washing amount and the type of washing clothes.

[0004] However, in the related art, for the above-mentioned double-drum washing machine, independent input control unit and independent output display unit are usually configured for each washing tub. The control system is simply superimposed on the hardware, and is still essentially two separate control systems. It indirectly leads to higher manufacturing costs, hinders the promotion and application in the market, and it is also to the disadvantage of the upgrade and maintenance of the control system in a later period.

SUMMARY

[0005] The present disclosure provides a multi-drum washing machine and a control method therefor to solve the problem of controlling each washing dram of the multi-drum washing machine so as to reduce the manufacturing cost of the multi-drum washing machine.

[0006] Embodiments of the present disclosure provide a multi-drum washing machine, including:

at least two separate washing drums, a control panel, an integrated circuit (IC) controller, and a driving circuit board,

the control panel has a plurality of input control elements and a plurality of output display elements, the input control elements are configured for inputting laundry parameters, and the output display elements are configured for displaying states in a washing process, and

the IC controller and the driving circuit board are connected to the control panel and control the operation of the washing drums.

[0007] Optionally, the plurality of washing drums share a part or all of the input control elements and the output display elements, and shared input control elements and/or shared output display elements uniquely correspond to an operating program of one of the washing drums by selecting one of the washing drums at the time of operation and serve as input elements or output elements of one of the washing drums.

[0008] Optionally, a selection switch is disposed on the control panel for designating one of the washing drums.

[0009] Optionally, the switch is a button or a rotary knob.

[0010] Optionally, a plurality of the washing drums have respective separate output display elements, and only the input control elements are shared.

[0011] Optionally, the plurality of the washing drums have respective separate input control elements, and only the output display elements are shared.

[0012] Optionally, the plurality of the washing drums share the input control elements and the output display elements.

[0013] Optionally, the control panel has a power switch served as a total control power switch.

[0014] Optionally, the input control element and the output display element are a same button.

[0015] The embodiments of the present disclosure also provides a control method of a multi-drum washing machine, which adopts the multi-drum washing machine provided by any one embodiment of the present disclosure, and the method includes:

[0016] acquiring a selection instruction of a corresponding washing drum by a washing machine, retrieving a background control program of the washing drum and

enabling the shared input control elements and/or the shared output display elements to uniquely correspond to the operating program of one of the washing drums and serve as input elements or output elements of the one of the washing drums.

[0017] Optionally, when the background control program of the washing drum is retrieved, only the input control elements are used as input elements.

[0018] Optionally, when the background control program of the washing drum is retrieved, only the output control elements are used as output elements.

[0019] Regarding the multi-drum washing machine and the control method therefor provided by the embodiments of the present disclosure, input control elements and output display elements are provided on the control panel. During uses, a plurality of washing drums share all or a part of the input control elements and the output display elements. By selecting a specific washing drum, the corresponding washing program is retrieved, and the above-mentioned input control elements and/or output display elements are associated with the washing program as a corresponding input and output of one of the washing drums so that operations and controls of a plurality of washing drums are incorporated with a set of control systems. It replaces a superposition of simple hardware in the past, and reduces the number of the input control units and the output display units in the control panel of the multi-washing drum washing machine, thereby simplifying the hardware structure of the control panel, reducing the cost of the hardware of the washing machine and contributing to the later upgrade and maintenance of the control system.

BRIEF DESCRIPTION OF DRAWINGS

[0020]

FIG. 1 is a structural diagram showing an appearance of a double-drum washing machine according to an embodiment;

FIG. 2 is a structural composition diagram showing a control system of the double-drum washing machine according to an embodiment;

FIG. 3 is a structural composition diagram showing a control panel of the double-drum washing machine according to an embodiment;

FIG. 4 is a schematic view of the composition of a plurality of input control elements of the double-drum washing machine according to an embodiment;

FIG. 5 is a schematic view of the composition of a plurality of output display elements of the double-drum washing machine according to an embodiment;

FIG. 6 is a second composition diagram showing the control panel of the double-drum washing machine according to an embodiment;

FIG. 7 is a third composition diagram showing the control panel of the double-drum washing machine according to an embodiment;

FIG. 8 is a fourth composition diagram showing the control panel of the double-drum washing machine according to an embodiment;

FIG. 9 is a schematic diagram of the input control elements and the output display elements located in a same button according to an embodiment; and

FIG. 10 is a flowchart showing a control method according to an embodiment of the present disclosure.

Description of symbols

[0021] In the figure:

1: Upper drum; 2: Lower drum; 3: Control panel; 4: Input control unit; 5, 6: Output display unit; 7: Switching unit; 8: Power switch; 9: Input control element; 10: Output display element

DETAILED DESCRIPTION

[0022] The present disclosure will be described in detail below in combination with alternative embodiments and drawings. It should be understood that, the alternative embodiments described herein are merely for purposes of explaining the present disclosure and are not intended to limit the present disclosure. In addition, for ease of description, only some of the details related to the present disclosure are shown in the drawings instead of the whole contents. The features in the embodiments and the embodiments may be combined with each other arbitrarily without conflicts.

[0023] As shown in FIG. 1, a schematic diagram of the appearance of a double-drum washing machine is provided. The washing machine is equipped with an upper drum 1 and a lower drum 2 in a machine body to form a pair of separate washing drums, and has a control panel 3 at the same time. In practical productions, the capacity of the upper drum 1 is usually designed to be small, generally 2-3 kg, and the capacity of the lower drum 2 is designed to be large, generally 6-8 kg, which is also beneficial to lower of the overall washing machine's center of gravity. In operations, two separate washing drums can be operated separately or simultaneously. For a user, it is as if that there should be two drum washing machines with different capacities at the same time, and there are more choices when the user faces various washing conditions at home. For example, the upper drum can be used for the fine washing of single or small

batches of clothes, and the lower drum can be used for washing large items of clothing, such as the cleaning of bed sheets. More importantly, the two batches of washing can be performed simultaneously, and the waiting time can be reduced. From the aspect of actual use effect, it provides the advantages of saving time and energy.

[0024] Since the above-mentioned drum washing machine involves the control of two independent washing drums (the upper and lower washing drums), it is objectively necessary to provide two sets of input control units and output display units respectively correspond to each of the two independent washing drums on the control panel 3 to cooperate with the user to perform input settings and status display for each of the two independent washing drums, and the composition of the control system of the double-drum washing machine is shown in FIG. 2. The user performs settings of a variety of laundry parameters and programs through the control panel. The IC controller performs a communication connection with the control panel, the input parameter of the control panel is received, a selected program is inputted, and instructions are sent to the driving circuit. According to the instructions, the driving circuit drives the corresponding operations of the upper drum or the lower drum, and the corresponding IC controller transmits the working state parameters of the corresponding drum in real time to the control panel for a real-time display, so as to facilitate the user's control over a washing process.

[0025] Regarding a control process of the double-drum washing machine, the control panel provided by embodiments of the present disclosure may adopt structures shown in FIGS. 3 to 5. The areas in the control panel can be divided into an input control unit 4, an output display unit 5, 6 and a switching unit 7. The input control unit 4 is composed of six buttons of "temperature", "rotation speed", "wash", "rinse", "reserve" and "clean", as input control elements 9, and all the input control elements in the input control unit 4 are taken as common parts of the upper and lower drums. Accordingly, the output display unit 5 is also composed of a plurality of output display elements 10, which respectively correspond to the displays of the selected parameters at the time of inputting the input control elements of the upper drum as "temperature", "rotation speed", "wash", "rinse", "reserve" and "clean". At the same time, the output display unit 6 is also composed of a plurality of output display elements, which respectively correspond to the displays of the selected parameters at the time of inputting the input control elements of lower drum as "temperature", "rotation speed", "wash", "rinse", "reserve" and "clean". During operations, the corresponding upper or lower drum is selected by the selection of the switching unit 7. As shown in FIG. 3, at this time, the upper drum is selected, shared input control elements uniquely correspond to the operating procedure of the upper drum, and the IC controller transfers the above-mentioned input parameters to the corresponding operation program. At this time, shared control elements 9 are merely used as the input of a control program the upper drum, and the output display units of the corresponding upper and lower drums are independent, e.g. the "rotation speed" is 900 rpm for the upper drum and 1000 rpm for the lower drum; and the "washing" is 30 minutes for the upper drum and 20 minutes for the lower drum. This enables the real-time status of the operation of the washing machine to be more visible.

[0026] Another option of the structure of the control panel is shown in FIG. 6. The area of the control panel is divided into an input control unit 4 and an output display unit 5. In this example, the corresponding output display unit 5 is formed by a plurality of output display elements 10, which are served as common output display elements. There are two input control units 4 to respectively correspond to the upper drum and the lower drum. Each input control unit 4 is formed by six buttons marked with "temperature", "rotation speed", "wash", "rinse", "reserve" and "clean" as the input control elements 9, and each of the six buttons corresponds to the input control elements of control programs of the upper and lower drum. During operations, the corresponding upper or lower drum is selected by the selection of the switching unit 7. As shown in FIG. 6, the upper drum is selected at this time, and the common output display elements uniquely correspond to the operating procedure of the upper drum. The IC controller outputs the status parameters of the upper drum in real-time through the above display elements. As shown in the figure, the upper drum has a "temperature" of 60 °C, a "rotation speed" of 800 rpm, a "washing" time of 30 minutes and "rinse" for three times. At this time, the inputs of the upper and lower drums are inputted through separate control elements.

[0027] A third option of the structure of the control panel is shown in FIG. 7. The area of the control panel is divided into an input control unit 4 and an output display unit 5. In this example, the corresponding output display unit 5 is formed by a plurality of output display elements 10, which are served as common output display elements. The input control unit 4 is formed by six buttons marked with "temperature", "rotation speed", "wash", "rinse", "reserve" and "clean" as the input control elements 9, which are also served as common output display elements. During operations, the corresponding upper or lower drum is selected by the selection of the switching unit 7. As shown in FIG. 7, the upper drum is selected at this time, and the common output display elements and the common input control elements uniquely correspond to the operating procedure of the upper drum. The IC controller outputs the status parameters of the upper drum in real-time through the above display elements. As shown in the figure, the upper drum has a "temperature" of 60 °C, a "rotation speed" of 800 rpm, a "washing" time of 30 minutes and "rinse" for twice. The advantage of this solution is that the input and output functions necessary for separately controlling the upper and lower drums can be satisfied with merely using a set of common input control elements and common output display elements.

[0028] Another advantage of the embodiments of the

present disclosure is that, for two or more separate washing drums, no major changes are required for their respective control systems, i.e. only one separate system needs to be maintained during maintenance, which is of practical significance to the later software upgrading of the product, such as the increasing demands of the customers driven by the Internet.

[0029] For the entire control panel, since there is merely one set of control systems, one power switch 8 can be separately configured as the total power control. The corresponding switching unit 7 also can be configured in a variety of external forms. In addition to the commonly used double buttons, a single button can be used for switching. Alternatively, a knob can be used for performing selections and switching.

[0030] FIG. 8 shows a fourth possible selection of the structure of the control panel. As shown in the figure, the rotary knob can be used as a selection switch, a rotation direction serves as the input control elements, and program items on both sides serve as the output display elements. The corresponding input control elements and output display elements are shared, and the washing drum is selected by a selection switch. As shown in the figure, it is used as the output of the lower drum.

[0031] In practical use, another case also exists. As shown in FIG. 9, a corresponding input control element and an output display element are configured on a same button position, which is used as an input and also as an output status. As shown in the figure, the "chemical fiber" washing program is selected at this time, and at the same time, just at this time, the corresponding "chemical fiber" button lights up as the output of the state.

[0032] FIG. 10 correspondingly shows a flow chart of the control method applied in the above-mentioned washing machine. When the washing machine is operated, it includes the following steps: in S110, acquiring a selection instruction of a corresponding washing drum by a washing machine, and in S120, retrieving a background control program of the washing drum and enabling shared input control elements and/or shared output display elements to uniquely correspond to the operating procedure of one of the washing drums and serve as input elements or output elements of one of the washing drums.

[0033] Certainly, as an optional mode of program execution, when the background control program of the washing drum is configured to be retrieved according to the structure of the control panel, only the input control element is used as an input element, and when the background control program of the washing drum is retrieved, only the output control elements are used as output elements.

[0034] Above descriptions are merely optional embodiments of the present disclosure and are not intended to limit the disclosure. For those skilled in the art, the present disclosure may have various changes and modifications in the alternative embodiments.

Industrial applicability

[0035] The embodiment of the present disclosure provides a multi-drum washing machine and a control method therefor, which achieves a set of control systems incorporating the operation and control of a plurality of washing drums. It replaces a superposition of conventionally simple hardware and reduces the number of the input control units and the output display units of the multi-washing drum washing machine control panel, thereby simplifying the hardware structure of the control panel, reducing the cost of the hardware of the washing machine and contributing to the later upgrade and maintenance of the control system.

Claims

1. A multi-drum washing machine, comprising:

   at least two independent washing drums, a control panel, an integrated circuit (IC) controller and a driving circuit board, wherein
   the control panel comprises a plurality of input control elements and a plurality of output display elements, the plurality of input control elements are configured for inputting laundry parameters, and the plurality of output display elements are configured for displaying states in a washing process, and
   the IC controller and the driving circuit board are connected to the control panel and control an operation of the at least two independent washing drums.

2. The multi-drum washing machine according to claim 1, wherein the at least two independent washing drums share a part or all of the plurality of input control elements and the plurality of output display elements, and shared input control elements and/or shared output display elements uniquely correspond to an operating program of one of the at least two independent washing drums by selecting the one of the at least two independent washing drums at the time of operation, and serve as input elements or output elements of the one of the at least two independent washing drums.

3. The multi-drum washing machine according to claim 2, wherein a selection switch is disposed on the control panel for designating one of the at least two independent washing drums.

4. The multi-drum washing machine according to claim 2, wherein the plurality of washing drums have respective separate output display elements, and only the plurality of input control elements are shared.

5. The multi-drum washing machine according to claim 2, wherein the plurality of washing drums have respective separate input control elements, and only the plurality of output display elements are shared.

6. The multi-drum washing machine according to claim 2, wherein the plurality of washing drums share the plurality of input control elements and the output display elements.

7. The multi-drum washing machine according to claim 3, wherein the selection switch is a button or a rotary knob.

8. The multi-drum washing machine according to any one of claims 1 to 7, wherein the control panel comprises a power switch served as a total control power switch.

9. The multi-drum washing machine according to any one of claims 1 to 7, wherein one of the plurality of input control elements and a respective one of the plurality of output display elements are a same button.

10. A control method for a multi-drum washing machine employing any one of the multi-drum washing machines in claims 1 to 9, the method comprising:

    acquiring a selection instruction of a corresponding washing drum by a washing machine, and
    retrieving a background control program of the washing drum and enabling shared input control elements and/or shared output display elements to uniquely correspond to an operating program of one of the at least two independent washing drums and serve as input elements or output elements of the one of the at least two independent washing drums.

11. The control method for a multi-drum washing machine according to claim 10, wherein when the background control program of the washing drum is retrieved, only the input control elements are used as input elements.

12. The control method for a multi-drum washing machine according to claim 10, wherein when the background control program of the washing drum is retrieved, only output control element are used as output elements.

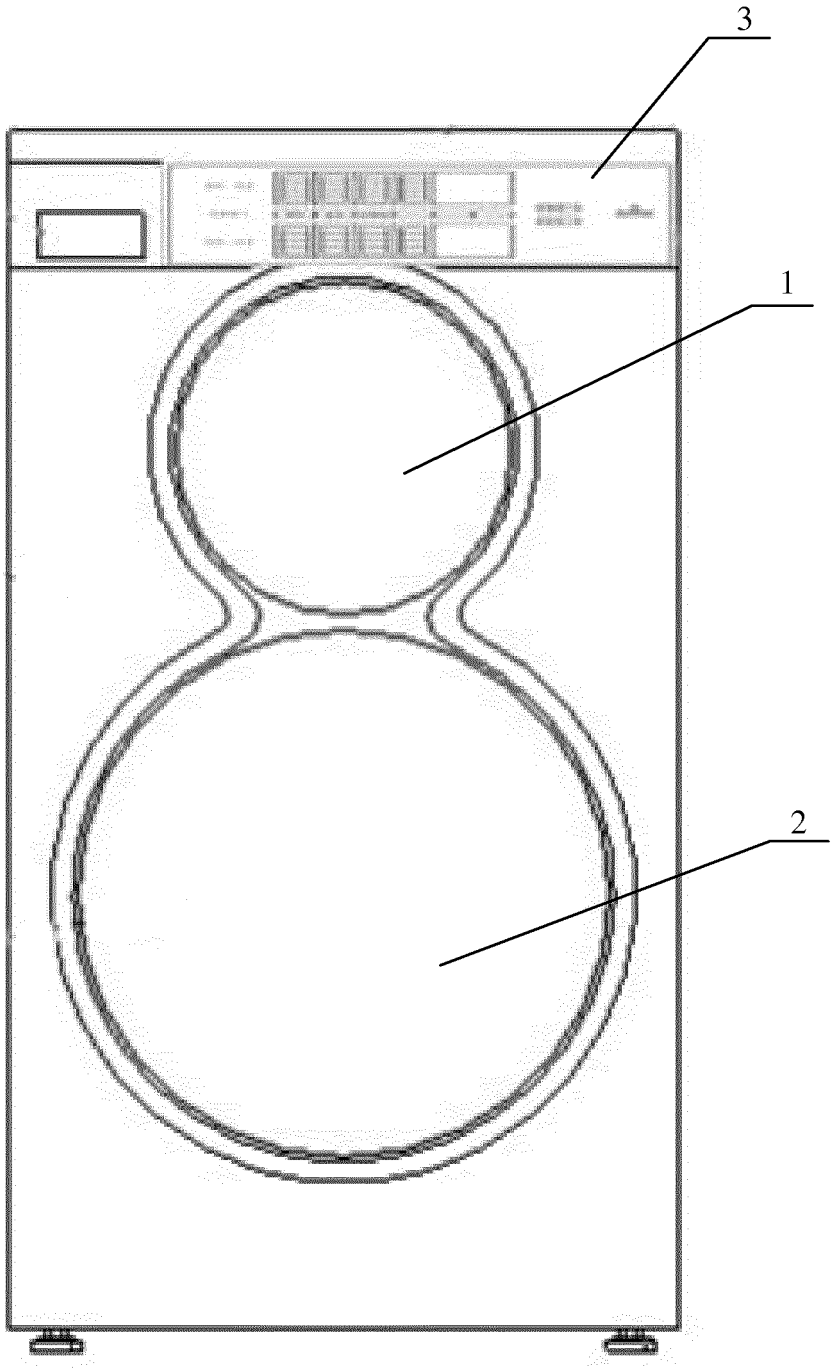

FIG. 1

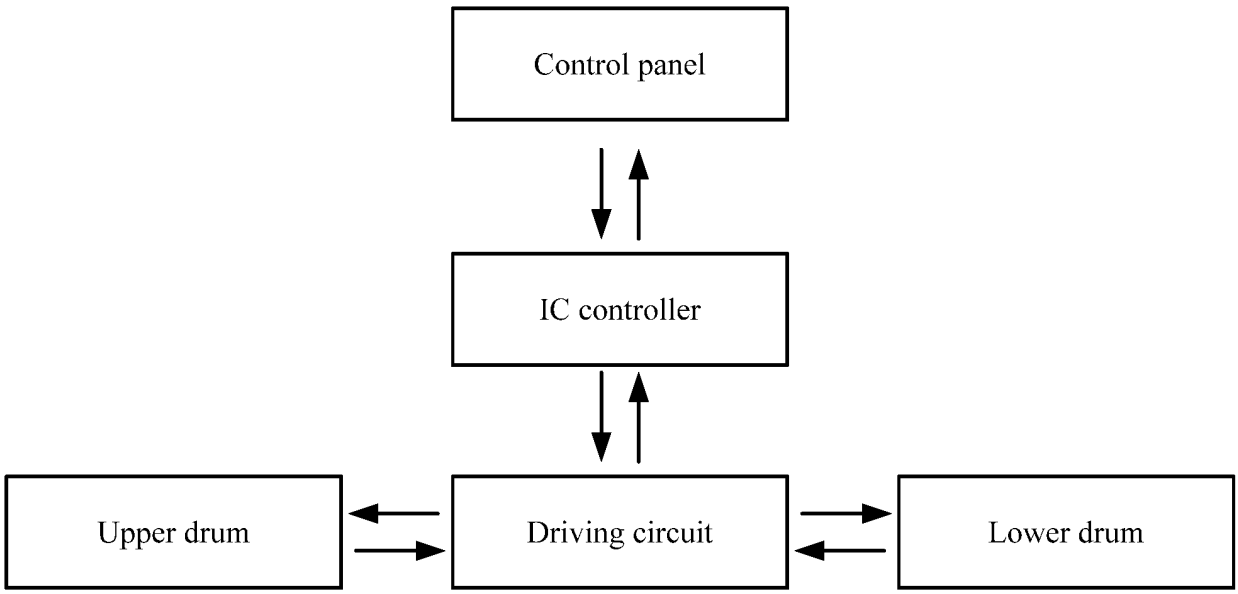
Control panel
IC controller
Upper drum
Driving circuit
Lower drum

FIG. 2

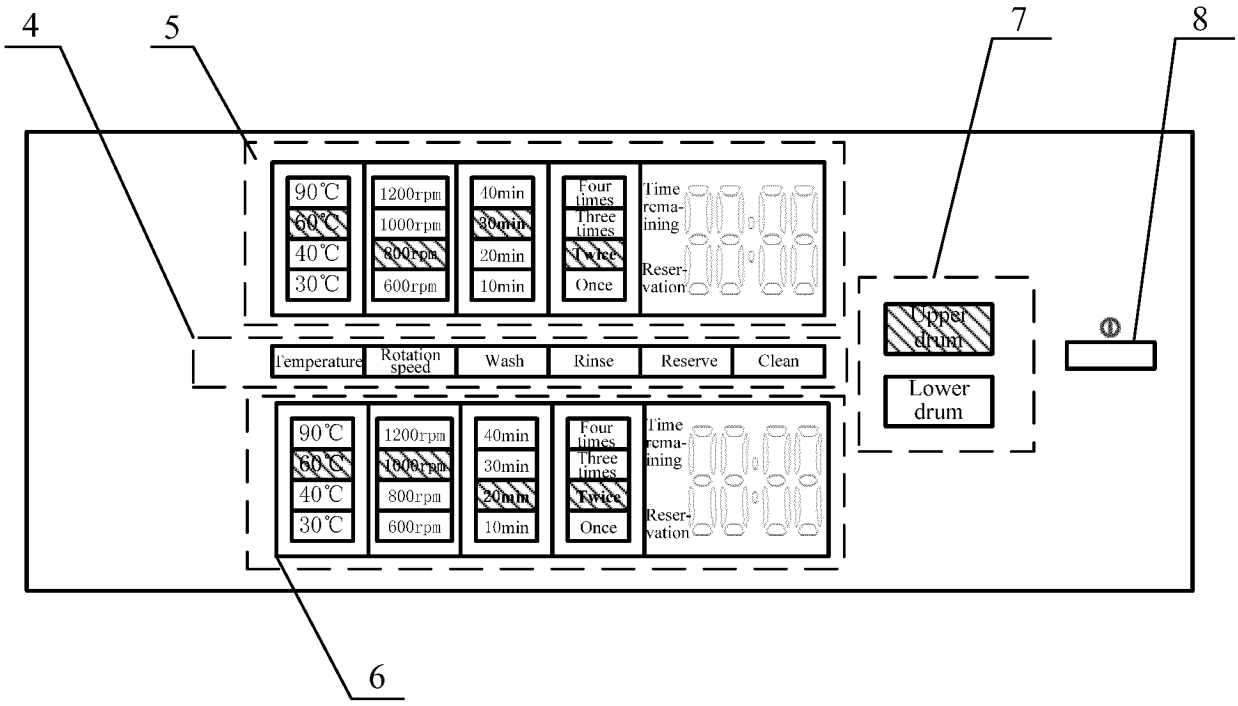
4
5
7
8
90℃
60℃
40℃
30℃
1200rpm
1000rpm
800rpm
600rpm
40min
30min
20min
10min
Four times
Three times
Twice
Once
Time remaining
Reservation
Temperature
Rotation speed
Wash
Rinse
Reserve
Clean
Upper drum
Lower drum
6

FIG. 3

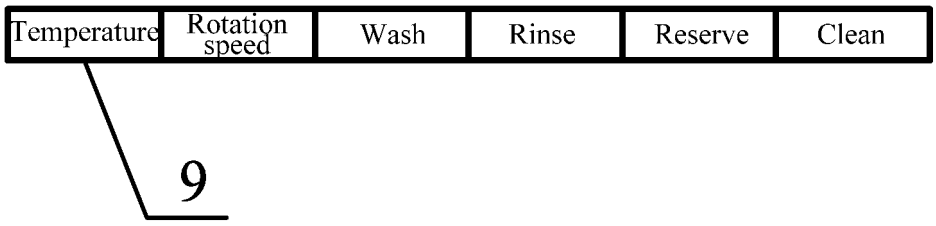

FIG. 4

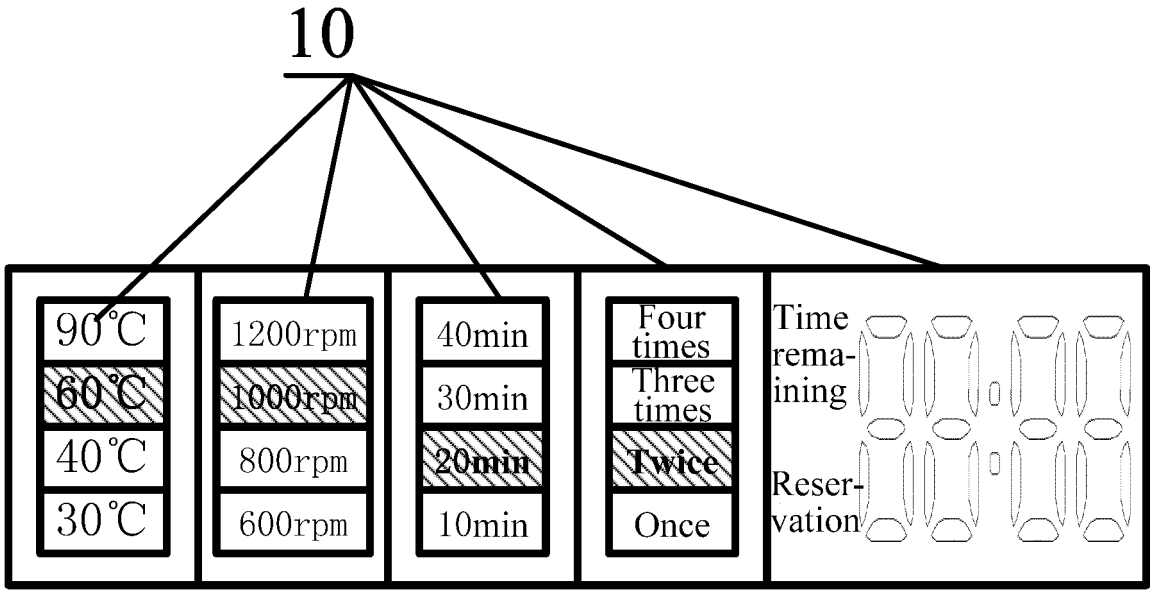
10
90℃
60℃
40℃
30℃
1200rpm
1000rpm
800rpm
600rpm
40min
30min
20min
10min
Four times
Three times
Twice
Once
Time remaining
Reservation

FIG. 5

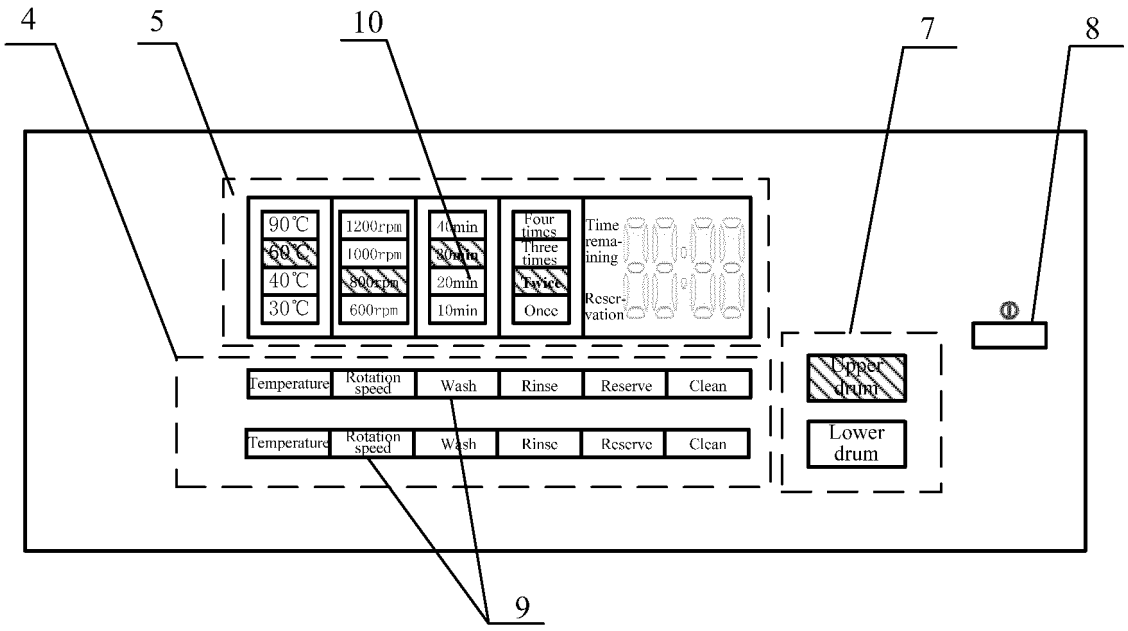
4
5
10
7
8
90℃
60℃
40℃
30℃
1200rpm
1000rpm
800rpm
600rpm
40min
30min
20min
10min
Four times
Three times
Twice
Once
Time remaining
Reservation
Temperature
Rotation speed
Wash
Rinse
Reserve
Clean
Upper drum
Lower drum
9

FIG. 6

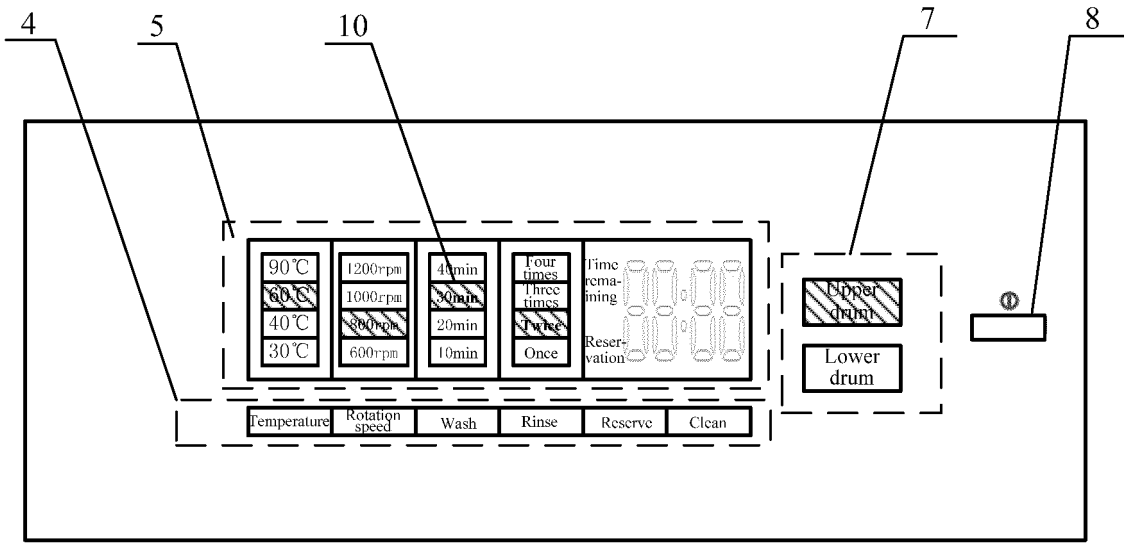
4
5
10
7
8
90℃
60℃
40℃
30℃
1200rpm
1000rpm
800rpm
600rpm
40min
30min
20min
10min
Four times
Three times
Twice
Once
Time remaining
Reservation
Upper drum
Lower drum
Temperature
Rotation speed
Wash
Rinse
Reserve
Clean

FIG. 7

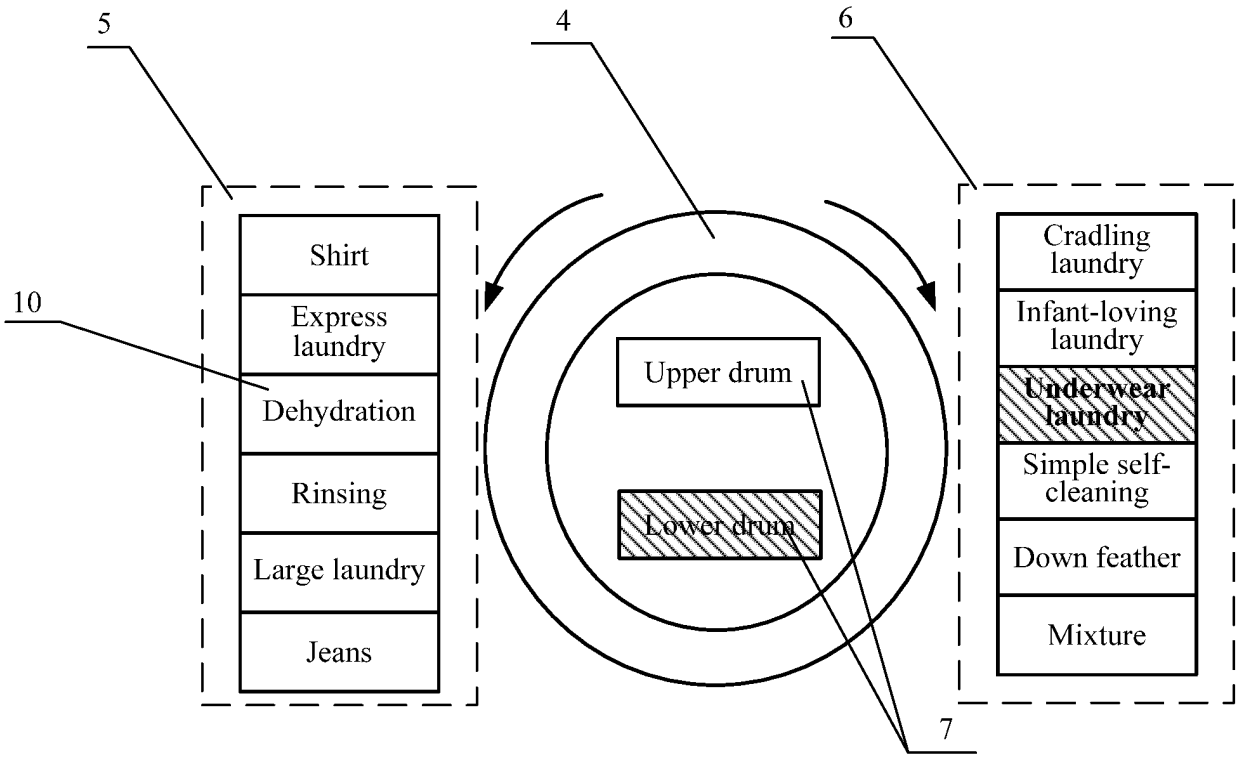
5
4
6
10
Shirt
Express laundry
Dehydration
Rinsing
Large laundry
Jeans
Upper drum
Lower drum
Cradling laundry
Infant-loving laundry
Underwear laundry
Simple self-cleaning
Down feather
Mixture
7

FIG. 8

FIG. 9

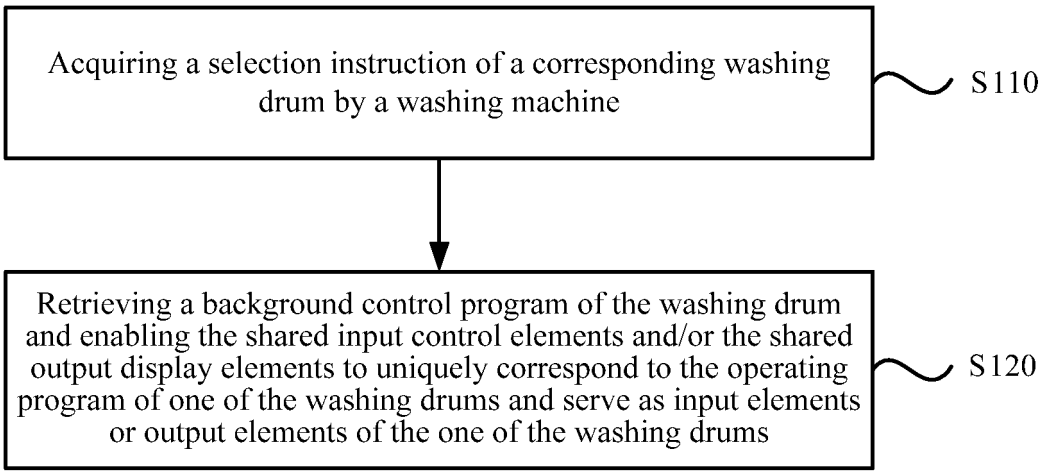
Acquiring a selection instruction of a corresponding washing drum by a washing machine
S110
Retrieving a background control program of the washing drum and enabling the shared input control elements and/or the shared output display elements to uniquely correspond to the operating program of one of the washing drums and serve as input elements or output elements of the one of the washing drums
S120

FIG. 10

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2017/070496

A. CLASSIFICATION OF SUBJECT MATTER

D06F 31/00 (2006.01) i; D06F 39/00 (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)

D06F

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

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

CNABS; SIPOABS; DWPI; CNKI: haier, SU, groove, key, rotary knob, share, sub+, second+, assistant, auxiliary+, small??, two, double, multi, several, tub, bucket, roller, barrel, drum, cylinder, roller, panel, board, keyboard, control+, combinat+, pile, stack, screen+, display+, select, display

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	CN 101113557 A (SAMSUNG ELECTRONICS CO., LTD.) 30 January 2008 (30.01.2008) description, page 7, paragraphs 3, 5, 6 , page 8, paragraph 5, and figure 1	1-12
PX	CN 205443672 U (QINGDAO HAIER WASHING MACHINE CO., LTD.) 10 August 2016 (10.08.2016) description, paragraphs [0031]-[0040], and figures 1-10	1-12
PX	CN 106032612 A (QINGDAO HAIGAO DESIGN & MFG CO., LTD.) 19 October 2016 (19.10.2016) description, paragraphs [0049]-[0090], and figures 1-11	1-12
PX	CN 106032625 A (QINGDAO HAIER DRUM WASHING MACHINE CO., LTD.) 19 October 2016 (19.10.2016) description, paragraphs [0047]-[0093], and figures 1-5	1-12
A	CN 102926168 A (SU, Shaozhong) 13 February 2013 (13.02.2013) the whole document	1-12

☒ 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
30 March 2017	12 April 2017

Name and mailing address of the ISA	Authorized officer
State Intellectual Property Office of the P. R. China No. 6, Xitucheng Road, Jimenqiao Haidian District, Beijing 100088, China Facsimile No. (86-10) 62019451	LIU, Jing Telephone No. (86-10) 62084545

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

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2017/070496

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	KR 20040009400 A (SAMSUNG ELECTRONICS CO LTD) 31 January 2004 (31.01.2004) the whole document	1-12
A	CN 104928883 A (HAIER GROUP CORP. et al.) 23 September 2015 (23.09.2015) the whole document	1-12

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

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CN2017/070496

Patent Documents referred in the Report	Publication Date	Patent Family	Publication Date
CN 101113557 A	30 January 2008	US 2008022465 A1	31 January 2008
		US 7904983 B2	15 March 2011
		US 9284673 B2	15 March 2016
		KR 20080010047 A	30 January 2008
		CN 101775729 B	06 June 2012
		CN 101775729 A	14 July 2010
		US 2010138055 A1	03 June 2010
		EP 1882768 A2	30 January 2008
		KR 101075227 B1	19 October 2011
		CN 101113557 B	27 June 2012
CN 205443672 U	10 August 2016	None	
CN 106032612 A	19 October 2016	None	
CN 106032625 A	19 October 2016	WO 2016141714 A1	15 September 2016
CN 102926168 A	13 February 2013	None	
KR 20040009400 A	31 January 2004	KR 100903145 B1	16 June 2009
CN 104928883 A	23 September 2015	WO 2015139472 A1	24 September 2015

Form PCT/ISA /210 (patent family annex) (July 2009)