US012385178B2

(12) **United States Patent**
Kwak et al.

(10) **Patent No.: US 12,385,178 B2**
(45) **Date of Patent: Aug. 12, 2025**

(54) **CLOTHES TREATING SYSTEM AND CONTROL METHOD THEREOF**

(71) Applicant: **SAMSUNG ELECTRONICS CO., LTD.**, Suwon-si (KR)

(72) Inventors: **Eunkyeong Kwak**, Suwon-si (KR); **Taehyung Kim**, Suwon-si (KR); **Minhwan Oh**, Suwon-si (KR); **Sungjong Kim**, Suwon-si (KR)

(73) Assignee: **SAMSUNG ELECTRONICS CO., LTD.**, Suwon-si (KR)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 176 days.

(21) Appl. No.: **18/370,119**

(22) Filed: **Sep. 19, 2023**

(65) **Prior Publication Data**

US 2024/0167209 A1 May 23, 2024

Related U.S. Application Data

(63) Continuation of application No. PCT/KR2023/012628, filed on Aug. 25, 2023.

(30) **Foreign Application Priority Data**

Nov. 22, 2022 (KR) 10-2022-0157698
Jan. 19, 2023 (KR) 10-2023-0008339

(51) **Int. Cl.**
D06F 29/00 (2006.01)
D06F 23/02 (2006.01)
(Continued)

(52) **U.S. Cl.**
CPC ***D06F 29/005*** (2013.01); ***D06F 23/02*** (2013.01); ***D06F 33/32*** (2020.02); ***D06F 34/20*** (2020.02);
(Continued)

(58) **Field of Classification Search**
CPC D06F 29/005
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

7,904,983 B2 3/2011 Jun et al.
8,122,547 B2 2/2012 Park
(Continued)

FOREIGN PATENT DOCUMENTS

JP 4523260 8/2010
KR 10-0717458 5/2007
(Continued)

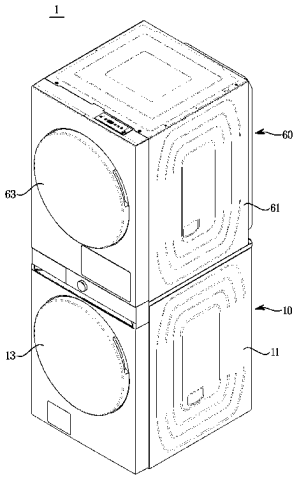
OTHER PUBLICATIONS

International Search Report dated Dec. 19, 2023 for International Application No. PCT/KR2023/012628.
(Continued)

Primary Examiner — Jason Y Ko
(74) *Attorney, Agent, or Firm* — STAAS & HALSEY LLP

(57) **ABSTRACT**

A method of controlling a clothes treating system including a first clothes treating apparatus electrically connected to a second clothes treating apparatus, the method including obtaining information about an operation course of the first clothes treating apparatus and an operation course of the second clothes treating apparatus; identifying a priority between the operation course of the first clothes treating apparatus and the operation course of the second clothes treating apparatus based on the obtained information about the operation course of the first clothes treating apparatus and the obtained information about the operation course of the second clothes treating apparatus; and changing an algorithm of the operation course of the first clothes treating apparatus or the operation course of the second clothes treating apparatus based on the identified priority between
(Continued)



the operation courses of the first clothes treating apparatus and the second clothes treating apparatus.

15 Claims, 22 Drawing Sheets

(51) **Int. Cl.**

D06F 33/32	(2020.01)
D06F 34/20	(2020.01)
D06F 34/26	(2020.01)
D06F 34/28	(2020.01)
D06F 37/30	(2020.01)
D06F 58/02	(2006.01)
D06F 58/20	(2006.01)
D06F 58/36	(2020.01)
D06F 103/32	(2020.01)
D06F 105/30	(2020.01)
D06F 105/46	(2020.01)
D06F 105/50	(2020.01)
D06F 105/62	(2020.01)

(52) **U.S. Cl.**

CPC ***D06F 34/26*** (2020.02); ***D06F 34/28*** (2020.02); ***D06F 37/304*** (2013.01); ***D06F 58/02*** (2013.01); ***D06F 58/20*** (2013.01); ***D06F 58/36*** (2020.02); *D06F 2103/32* (2020.02); *D06F 2105/30* (2020.02); *D06F 2105/46* (2020.02); *D06F 2105/50* (2020.02); *D06F 2105/62* (2020.02)

(56) **References Cited**

U.S. PATENT DOCUMENTS

8,312,638	B2	11/2012	Park et al.
10,934,653	B2	3/2021	Choi
11,078,613	B2	8/2021	Bae et al.
11,085,138	B2	8/2021	Bae et al.
11,492,744	B2	11/2022	Kim et al.
2012/0047661	A1	3/2012	Hong et al.
2016/0215432	A1	7/2016	Kim
2017/0167066	A1	6/2017	Underly et al.
2019/0040563	A1	2/2019	Bae
2020/0024784	A1	1/2020	Yoon et al.
2023/0175194	A1	6/2023	Ryoo et al.

FOREIGN PATENT DOCUMENTS

KR	10-2010-0120055		11/2010
KR	10-1075227	B1	10/2011
KR	10-1100166	B1	12/2011
KR	10-1319875	B1	10/2013
KR	10-2017-0087272	A	7/2017
KR	10-2017-0089605	A	8/2017
KR	10-2017-0089677	A	8/2017
KR	10-2017-0090648	A	8/2017
KR	10-2019-0024671		3/2019
KR	10-2021-0104394		8/2021
KR	10-2021-0114092	A	9/2021
KR	10-2351650	B1	1/2022

OTHER PUBLICATIONS

Written Opinion of International Searching Authority dated Dec. 19, 2023 for International Application No. PCT/KR2023/012628.

FIG. 1

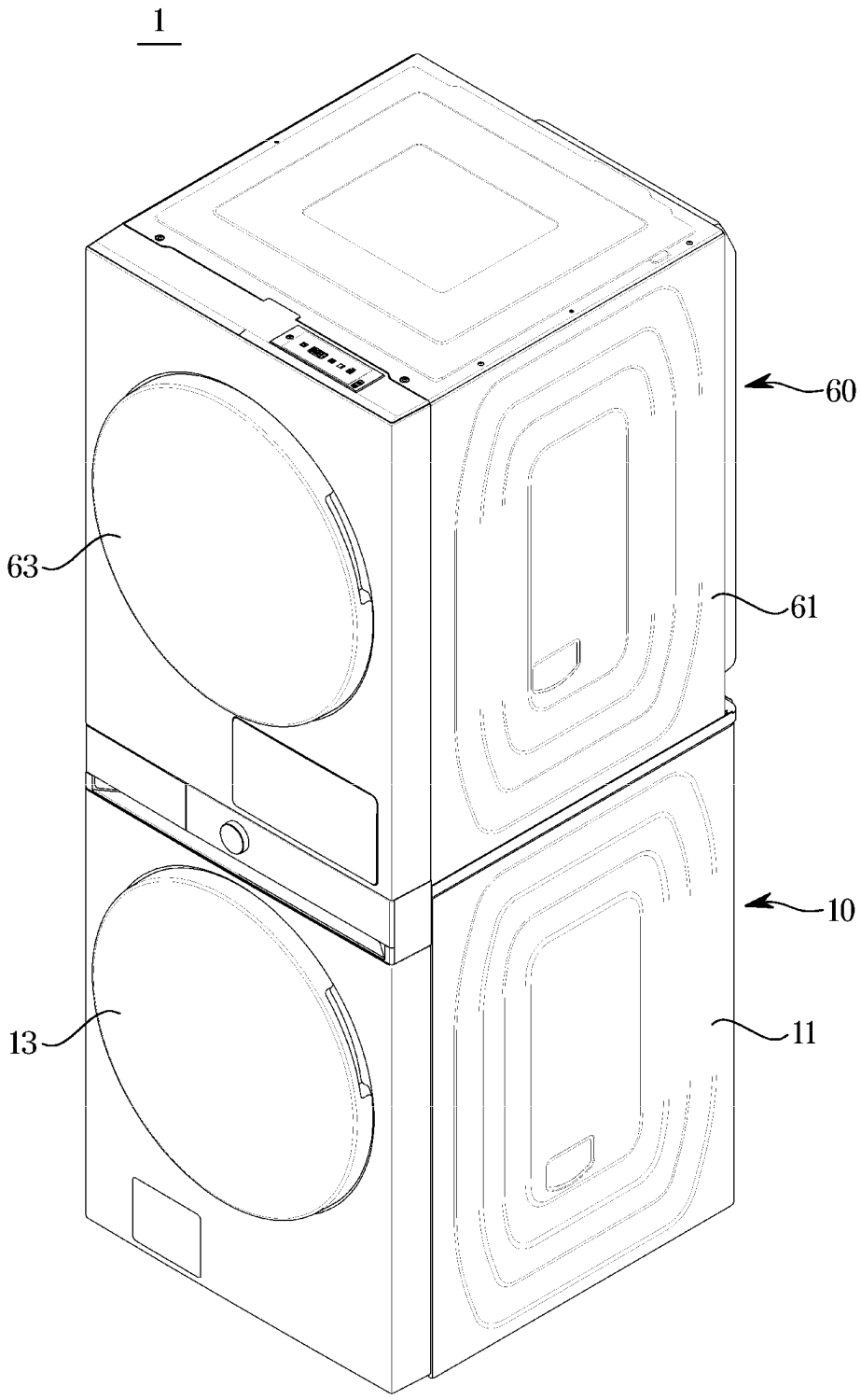


FIG. 2

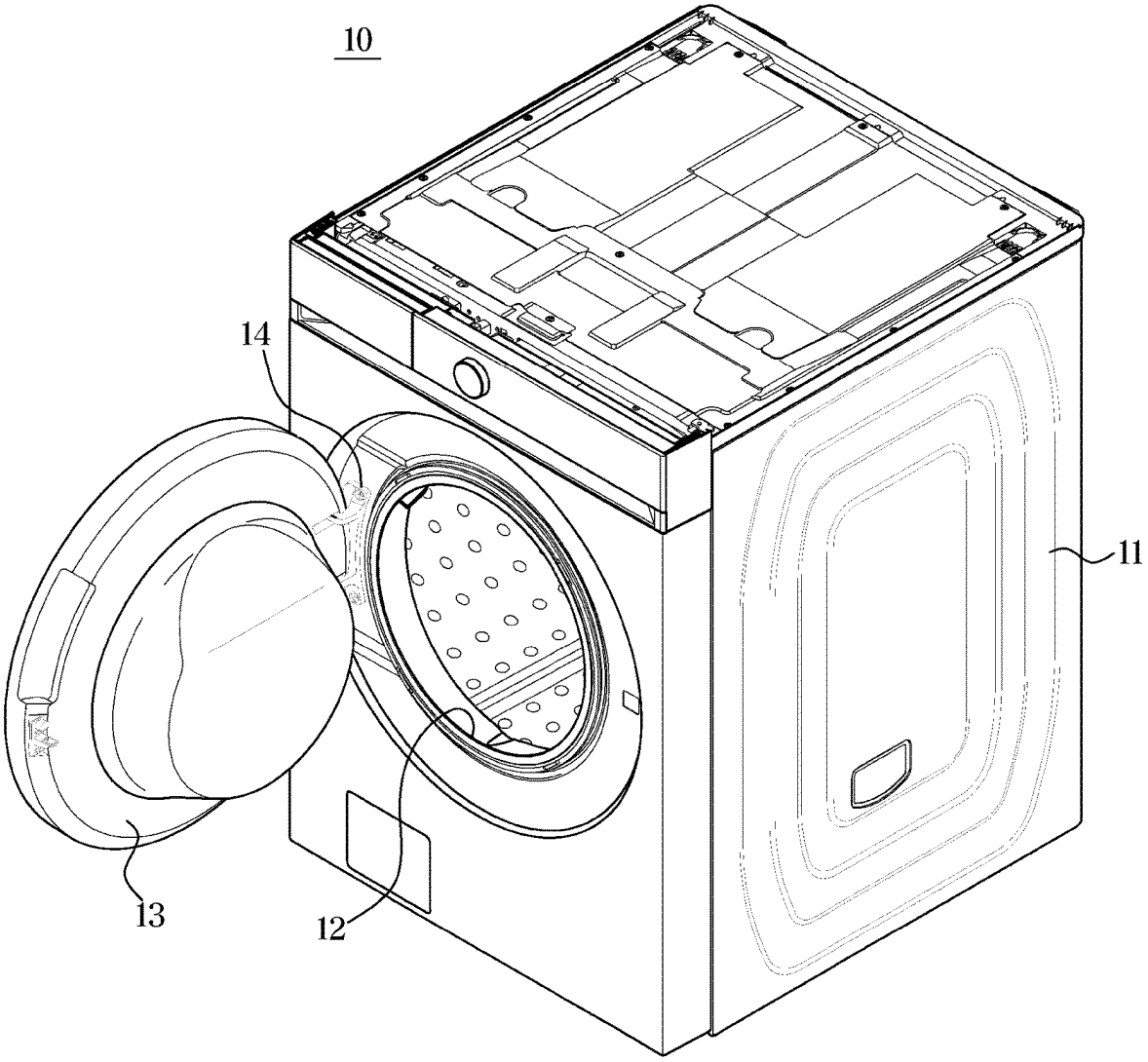


FIG. 3

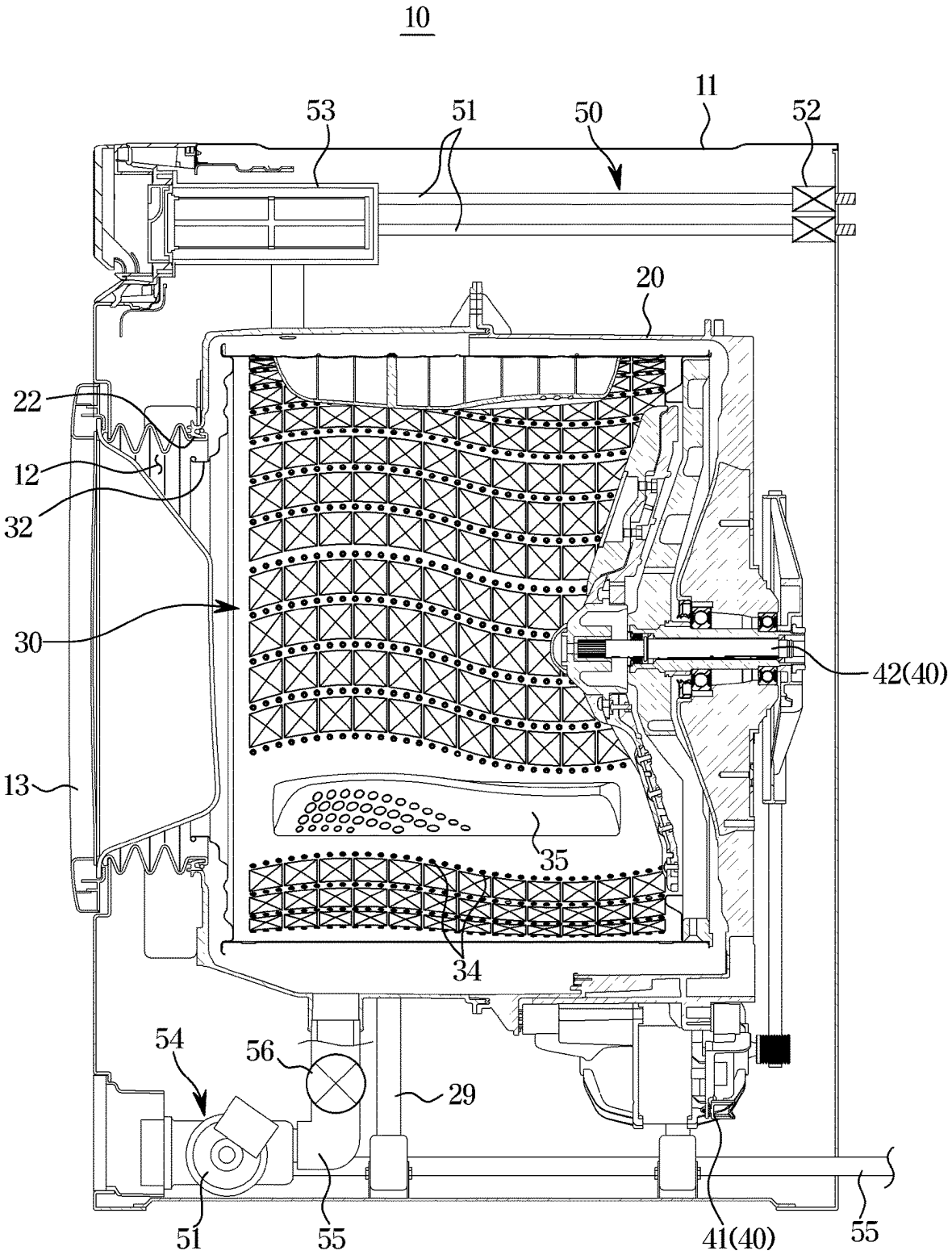


FIG. 4

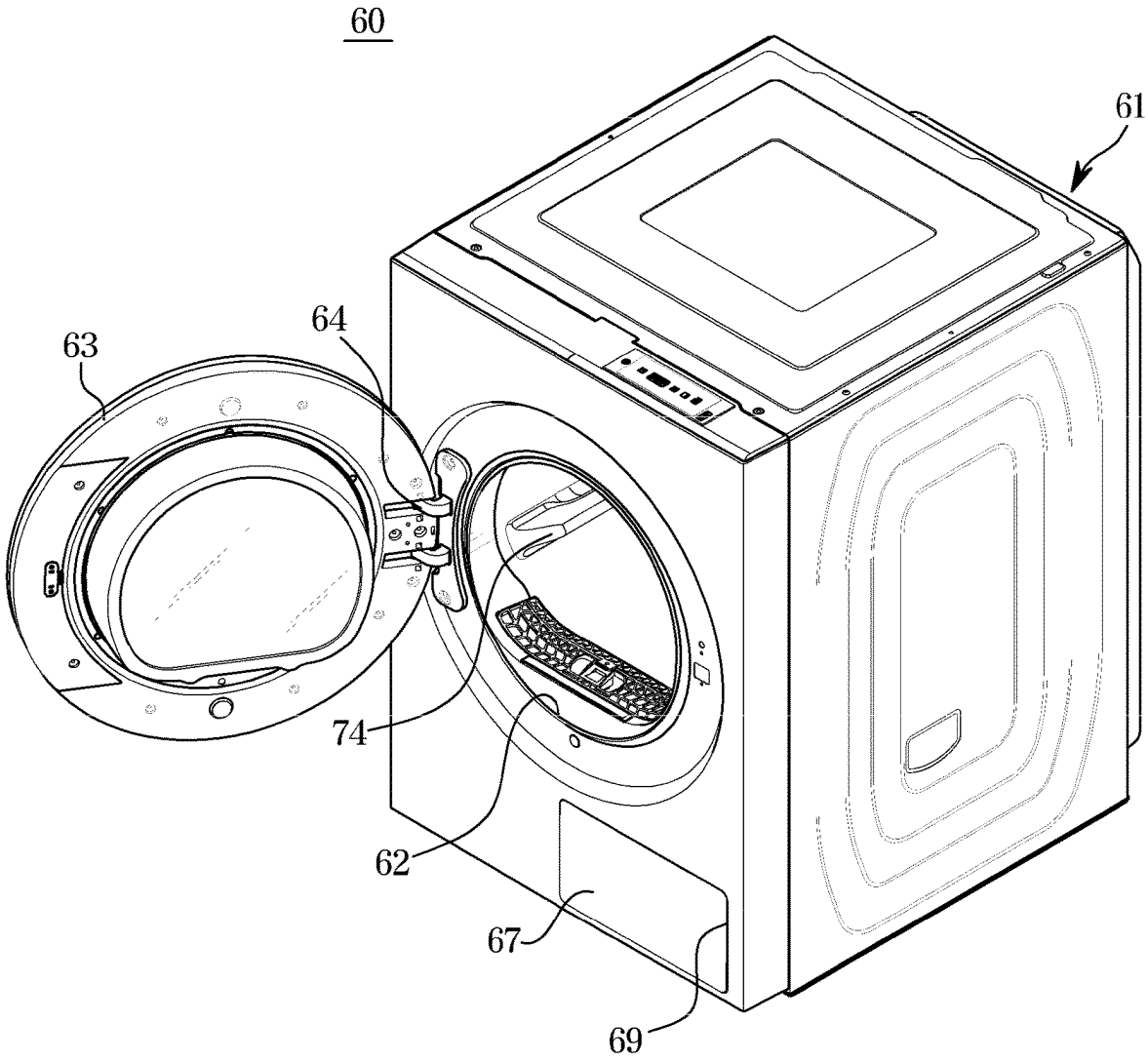


FIG. 5

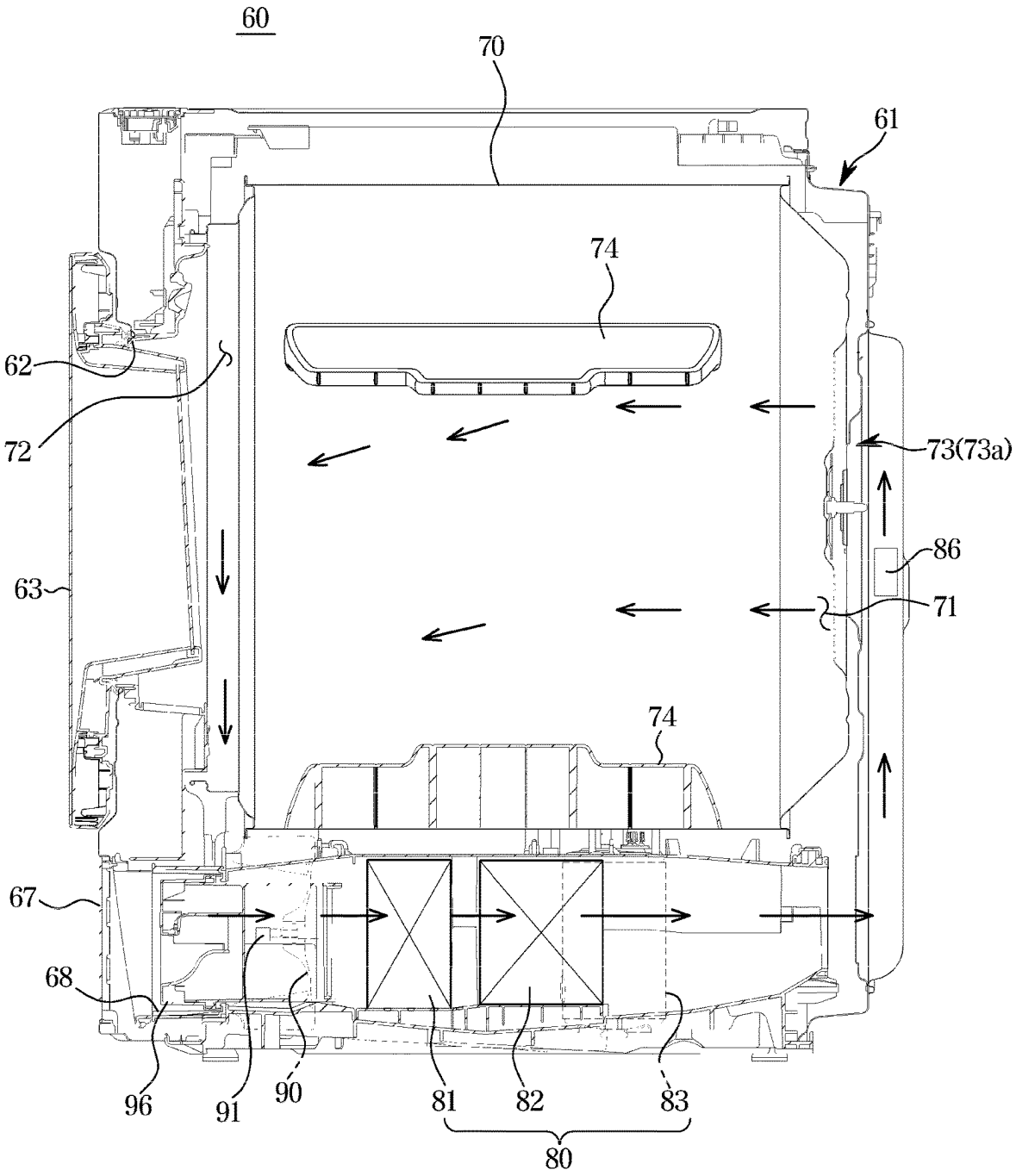


FIG. 6

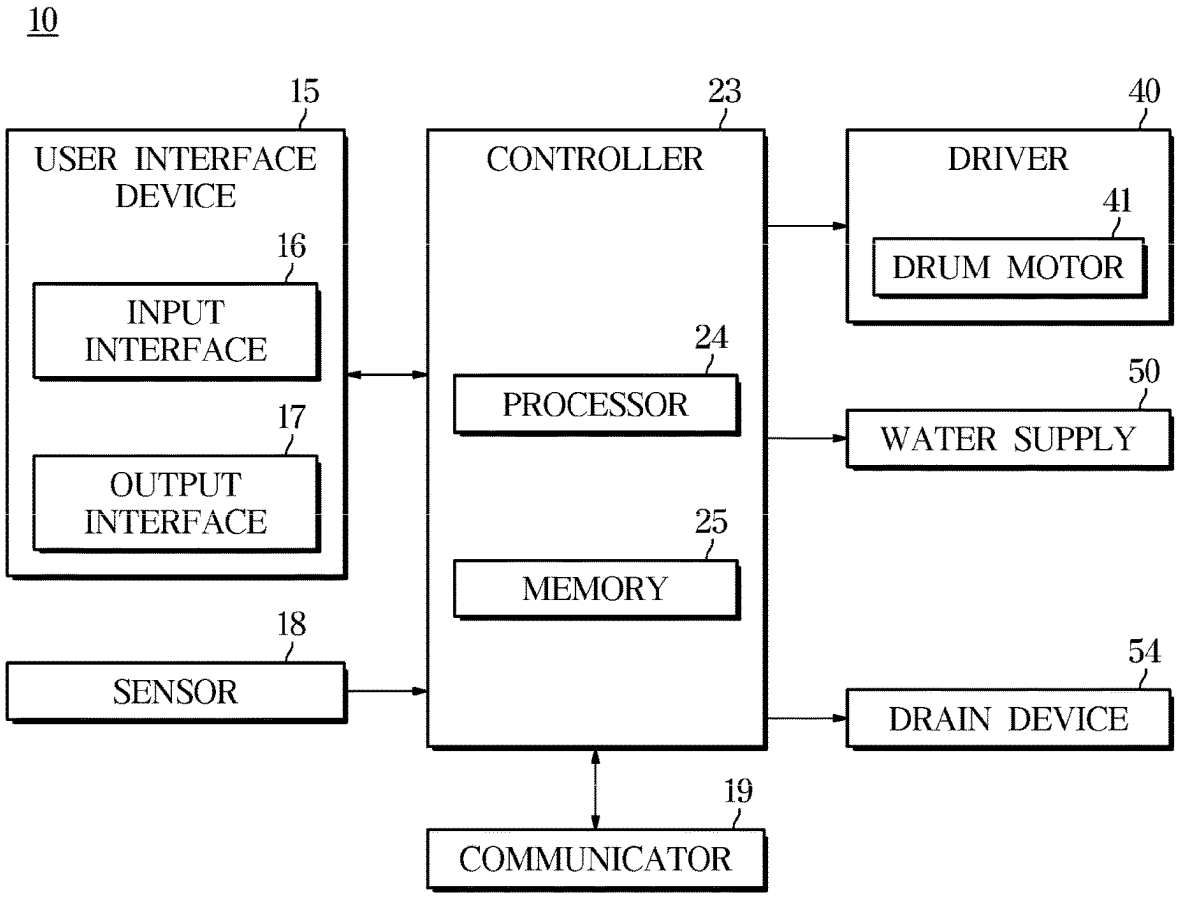

10
15
USER INTERFACE DEVICE
16
INPUT INTERFACE
17
OUTPUT INTERFACE
18
SENSOR
23
CONTROLLER
24
PROCESSOR
25
MEMORY
19
COMMUNICATOR
40
DRIVER
41
DRUM MOTOR
50
WATER SUPPLY
54
DRAIN DEVICE

FIG. 7

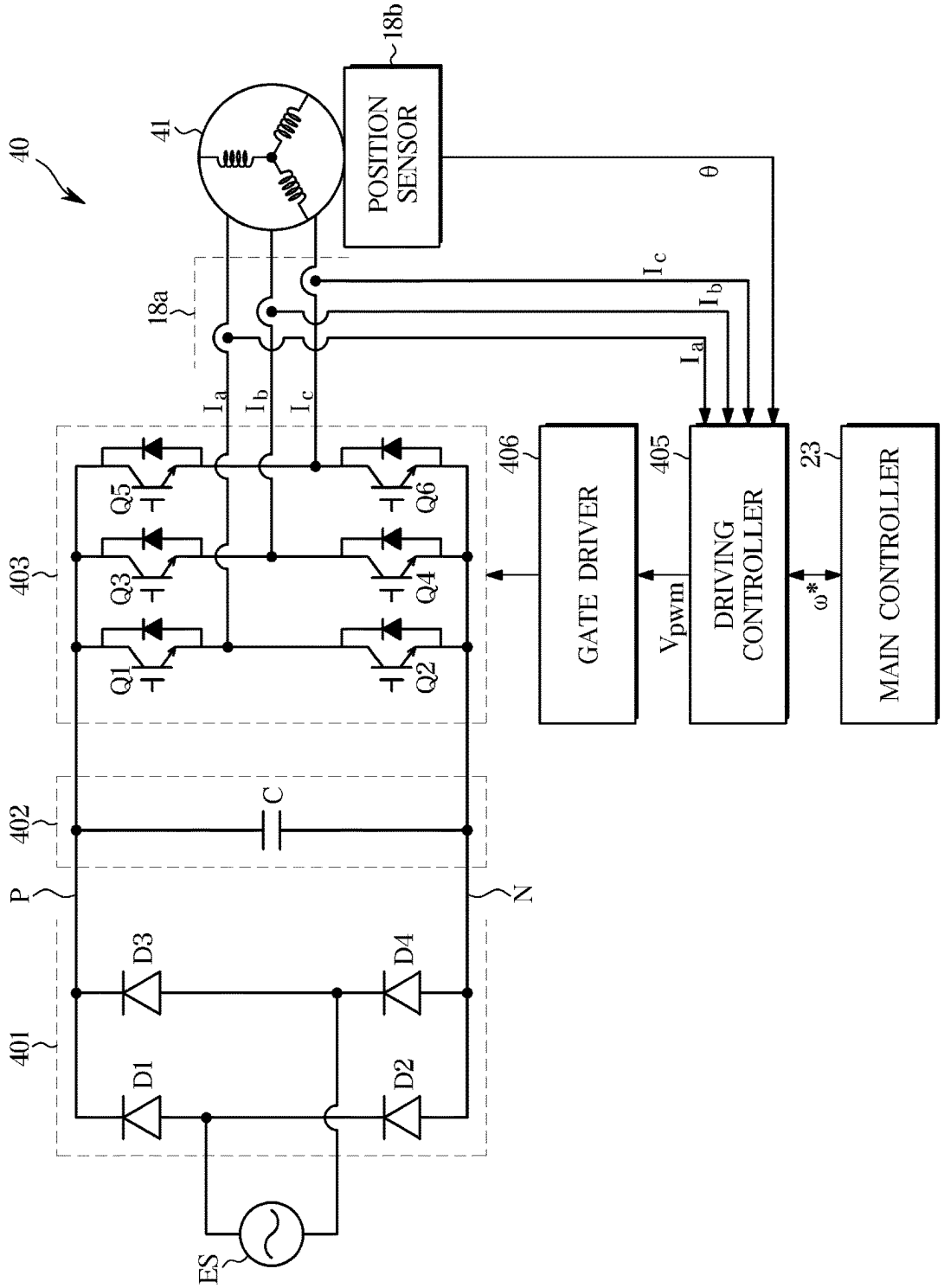

40
41
18b
POSITION SENSOR
θ
18a
I_a
I_b
I_c
403
Q1
Q2
Q3
Q4
Q5
Q6
406
GATE DRIVER
405
DRIVING CONTROLLER
V_{pwm}
23
MAIN CONTROLLER
ω*
402
C
P
N
401
D1
D2
D3
D4
ES

FIG. 8

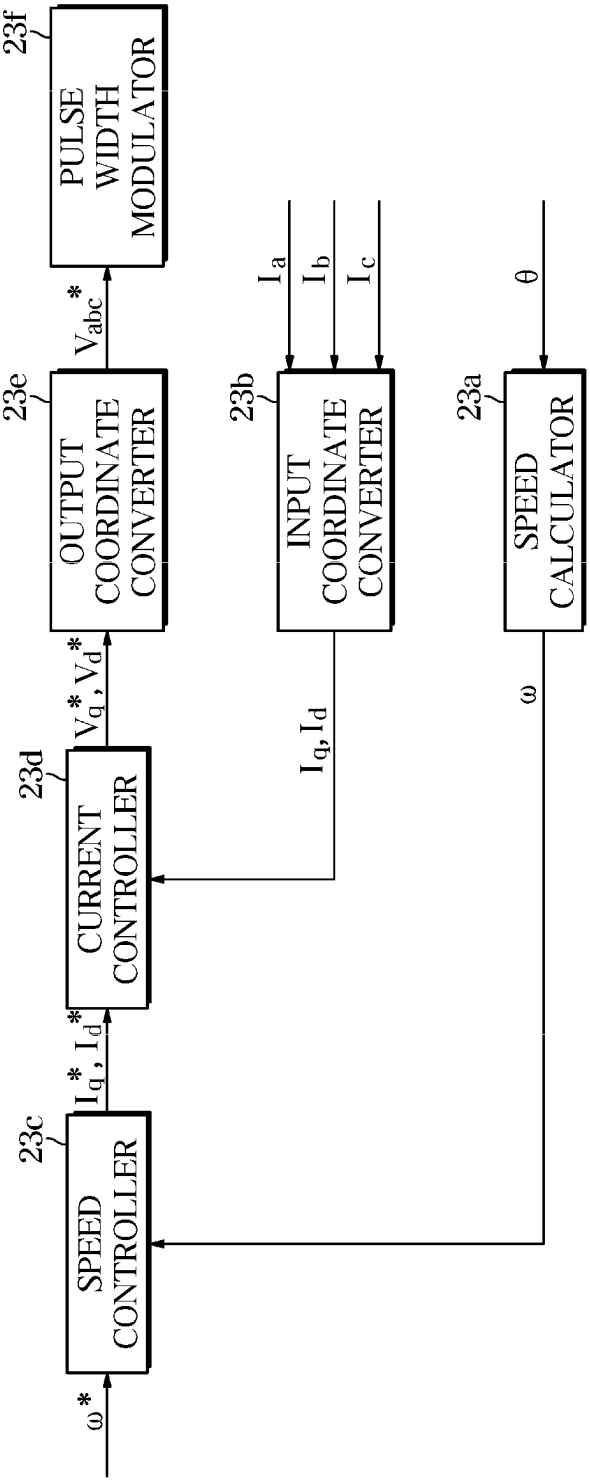

23f
PULSE WIDTH MODULATOR
23e
OUTPUT COORDINATE CONVERTER
23b
INPUT COORDINATE CONVERTER
23a
SPEED CALCULATOR
23d
CURRENT CONTROLLER
23c
SPEED CONTROLLER
V_{abc}^*
I_a
I_b
I_c
θ
V_q^*, V_d^*
I_q, I_d
ω
I_q^*, I_d^*
ω*

FIG. 9

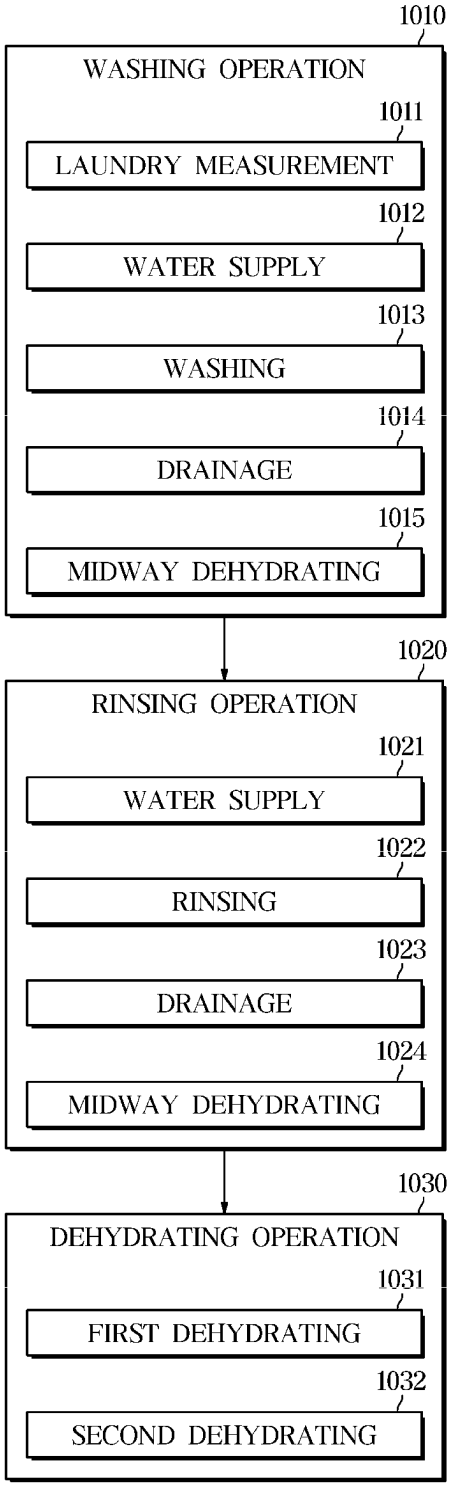

1010
WASHING OPERATION
1011
LAUNDRY MEASUREMENT
1012
WATER SUPPLY
1013
WASHING
1014
DRAINAGE
1015
MIDWAY DEHYDRATING
1020
RINSING OPERATION
1021
WATER SUPPLY
1022
RINSING
1023
DRAINAGE
1024
MIDWAY DEHYDRATING
1030
DEHYDRATING OPERATION
1031
FIRST DEHYDRATING
1032
SECOND DEHYDRATING

FIG. 10

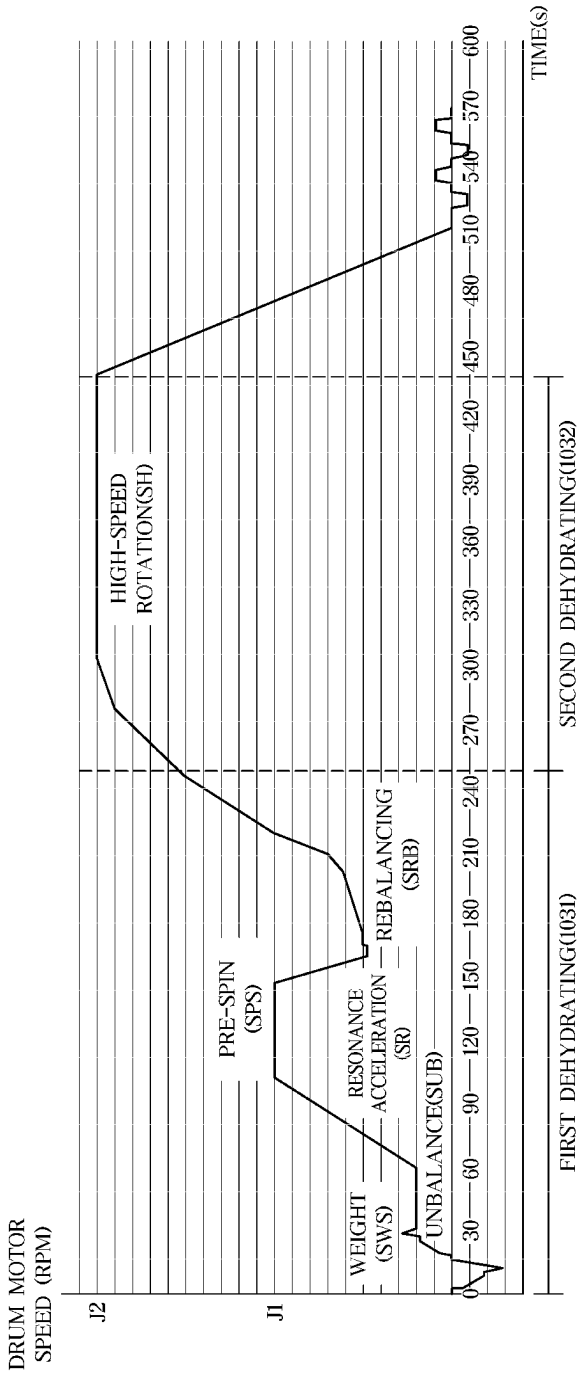

DRUM MOTOR SPEED (RPM)
J2
J1
HIGH-SPEED ROTATION(SH)
PRE-SPIN (SPS)
WEIGHT (SWS)
RESONANCE ACCELERATION (SR)
REBALANCING (SRB)
UNBALANCE(SUB)
0
30
60
90
120
150
180
210
240
270
300
330
360
390
420
450
480
510
540
570
600
TIME(s)
FIRST DEHYDRATING(1031)
SECOND DEHYDRATING(1032)

FIG. 11

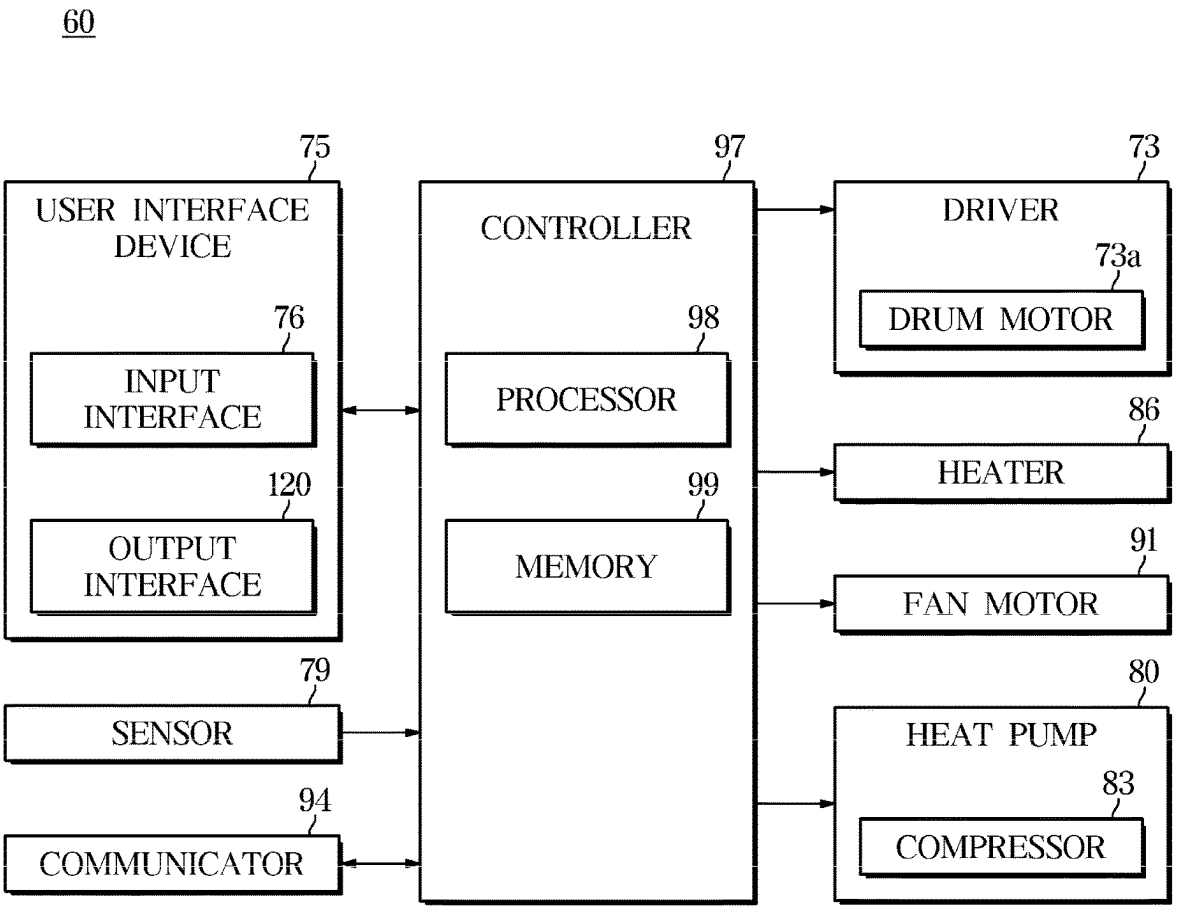

60
75
USER INTERFACE DEVICE
76
INPUT INTERFACE
120
OUTPUT INTERFACE
79
SENSOR
94
COMMUNICATOR
97
CONTROLLER
98
PROCESSOR
99
MEMORY
73
DRIVER
73a
DRUM MOTOR
86
HEATER
91
FAN MOTOR
80
HEAT PUMP
83
COMPRESSOR

FIG. 12

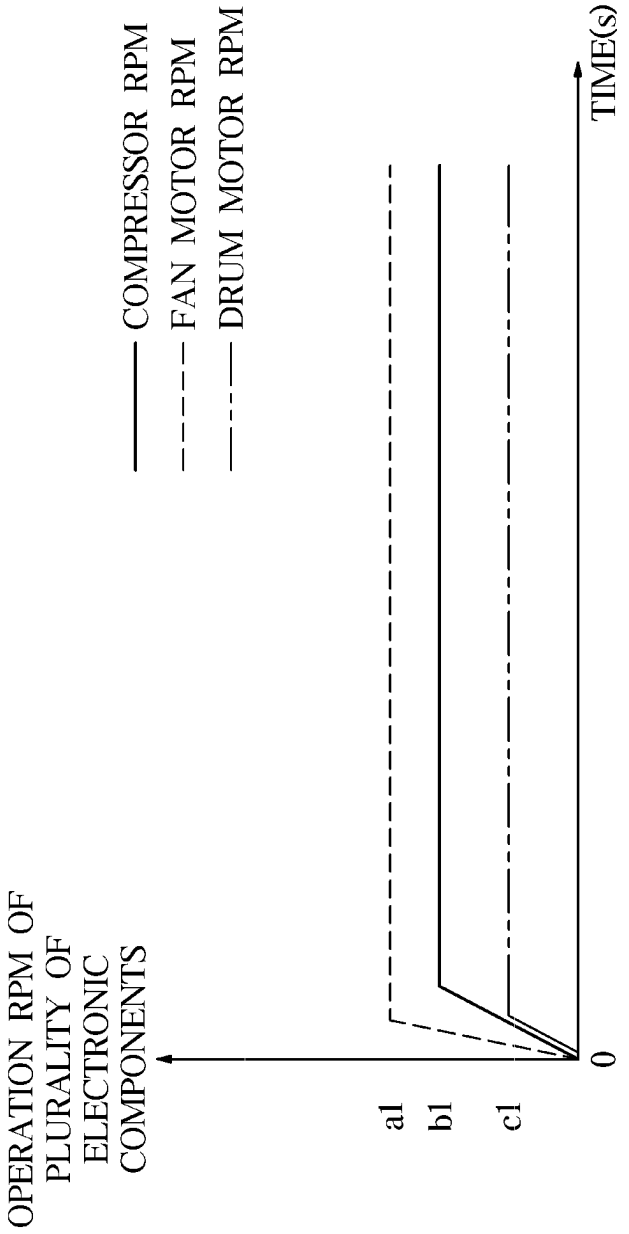

COMPRESSOR RPM
FAN MOTOR RPM
DRUM MOTOR RPM
OPERATION RPM OF PLURALITY OF ELECTRONIC COMPONENTS
TIME(s)
0
a1
b1
c1

FIG. 13

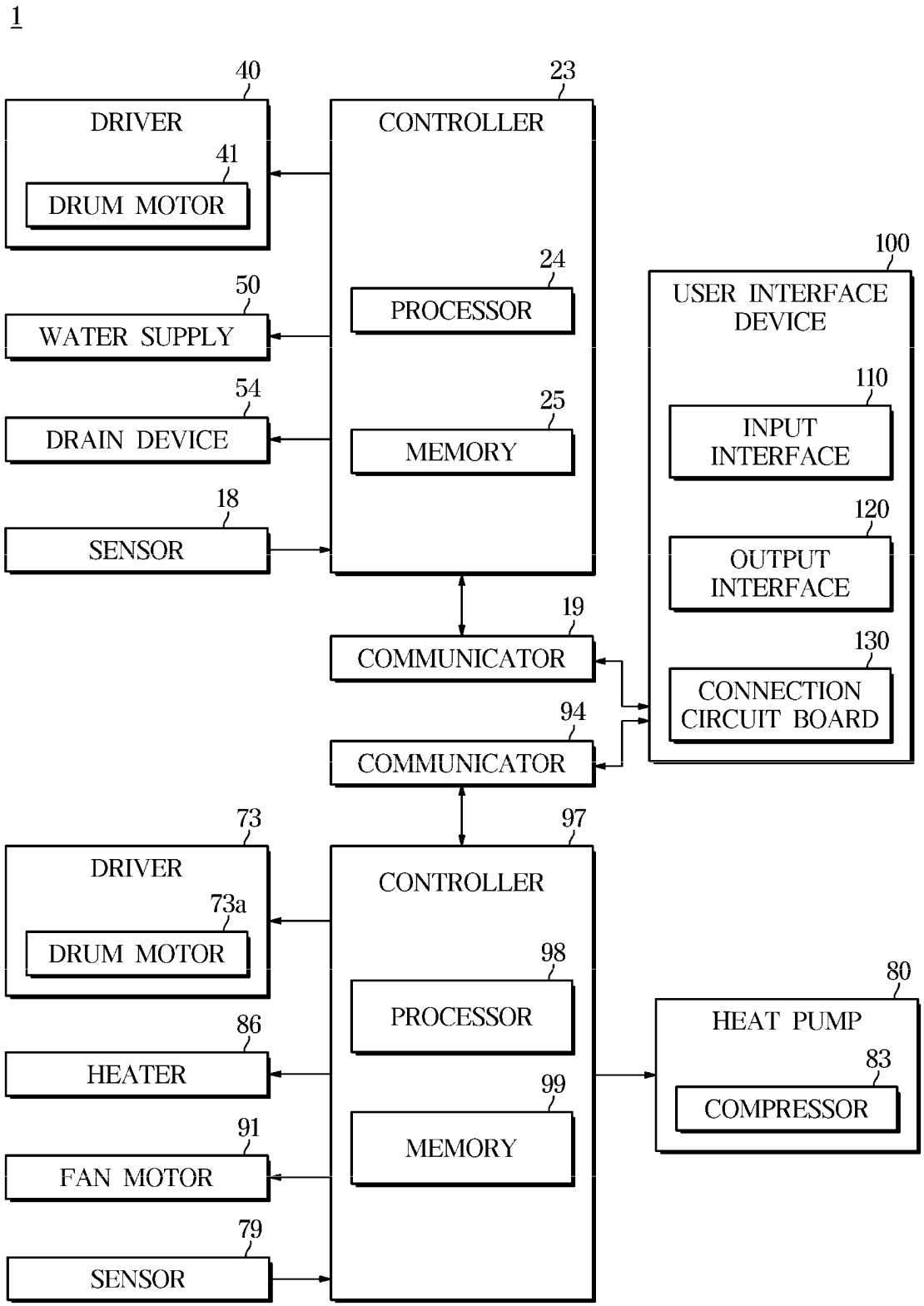

1
40
DRIVER
41
DRUM MOTOR
23
CONTROLLER
24
PROCESSOR
25
MEMORY
50
WATER SUPPLY
54
DRAIN DEVICE
18
SENSOR
100
USER INTERFACE DEVICE
110
INPUT INTERFACE
120
OUTPUT INTERFACE
130
CONNECTION CIRCUIT BOARD
19
COMMUNICATOR
94
COMMUNICATOR
73
DRIVER
73a
DRUM MOTOR
97
CONTROLLER
98
PROCESSOR
99
MEMORY
86
HEATER
91
FAN MOTOR
79
SENSOR
80
HEAT PUMP
83
COMPRESSOR

FIG. 14A

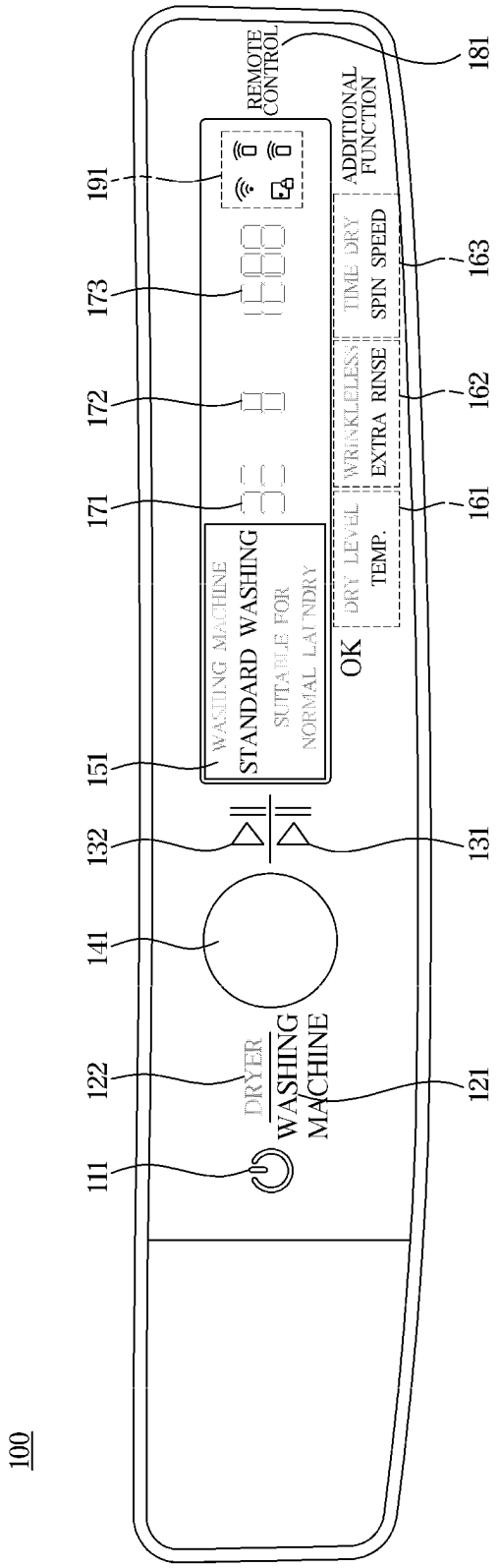

100
111
DRYER
WASHING MACHINE
122
121
141
132
131
151
WASHING MACHINE
STANDARD WASHING
SUITABLE FOR
NORMAL LAUNDRY
OK
171
DRY LEVEL
TEMP.
172
WRINKLELESS
EXTRA RINSE
173
TIME DRY
SPIN SPEED
191
REMOTE CONTROL
ADDITIONAL FUNCTION
181
161
162
163

FIG. 14B

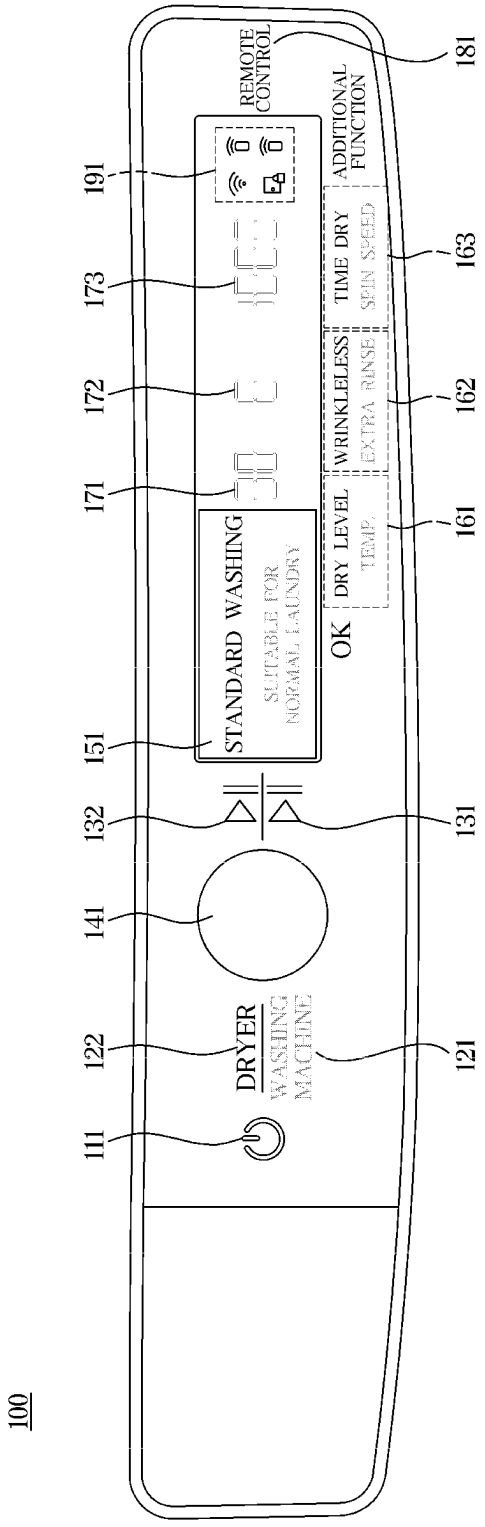

100
111
122
DRYER
WASHING MACHINE
121
141
132
131
151
STANDARD WASHING
SUITABLE FOR NORMAL LAUNDRY
OK
171
DRY LEVEL
TEMP
161
172
WRINKLELESS
EXTRA RINSE
162
173
TIME DRY
SPIN SPEED
163
191
ADDITIONAL FUNCTION
REMOTE CONTROL
181

FIG. 15

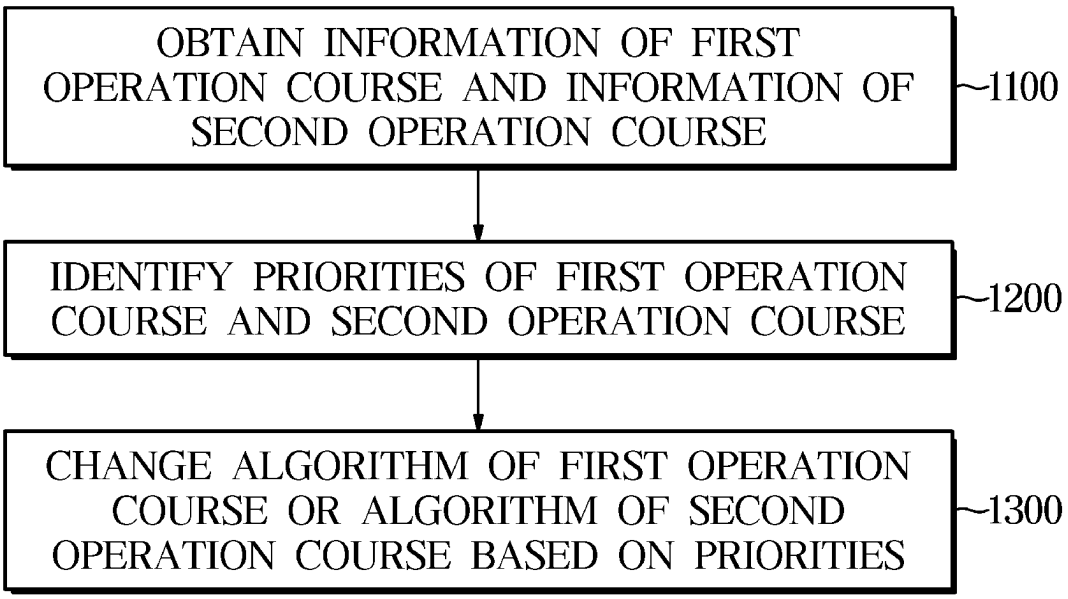

OBTAIN INFORMATION OF FIRST OPERATION COURSE AND INFORMATION OF SECOND OPERATION COURSE
1100
IDENTIFY PRIORITIES OF FIRST OPERATION COURSE AND SECOND OPERATION COURSE
1200
CHANGE ALGORITHM OF FIRST OPERATION COURSE OR ALGORITHM OF SECOND OPERATION COURSE BASED ON PRIORITIES
1300

FIG. 16

PRIORITY	OPERATION COURSE
1	ENERGY SAVING COURSE
2	TIME SAVING COURSE
3	LOW NOISE COURSE
4	DELICATE CLOTHES COURSE
5	STANDARD COURSE
⋮	⋮

FIG. 17A

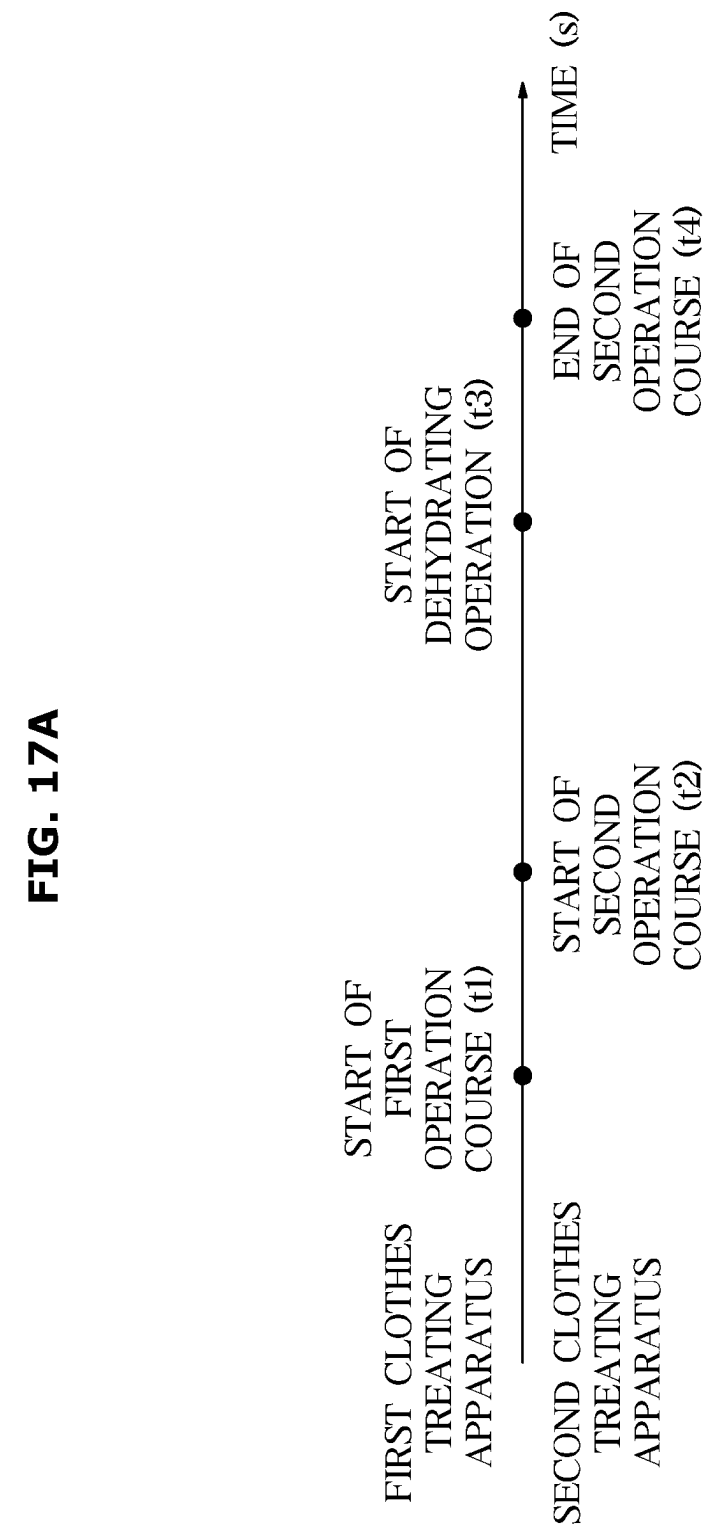

FIRST CLOTHES TREATING APPARATUS
SECOND CLOTHES TREATING APPARATUS
START OF FIRST OPERATION COURSE (t1)
START OF SECOND OPERATION COURSE (t2)
START OF DEHYDRATING OPERATION (t3)
END OF SECOND OPERATION COURSE (t4)
TIME (s)

FIG. 17B

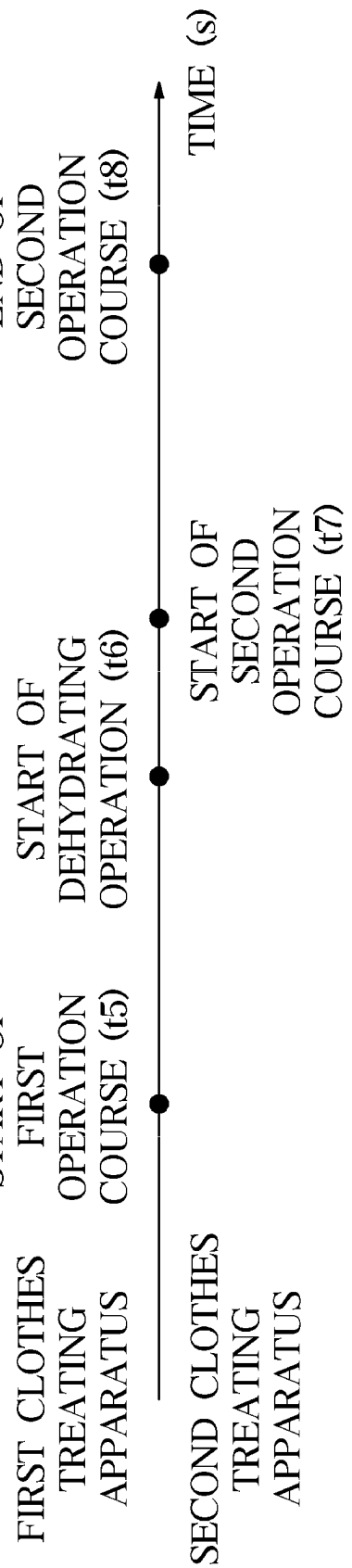

FIRST CLOTHES TREATING APPARATUS
SECOND CLOTHES TREATING APPARATUS
START OF FIRST OPERATION COURSE (t5)
START OF DEHYDRATING OPERATION (t6)
START OF SECOND OPERATION COURSE (t7)
END OF SECOND OPERATION COURSE (t8)
TIME (s)

FIG. 18

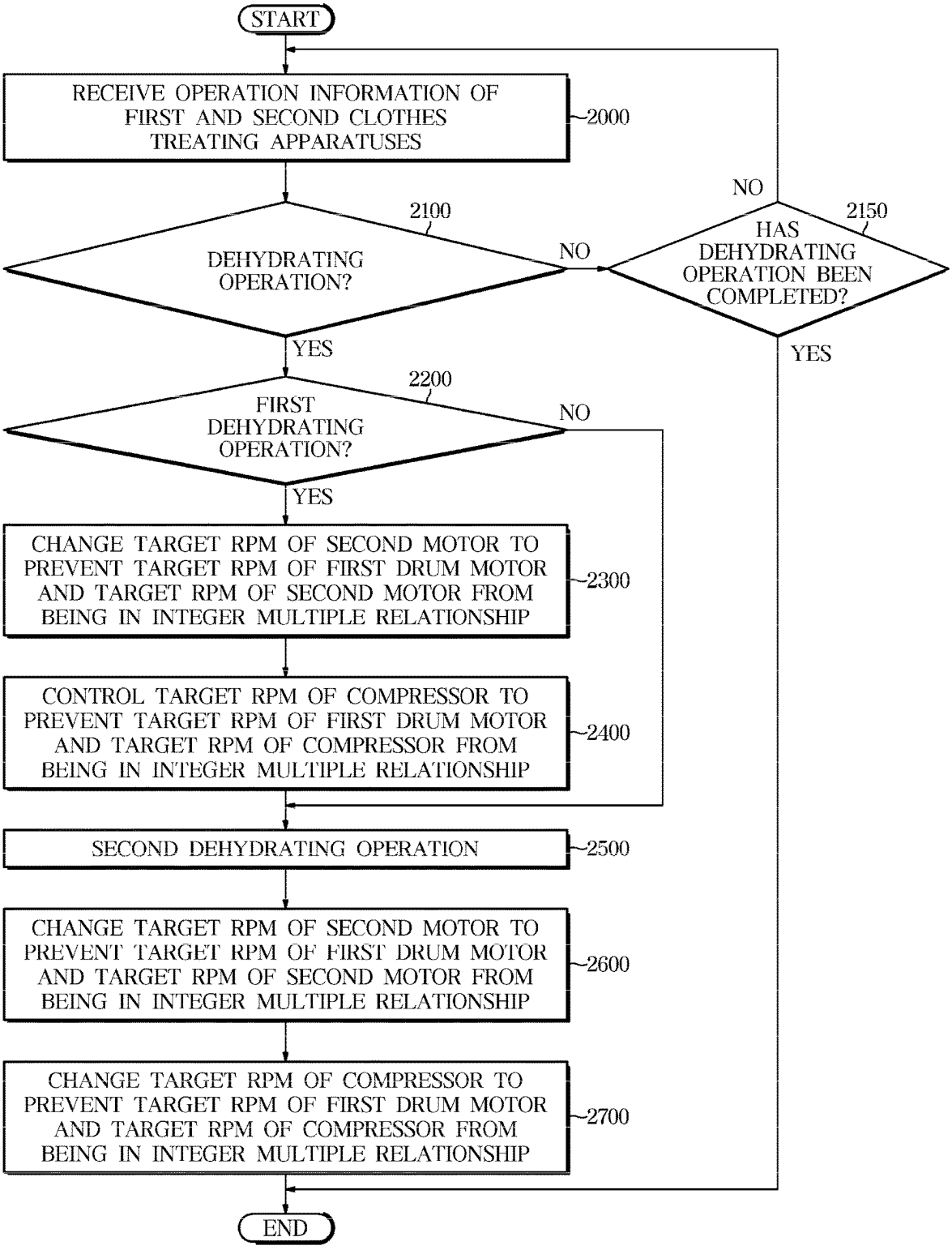

START
RECEIVE OPERATION INFORMATION OF FIRST AND SECOND CLOTHES TREATING APPARATUSES
2000
2100
DEHYDRATING OPERATION?
NO
2150
HAS DEHYDRATING OPERATION BEEN COMPLETED?
NO
YES
YES
2200
FIRST DEHYDRATING OPERATION?
NO
YES
CHANGE TARGET RPM OF SECOND MOTOR TO PREVENT TARGET RPM OF FIRST DRUM MOTOR AND TARGET RPM OF SECOND MOTOR FROM BEING IN INTEGER MULTIPLE RELATIONSHIP
2300
CONTROL TARGET RPM OF COMPRESSOR TO PREVENT TARGET RPM OF FIRST DRUM MOTOR AND TARGET RPM OF COMPRESSOR FROM BEING IN INTEGER MULTIPLE RELATIONSHIP
2400
SECOND DEHYDRATING OPERATION
2500
CHANGE TARGET RPM OF SECOND MOTOR TO PREVENT TARGET RPM OF FIRST DRUM MOTOR AND TARGET RPM OF SECOND MOTOR FROM BEING IN INTEGER MULTIPLE RELATIONSHIP
2600
CHANGE TARGET RPM OF COMPRESSOR TO PREVENT TARGET RPM OF FIRST DRUM MOTOR AND TARGET RPM OF COMPRESSOR FROM BEING IN INTEGER MULTIPLE RELATIONSHIP
2700
END

FIG. 19

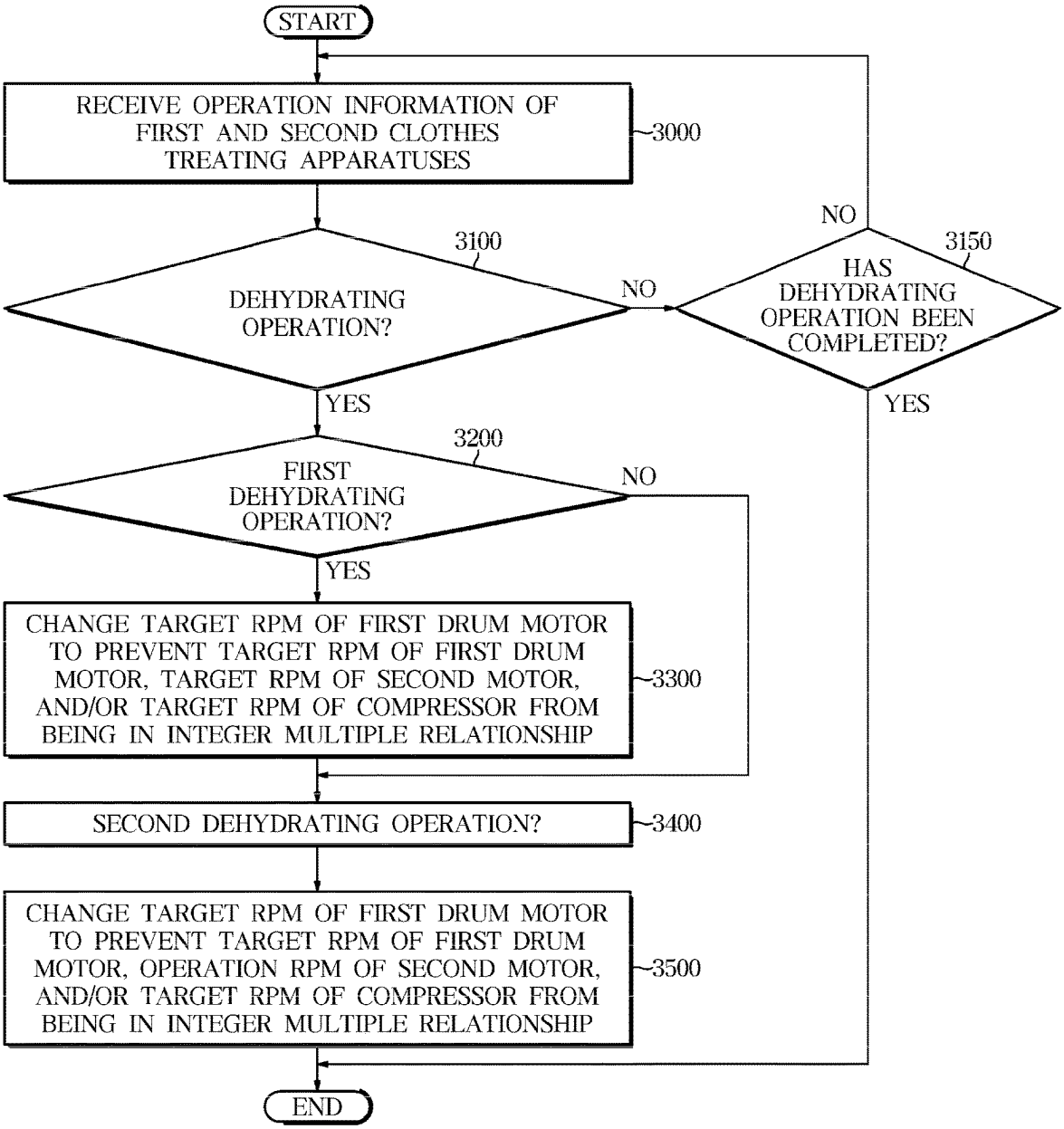
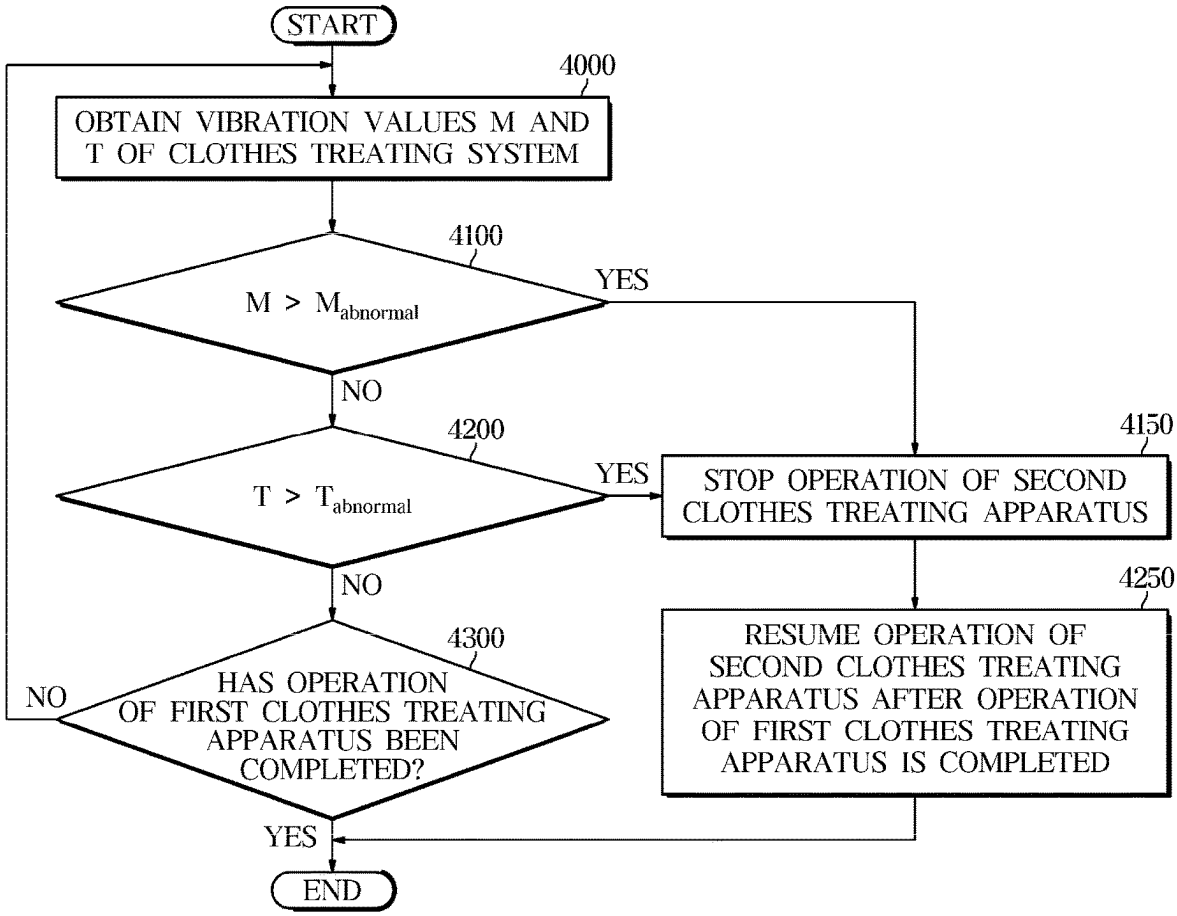

START
RECEIVE OPERATION INFORMATION OF FIRST AND SECOND CLOTHES TREATING APPARATUSES
3000
3100
DEHYDRATING OPERATION?
NO
3150
HAS DEHYDRATING OPERATION BEEN COMPLETED?
NO
YES
YES
3200
FIRST DEHYDRATING OPERATION?
NO
YES
CHANGE TARGET RPM OF FIRST DRUM MOTOR TO PREVENT TARGET RPM OF FIRST DRUM MOTOR, TARGET RPM OF SECOND MOTOR, AND/OR TARGET RPM OF COMPRESSOR FROM BEING IN INTEGER MULTIPLE RELATIONSHIP
3300
SECOND DEHYDRATING OPERATION?
3400
CHANGE TARGET RPM OF FIRST DRUM MOTOR TO PREVENT TARGET RPM OF FIRST DRUM MOTOR, OPERATION RPM OF SECOND MOTOR, AND/OR TARGET RPM OF COMPRESSOR FROM BEING IN INTEGER MULTIPLE RELATIONSHIP
3500
END

FIG. 20


START
4000
OBTAIN VIBRATION VALUES M AND T OF CLOTHES TREATING SYSTEM
4100
M > M_abnormal
YES
NO
4200
T > T_abnormal
YES
4150
STOP OPERATION OF SECOND CLOTHES TREATING APPARATUS
NO
4250
RESUME OPERATION OF SECOND CLOTHES TREATING APPARATUS AFTER OPERATION OF FIRST CLOTHES TREATING APPARATUS IS COMPLETED
4300
HAS OPERATION OF FIRST CLOTHES TREATING APPARATUS BEEN COMPLETED?
NO
YES
END

CLOTHES TREATING SYSTEM AND CONTROL METHOD THEREOF

CROSS-REFERENCE TO RELATED APPLICATIONS

This application is a continuation application, under 35 U.S.C. § 111 (a), of International Application No. PCT/KR2023/012628, filed on Aug. 25, 2023, which claims priority under 35 U.S.C. § 119 to Korean Patent Application No. 10-2022-0157698, filed on Nov. 22, 2022 and Korean Patent Application No. 10-2023-0008339, filed on Jan. 19, 2023, in the Korean Intellectual Property Office, the disclosures of which are incorporated by reference herein in their entireties.

BACKGROUND

1. Field

The disclosure relates to a clothes treating system including a washing machine and a plurality of clothes treating apparatuses, and a method for controlling the clothes treating system.

2. Description of the Related Art

A clothes treating apparatus is an apparatus for treating and/or caring for clothes. Clothes treating apparatuses include a washing machine and a dryer.

The washing machine is an apparatus for washing laundry put into the tub through friction by stirring the laundry, water, and a detergent together with a driving force of the drum motor. Operations that are performed by the washing machine include, regardless of the kind of the washing machine, a washing operation of supplying a detergent and water into the tub in which laundry is accommodated and washing the laundry while rotating the drum, a rinsing operation of supplying water to the tub and rinsing the laundry by rotating the drum, and a dehydrating operation of discharging water from the tub and removing water of the laundry by rotating the drum.

The dryer is an apparatus for drying objects with hot and dry air. The dryer is configured to dry objects by passing hot wind through the drum while rotating the drum in which the objects are accommodated at low speed. An operation that is performed by the dryer includes a drying operation of drying objects.

For the convenience of use, a plurality of clothes treating apparatuses may be connected to each other and used.

SUMMARY

Aspects of embodiments of the disclosure will be set forth in part in the description which follows and, in part, will be apparent from the description, or may be learned by practice of the presented embodiments.

According to an embodiment of the disclosure, provided is a method of controlling a clothes treating system including a first clothes treating apparatus and a second clothes treating apparatus electrically connected to the first clothes treating apparatus, the method including obtaining information about an operation course of the first clothes treating apparatus and information about an operation course of the second clothes treating apparatus; identifying a priority between the operation course of the first clothes treating apparatus and the operation course of the second clothes treating apparatus based on the obtained information about the operation course of the first clothes treating apparatus and the obtained information about the operation course of the second clothes treating apparatus; and changing an algorithm of the operation course of the first clothes treating apparatus or an algorithm of the operation course of the second clothes treating apparatus based on the identified priority between the operation course of the first clothes treating apparatus and the operation course of the second clothes treating apparatus.

According to an embodiment of the disclosure, the changing the algorithm of the operation course of the first clothes treating apparatus or the algorithm of the operation course of the second clothes treating apparatus may include changing the algorithm of the operation course of the second clothes treating apparatus in response to identifying that the operation course of the first clothes treating apparatus has the priority over the operation course of the second clothes treating apparatus.

According to an embodiment of the disclosure, the changing the algorithm of the operation course of the first clothes treating apparatus or the algorithm of the operation course of the second clothes treating apparatus may include changing the algorithm of the operation course of the first clothes treating apparatus in response to identifying that the operation course of the second clothes treating apparatus has the priority over the operation course of the first clothes treating apparatus.

According to an embodiment of the disclosure, the identifying the priority between the operation course of the first clothes treating apparatus and the operation course of the second clothes treating apparatus may include identifying the priority between the operation course of the first clothes treating apparatus and the operation course of the second clothes treating apparatus based on a lookup table in which priorities of a plurality of operation courses capable of being performed by the first clothes treating apparatus and the second clothes treating apparatus are mapped.

According to an embodiment of the disclosure, the first clothes treating apparatus is a washing machine may include a drum, and a drum motor to rotate the drum, and the second clothes treating apparatus is a dryer may include at least one of a compressor, and a fan and a fan motor to rotate the fan.

According to an embodiment of the disclosure, the changing the algorithm of the operation course of the first clothes treating apparatus may include changing a target revolutions per minute (RPM) of the drum motor, corresponding to the operation course of the first clothes treating apparatus, to prevent the target RPM of the drum motor and a target RPM of the fan motor, corresponding to the operation course of the second clothes treating apparatus, from being in an integer multiple relationship.

According to an embodiment of the disclosure, the changing the algorithm of the operation course of the first clothes treating apparatus may include changing a target revolutions per minute (RPM) of the drum motor, corresponding to the operation course of the first clothes treating apparatus, to prevent the target RPM of the drum motor and a target RPM of the compressor, corresponding to the operation course of the second clothes treating apparatus, from being in an integer multiple relationship.

According to an embodiment of the disclosure, the changing the algorithm of the operation course of the second clothes treating apparatus may include changing a target revolutions per minute (RPM) of the fan motor, corresponding to the operation course of the second clothes treating apparatus, to prevent a target RPM of the drum motor,

corresponding to the operation course of the first clothes treating apparatus, and the target RPM of the fan motor from being in an integer multiple relationship.

According to an embodiment of the disclosure, the changing the algorithm of the operation course of the second clothes treating apparatus may include changing a target revolutions per minute (RPM) of the compressor, corresponding to the operation course of the second clothes treating apparatus, to prevent a target RPM of the drum motor, corresponding to the operation course of the first clothes treating apparatus, and the target RPM of the compressor from being in an integer multiple relationship.

According to an embodiment of the disclosure, the method may further include obtaining an inside temperature of the dryer. The changing the target RPM of the compressor may include up-regulating the target RPM of the compressor in response to the obtained inside temperature of the dryer being lower than a target temperature, and down-regulating the target RPM of the compressor in response to the obtained inside temperature of the dryer being higher than the target temperature.

According to an embodiment of the disclosure, the method may further include obtaining a vibration value of the clothes treating system; and stopping the operation course of the second clothes treating apparatus in response to the obtained vibration value of the clothes treating system being greater than a preset value.

According to an embodiment of the disclosure, the method may further include resuming the operation course of the second clothes treating apparatus in response to the operation course of the first clothes treating apparatus being completed.

According to an embodiment of the disclosure, the method may further include changing a target revolutions per minute (RPM) of the compressor or a target RPM of the fan motor in response to the operation course of the first clothes treating apparatus and the operation course of the second clothes treating apparatus having the same priority.

According to an embodiment of the disclosure, the method may further include obtaining a revolutions per minute (RPM) of the drum motor corresponding to the operation course of the first clothes treating apparatus; changing, while the operation course of the first clothes treating apparatus and the operation course of the second clothes treating apparatus having the same priority, a target revolutions per minute (RPM) of the compressor or a target RPM of the fan motor according to the obtained RPM of the drum motor being greater than a preset value; and changing, while the operation course of the first clothes treating apparatus and the operation course of the second clothes treating apparatus having the same priority, a target RPM of the drum motor according to the obtained RPM of the drum motor being smaller than the preset value.

According to an embodiment of the disclosure, a clothes treating system including a first clothes treating apparatus including a drum, a drum motor configured to rotate the drum, and a first controller configured to control the drum motor; a second clothes treating apparatus including a fan, a fan motor configured to rotate the fan, a compressor, and a second controller configured to control the fan motor and the compressor; and a user interface device configured to receive a user input selecting an operation course of the first clothes treating apparatus and an operation course of the second clothes treating apparatus. The first controller is configured to change an algorithm of the operation course of the first clothes treating apparatus based on a priority between the operation course of the first clothes treating apparatus and the operation course of the second clothes treating apparatus. The second controller is configured to change an algorithm of the operation course of the second clothes treating apparatus based on the priority between the operation course of the first clothes treating apparatus and the operation course of the second clothes treating apparatus.

BRIEF DESCRIPTION OF THE DRAWINGS

These and/or other embodiments of the disclosure will become apparent and more readily appreciated from the following description of embodiments, taken in conjunction with the accompanying drawings of which:

FIG. **1** shows a clothes treating system according to an embodiment of the disclosure;

FIG. **2** shows a first clothes treating apparatus of a clothes treating system according to an embodiment of the disclosure;

FIG. **3** shows a cross section of a first clothes treating apparatus of a clothes treating system according to an embodiment of the disclosure;

FIG. **4** shows a second clothes treating apparatus of a clothes treating system according to an embodiment of the disclosure;

FIG. **5** shows a cross section of a second clothes treating apparatus of a clothes treating system according to an embodiment of the disclosure;

FIG. **6** is a control block diagram of a first clothes treating apparatus according to an embodiment of the disclosure;

FIG. **7** shows an example of a driver included in a first clothes treating apparatus according to an embodiment of the disclosure;

FIG. **8** shows an example of a controller included in a first clothes treating apparatus according to an embodiment of the disclosure;

FIG. **9** shows an example of an operation cycle of a first clothes treating apparatus according to an embodiment of the disclosure;

FIG. **10** shows an example of an operation revolutions per minute (RPM) profile of a drum motor in an operation of an operation cycle of a first clothes treating apparatus according to an embodiment of the disclosure;

FIG. **11** is a control block diagram of a second clothes treating apparatus according to an embodiment of the disclosure;

FIG. **12** shows examples of operation RPM profiles of a plurality of electronic components in an operation of a second clothes treating apparatus according to an embodiment of the disclosure;

FIG. **13** is a control block diagram of a clothes treating system according to an embodiment of the disclosure;

FIGS. **14**A and **14**B show an example of an appearance of a user interface device according to an embodiment of the disclosure;

FIG. **15** is a flowchart showing an example of a method for controlling a clothes treating system according to an embodiment of the disclosure;

FIG. **16** is a lookup table showing an example of priorities for operation courses of a clothes treating system according to an embodiment of the disclosure;

FIGS. **17**A and **17**B are views for describing an example of a method for setting the same priorities of a first operation course and a second operation course to different priorities according to an embodiment of the disclosure;

FIG. **18** shows an example of a method for controlling a clothes treating system according to an embodiment of the

disclosure while a priority of a first operation course is higher than a priority of a second operation course;

FIG. **19** shows an example of a method for controlling a clothes treating system according to an embodiment of the disclosure while a priority of a second operation course is higher than a priority of a first operation course; and

FIG. **20** is a flowchart showing an example of a method for controlling a clothes treating system according to an embodiment of the disclosure.

DETAILED DESCRIPTION

Configurations illustrated in the embodiments and the drawings described in the present specification are only the preferred embodiments of the disclosure, and thus it is to be understood that various modified examples, which may replace the embodiments and the drawings described in the present specification, are possible when filing the present application.

Also, the terms used in the present specification are merely used to describe the embodiments, and are not intended to limit and/or restrict the disclosure.

For example, it is to be understood that the singular forms "a," "an," and "the" include plural referents unless the context clearly dictates otherwise.

As used herein, each of such phrases as "A or B," "at least one of A and B," "at least one of A or B," "A, B, or C," "at least one of A, B, and C," and "at least one of A, B, or C," may include any one of, or all possible combinations of the items enumerated together in a corresponding one of the phrases.

The term "and/or" includes any and all combinations of one or more of associated listed items.

As used herein, such terms as "first" and "second" may be used to simply distinguish a corresponding component from another, and does not limit the components in other aspect (for example, importance or order).

It is to be understood that if a certain component (for example, a first component) is referred to, with or without the term "operatively" or "communicatively", as "coupled with," "coupled to," "connected with," or "connected to" another component (for example, a second component), it means that the component may be coupled with the other component directly (for example, wiredly), wirelessly, or via a third component.

It is to be understood that the terms such as "including" or "having," etc., are intended to indicate the existence of the features, numbers, steps, operations, components, parts, or combinations thereof disclosed in the specification, and are not intended to preclude the possibility that one or more other features, numbers, steps, operations, components, parts, or combinations thereof may exist or may be added.

It is to be understood that if a certain component is referred to as being "coupled with," "coupled to," "supported on" or "in contact with" another component, it means that the component may be coupled with the other component directly or indirectly via a third component.

It will also be understood that when a certain component is referred to as being "on" or "over" another component, it can be directly on the other component or intervening components may also be present.

In addition, the terms "portion", "device", "block", "member", and "module" used herein refer to a unit for processing at least one function or operation. For example, the terms may mean at least one process that may be processed by at least one hardware such as field-programmable gate array (FPGA) or application specific integrated circuit (ASIC), or at least one software or processor stored in a memory.

A washing machine according to various embodiments of the disclosure may perform a washing operation, a rinsing operation, a dehydrating operation, and a drying operation. The washing machine is an example of a clothes treating apparatus, and may be a concept including an apparatus for washing clothes (an object to be washed or an object to be dried), an apparatus for drying clothes, and an apparatus capable of performing both washing and drying.

The washing machine according to various embodiments of the disclosure may include a top-loading washing machine, wherein an inlet through which laundry is put into or taken out of the top-loading washing machine opens upward, or a front-loading washing machine, wherein a laundry inlet opens in a front direction. The washing machine according to various embodiments of the disclosure may include another loading type of washing machine other than the top-loading washing machine and the front-loading washing machine.

The top-loading washing machine may wash laundry with water streams generated by a rotating body such as a pulsator. The front-loading washing machine may wash laundry by rotating a drum to repeatedly raise and drop the laundry. The front-loading washing machine may include a washing machine with a drying function, which is capable of drying laundry accommodated in a drum. The washing machine with the drying function may include a hot air supply for supplying hot air into the drum and a condenser for removing moisture of air discharged from the drum. For example, the washing machine with the drying function may include a heat pump. The washing machine according to various embodiments of the disclosure may include a washing machine using another washing method other than the above-described washing methods.

Embodiments of the disclosure may provide a clothes treating system capable of reducing vibrations that are generated by operations of a plurality of clothes treating apparatuses.

Embodiments of the disclosure may provide a clothes treating system with improved stability.

Embodiments of the disclosure may provide a clothes treating system capable of reducing vibrations that may be generated, while satisfying a user's requirement.

Embodiments of the disclosure are not limited to the various aspects mentioned above, and other aspects not mentioned will be clearly understood by those of ordinary skill in the technical art to which the disclosure belongs from the following description.

Hereinafter, a clothes treating system according to various embodiments of the disclosure will be described in detail with reference to the accompanying drawings.

FIG. **1** shows a clothes treating system according to an embodiment of the disclosure. FIG. **2** shows a first clothes treating apparatus of a clothes treating system according to an embodiment of the disclosure. FIG. **3** shows a cross section of a first clothes treating apparatus according to an embodiment of the disclosure. FIG. **4** shows a second clothes treating apparatus of a clothes treating system according to an embodiment of the disclosure. FIG. **5** shows a cross section of a second clothes treating apparatus according to an embodiment of the disclosure.

As shown in FIG. **1**, a clothes treating system **1** may include a first clothes treating apparatus **10**, and a second clothes treating apparatus **60** mounted on the first clothes

treating apparatus **10**. For example, the second clothes treating apparatus **60** may be mounted on the first clothes treating apparatus **10**.

The first clothes treating apparatus **10** may be a washing machine or a dryer. For example, the first clothes treating apparatus **10** may be a washing machine.

Referring to FIGS. **2** and **3**, the first clothes treating apparatus **10** according to various embodiments of the disclosure may include a first housing **11** accommodating various components therein. The first housing **11** may be in a shape of a box, wherein a laundry inlet **12** is formed at one side of the first housing **11**.

The first clothes treating apparatus **10** may include a first door **13** for opening or closing the laundry inlet **12**. The first door **13** may be rotatably mounted on the first housing **11** by a first hinge **14**. At least one portion of the first door **13** may be transparent or translucent to show inside of the first housing **11**.

The first clothes treating apparatus **10** may include a tub **20** provided inside the first housing **11** to store water. The tub **20** may be substantially in a shape of a cylinder, wherein a tub opening **22** is formed at one side of the tub **20**, and the tub **20** may be positioned inside the first housing **11** such that the tub opening **22** is positioned to correspond to the laundry inlet **12**.

The tub **20** may be connected to the first housing **11** by a damper **29**. The damper **29** may absorb vibrations generated according to rotations of a first drum **30** to attenuate vibrations that are transferred to the first housing **11**.

The first clothes treating apparatus **10** may include the first drum **30** accommodating laundry.

The first drum **30** may be positioned inside the tub **20** such that a first drum opening **32** provided at one side of the first drum **30** corresponds to the laundry inlet **12** and the tub opening **22**. Laundry may pass through the laundry inlet **12**, the tub opening **22**, and the first drum opening **32** sequentially to be accommodated in the first drum **30** or taken out of the first drum **30**.

The first drum **30** may perform operations according to a washing operation, a rinsing operation, and/or a dehydrating operation, while rotating inside the tub **20**. A plurality of through holes **34** may be formed in a cylindrical wall of the first drum **30** such that water stored in the tub **20** enters the inside of the first drum **30** or is discharged out of the first drum **30**. At least one first lifter **35** may be installed on an inner circumferential surface of the first drum **30** to raise and drop laundry while the first drum **30** rotates.

The first clothes treating apparatus **10** may include a first driver **40** for rotating the first drum **30**. The first driver **40** may include a first drum motor **41**, and a first rotating shaft **42** for transferring a driving force generated in the first drum motor **41** to the first drum **30**. The first rotating shaft **42** may be connected to the first drum **30** by penetrating the tub **20**.

The first driver **40** may perform operations according to a washing operation, a rinsing operation and/or a dehydrating operation, or a drying operation by rotating the first drum **30** forward or backward.

The first clothes treating apparatus **10** may include a water supply **50** for supplying water to the tub **20**. The water supply **50** may include a water supply tube **51**, and a water supply valve **52** provided in the water supply tube **51**. The water supply tube **51** may be connected to an external water supply source. The water supply tube **51** may extend to a detergent supply device **53** and/or the tub **20** from the external water supply source. Water may be supplied to the tub **20** via the detergent supply device **53**. Water may be supplied to the tub **20** not via the detergent supply device **53**.

The water supply valve **52** may open or close the water supply tube **51** in response to an electrical signal from a controller. The water supply valve **52** may allow or block supply of water from the external water supply source to the tub **20**.

The water supply valve **52** may include, for example, a solenoid valve that is opened or closed in response to an electrical signal.

The first clothes treating apparatus **10** may include the detergent supply device **53** configured to supply a detergent to the tub **20**. The detergent supply device **53** may include a manual detergent supply device into which a user needs to put a detergent to be used whenever performing washing, and an automatic detergent supply device which stores a large amount of detergent and automatically puts a preset amount of detergent upon washing. The detergent supply device **53** may include a detergent case for storing a detergent. The detergent supply device **53** may supply a detergent into the inside of the tub **20** while water is supplied. Water supplied through the water supply tube **51** may be mixed with a detergent via the detergent supply device **53**. The water mixed with the detergent may be supplied to the inside of the tub **20**. The detergent may include a detergent for pre-washing, a detergent for main washing, a fabric softener, bleach, etc., and the detergent case may be partitioned into a pre-washing detergent storage area, a main washing detergent storage area, a fabric softener storage area, and a bleach storage area.

The first clothes treating apparatus **10** may include a drain device **54** for discharging water accommodated in the tub **20** to outside. The drain device **54** may include a drain tube **55** extending from a lower portion of the tub **20** to outside of the first housing **11**, a drain valve **56** provided at the drain tube **55** and configured to open or close the drain tube **55**, and a drain pump **57** provided on the drain tube **55**. The drain pump **57** may pump water of the drain tube **55** to the outside of the first housing **11**.

According to various embodiments of the disclosure, the first clothes treating apparatus **10** may further include a heater (not shown) for heating water stored in the tub **20**.

According to various embodiments of the disclosure, the first clothes treating apparatus **10** may further include a heater (not shown) for heating water supplied through the water supply **50**.

The second clothes treating apparatus **60** may be a washing machine or a dryer. For example, the second clothes treating apparatus **60** may be a dryer.

Referring to FIGS. **4** and **5**, the second clothes treating apparatus **60** according to various embodiments of the disclosure may include a second housing **61** accommodating various components therein. The second housing **61** may be in a shape of a box, wherein an object inlet **62** is formed at one side of the second housing **61**.

The second clothes treating apparatus **60** may include a second door **63** for opening or closing the object inlet **62**. The second door **63** may be rotatably mounted on the second housing **61** by a second hinge **64**. At least one portion of the second door **63** may be transparent or translucent to show inside of the second housing **61**.

The second clothes treating apparatus **60** may include a second drum **70** that accommodates an object. The second drum **70** may be positioned inside the second housing **61** such that a second drum opening **72** provided at one side of the second drum **70** corresponds to the object inlet **62**. An object may pass through the object inlet **62** and the second drum opening **72** sequentially to be accommodated inside

the second drum **70** or taken out of the second drum **70**. The second drum **70** may be rotatably provided inside the second housing **61**.

The second clothes treating apparatus **60** may include a second driver **73** configured to rotate the second drum **70**. The second driver **73** may include a second drum motor **73***a*, and a second rotating shaft (not shown) for transferring a driving force generated in the second drum motor **73***a* to the second drum **70**.

The second drum **70** may include an inlet **71** through which air enters inside of the second drum **70**. Inside air of the second drum **70** may be discharged to the outside of the second drum **70** through the second drum opening **72**. The inlet **71** may be positioned at another side of the second drum **70**, the other side being opposite to the one side at which the second drum opening **72** is positioned. For example, the inlet **71** may be positioned in a rear portion of the second drum **70**, and the second drum opening **72** may be positioned in a front portion of the second drum **70**.

Hot and dry air may enter the second drum **70** through the inlet **71** to dry an object accommodated in the second drum **70**. Air containing a large amount of moisture after drying the object may be discharged from the second drum **70** through the second drum opening **72**.

At least one second lifter **74** may be provided inside the second drum **70**. The second lifter **74** may raise and drop an object to cause the object to be in contact with hot air while floating in an inside space of the second drum **70**.

A heat pump **80** for heating and condensing air may be formed inside the second housing **61**. A refrigerant of the heat pump **80** may circulate through a series of processes of compression-condensation-expansion-evaporation. More specifically, the heat pump **80** may include an evaporator **81**, a condenser **82**, a compressor **83**, and an expander.

The compressor **83** may compress a refrigerant into a high-temperature, high-pressure state and then discharge the refrigerant, and the discharged refrigerant may enter the condenser **82**. The condenser **82** may condense the compressed refrigerant and emit heat to surroundings through the condensation. Also, the expander may expand the refrigerant being in a high-temperature, high-pressure state and condensed in the condenser **82**, to a low-pressure state. The evaporator **81** may evaporate the expanded refrigerant and take away heat from surroundings through the evaporation.

As operation revolutions per minute (RPM) of the compressor **83** increases, an amount of heat that is emitted to the surroundings through a condensation process of the condenser **82** may increase.

While an object is put into the second clothes treating apparatus **60** and the second clothes treating apparatus **60** operates in a drying mode, hot and humid air discharged from the second drum **70** may pass through the evaporator **81**. Accordingly, the hot and humid air discharged from the second drum **70** may be cooled by passing through the evaporator **81** and change to cold and dry air. At this time, while the hot and humid air is cooled in the evaporator **81**, condensation water may be generated. The condensation water may move to a collection bucket or be drained to the outside of the second housing **61**. Also, the cold and dry air passed through the evaporator **81** may pass through the condenser **82**. Accordingly, the cold and dry air discharged from the evaporator **81** may be heated by passing through the condenser **82** and change to hot and dry air. The hot and dry air may enter the second drum **70** through the inlet **71** to dry the object. Hot and humid air containing a large amount of moisture by drying the object may be discharged through the second drum opening **72**. The discharged air may again pass through the evaporator **81**. In summary, air may dry an object accommodated in the second drum **70** while circulating the inside of the second housing **61**.

In the drying mode, a closed flow path may be formed inside the second housing **61** of the second clothes treating apparatus **60**. The closed flow path may be a movement path (see an arrow of FIG. **5**) of air along which inside air of the second housing **61** circulates the heat pump **80** and the second drum **70**. The closed flow path may not communicate with the outside of the second housing **61** such that outside air of the second housing **61** does not enter the second housing **61** and inside air of the second housing **61** is not discharged to the outside. That is, a flow of air may form a closed loop.

The second clothes treating apparatus **60** may include a heater **86** provided on the closed flow path. The heater **86** may be implemented through a heating coil, although not limited thereto. However, the heater **86** may be implemented through various known devices. The heater **86** may further heat air heated by passing through the condenser or the heater **86** may heat air received from the outside without being heated through the heat pump **80**.

Referring to FIG. **4**, the second clothes treating apparatus **60** may include a housing opening **69** provided at a front side of the second housing **61** to allow an access to the heat pump **80**. More specifically, a filter device **96** may be installed inside the second housing **61** through the housing opening **69**. More specifically, the filter device **96** may be detachably installed in a device accommodating portion **68** formed inside the second housing **61** through the housing opening **69**. According to installation of the filter device **96** in the device accommodating portion **68**, the second clothes treating apparatus **60** may perform a drying mode (drying operation) for drying an object such as clothes. Meanwhile, a housing cover **67** may be provided in a front surface of the second housing **61** to open or close the housing opening **69**.

While the housing cover **67** closes the housing opening **69**, a front surface of the housing cover **67** may be connected to the front surface of the second housing **61** to form a seamlessly connected surface without any step. While the filter device **96** is not installed inside the second housing **61**, a user may access the heat pump **80** through the housing opening **69**. Foreign materials such as lint may adhere to the heat pump **80** due to long-time use of the dryer, and a user may remove such foreign materials through the housing opening **69**.

The filter device **96** may be detachably installed in the second clothes treating apparatus **60**. More specifically, the filter device **96** may be detachably installed inside the second housing **61** through the housing opening **69**. The filter device **96** may be installed in the device accommodating portion **68** or separated from the device accommodating portion **68**.

A fan **90** may be positioned below the second drum **70**. The fan **90** may circulate inside air of the second housing **61**. The fan **90** may form a circulating airflow passing through the second drum **70** inside the second housing **61**.

The second clothes treating apparatus **60** may include a fan motor **91** configured to rotate the fan **90**.

A driving force generated in the fan motor **91** may rotate the fan **90**.

According to various embodiments of the disclosure, the fan motor **91** for rotating the fan **90** may have the same configuration as the second drum motor **73***a* for rotating the second drum **70**.

According to an embodiment of the disclosure, a single motor **91** and **73***a* may be connected to different rotating shafts to simultaneously rotate the fan **90** and the second drum **70**.

While the single motor **91** and **73***a* is connected to the different rotating shafts to simultaneously rotate the fan **90** and the second drum **70**, RPM of the fan **90** may be different from RPM of the second drum **70**. For example, RPM of the fan **90** may be greater than RPM of the second drum **70**.

According to various embodiments of the disclosure, the fan motor **91** for rotating the fan **90** and the second drum motor **73***a* for rotating the second drum **70** may be separate components.

FIG. **6** is a control block diagram of a first clothes treating apparatus according to an embodiment of the disclosure.

Referring to FIG. **6**, according to an embodiment of the disclosure, the first clothes treating apparatus **10** may include a user interface device **15**, the first driver **40**, the water supply **50**, the drain device **54**, a sensor **18**, a communicator **19**, and a controller **23**.

The user interface device **15** may provide a user interface for enabling a user to interact with the first clothes treating apparatus **10**.

The user interface device **15** may include at least one input interface **16** and at least one output interface **17**.

According to an embodiment of the disclosure, the user interface device **15** may be positioned at one side of the first housing **11**, although a location of the user interface device **15** is not limited thereto.

The least one input interface **16** may convert sensory information received from a user into an electrical signal.

The at least one input interface **16** may include a power button, an operation button, a course selection dial (or a course selection button), and a washing/rinsing/dehydrating button. The at least one input interface **16** may include, for example, a tact switch, a push switch, a slide switch, a toggle switch, a micro switch, a touch switch, a touch pad, a touch screen, a jog dial, and/or a microphone, etc.

The at least one output interface **17** may generate sensory information and transfer various data related to an operation of the first clothes treating apparatus **10** to a user.

For example, the at least one output interface **17** may transfer information related to washing courses and operation times of the first clothes treating apparatus **10** or washing settings/rinsing settings/dehydrating settings to a user. Information related to operations of the first clothes treating apparatus **10** may be output through a screen, an indicator, a voice, etc. The at least one output interface **17** may include, for example, a Liquid Crystal Display (LCD) panel, a Light Emitting Diode (LED) panel, a speaker, etc.

The washing courses may include washing settings (for example, washing temperature, a number of times of rinsing, strength of dehydrating, etc.) set in advance by a designer of the first clothes treating apparatus **10** according to kinds (for example, bedclothes, underwear, etc.) and materials (for example, wool, etc.) of laundry. For example, standard washing may include washing settings capable of being applied to most of laundry, and bedclothes washing may include washing settings optimized to wash bedclothes. The washing courses may be divided into, for example, standard washing, strong washing, delicate clothes washing, bedclothes washing, baby clothes washing, towel washing, small washing, boiled washing, outdoor clothes washing, rinsing/dehydrating, dehydrating, etc.

According to various embodiments of the disclosure, the washing courses may include a plurality of courses according to users' needs. For example, the washing courses may include an energy saving course, a time saving course, a low noise course, etc.

The energy saving course may be a course for reducing energy that is consumed to perform a washing cycle. While the first clothes treating apparatus **10** performs a washing cycle corresponding to the energy saving course, an operation of the heater for heating water stored in the tub **20** may be reduced.

The time saving course may correspond to a course for reducing a time that is consumed to perform a washing cycle. While the first clothes treating apparatus **10** performs a washing cycle corresponding to the time saving course, a number of times of a washing operation, a rinsing operation, and/or a dehydrating operation may be reduced, or a consumption time for a washing operation, a rinsing operation, and/or a dehydrating operation may be reduced.

The low noise course may be a course for reducing noise generated from the first clothes treating apparatus **10** while a washing cycle is performed. While the first clothes treating apparatus **10** performs a washing cycle corresponding to the low noise course, maximum RPM of the first drum **30** in a washing operation, a rinsing operation, and/or a dehydrating operation may be reduced.

In the disclosure, courses, such as the energy saving course, the time saving course, and the low noise course, according to a user's special needs may be defined as specialized courses.

In the disclosure, remaining courses (for example, a standard course) except for the specialized courses may be defined as normal courses.

The memory **25** may store a plurality of washing course algorithms corresponding to a plurality of washing courses. The plurality of washing course algorithms may be algorithms for controlling a plurality of components (for example, the first driver **40**, the water supply **50**, the drain device **54**, and/or the heater (not shown)) in a washing cycle.

The processor **24** may perform a washing course based on an algorithm of an operation course selected based on a user input from among the plurality of washing course algorithms stored in the memory **25**.

The first driver **40** may include the first drum motor **41** that provides a driving force for rotating the first drum **30**. The first driver **40** may operate based on a control signal from the controller **23**.

The water supply **50** may include the water supply valve **52** for opening or closing the water supply tube **51** extending from the external water supply source to the detergent supply device **53** and/or the tub **20**. The water supply valve **52** may be opened or closed based on a control signal from the controller **23**.

The drain device **54** may include the drain pump **57** for discharging water of the tub **20** to the outside of the first housing **11**. The drain pump **57** may operate based on a control signal from the controller **23**.

The sensor **18** may include at least one sensor for obtaining information related to an operation state of the first clothes treating apparatus **10**.

For example, the sensor **18** may include at least one among a water level sensor for detecting a water level of the tub **20**, a sensor for detecting an operation state of the first driver **40**, a flow sensor for detecting a rate of flow of water entered the tub **20** through the water supply **50**, or a sensor for detecting an operation state of the drain device **54**.

According to various embodiments of the disclosure, the sensor **18** may include at least one sensor for detecting a weight of laundry accommodated in the first drum **30**.

According to various embodiments of the disclosure, the sensor **18** may include a vibration sensor for detecting a vibration value of the tub **20**. The vibration sensor may detect vibrations of the tub **20**. More specifically, the vibration sensor may detect vibrations of the tub **20**, which are generated by a rotation of the first drum **30** while a washing cycle is performed (for example, during a dehydrating operation). Due to unbalance of laundry positioned inside the first drum **30**, eccentricity of the first drum **30** may occur, and due to the eccentricity of the first drum **30**, vibrations of the tub **20** may be generated. As a result of an increase of RPM of the first drum **30** while laundry is positioned unbalanced, vibrations of the tub **20** may increase, and noise may also increase by the vibrations of the tub **20**.

According to various embodiments of the disclosure, while the first clothes treating apparatus **10** and the second clothes treating apparatus **60** operate together, vibrations of the tub **20** may increase by frequency resonance.

The vibration sensor may output a vibration signal related to vibrations of the tub **20**. An amplitude of the vibration signal may be defined as a vibration value corresponding to the vibrations of the tub **20**.

According to an embodiment of the disclosure, the controller **23** may convert a vibration signal of a time domain, output from the vibration sensor, into a vibration signal of a frequency domain, and process the vibration signal of the frequency domain. The vibration sensor may include a six-axes sensor capable of detecting displacement of six axes (X, Y, Z, Pitch, Roll, and Yaw).

The sensor for detecting the operation state of the first driver **40** may include, for example, a current sensor for measuring driving current that is applied to the first drum motor **41**, although not limited thereto.

The sensor for detecting the operation state of the drain device **54** may include, for example, a current sensor for measuring driving current that is applied to the drain pump **57**, although not limited thereto.

The first clothes treating apparatus **10** may include the communicator **19** for communicating with an external device (for example, a server, a user device, and/or another home appliance) in a wired and/or wireless manner.

The user device and/or the other home appliance may include various electronic devices, such as a smart phone, a notebook, a laptop, a smart watch, an internet of things (IoT) hub device, another home appliance (for example, a television and/or the second clothes treating apparatus **60**), a stationary type tablet, and a speaker.

The communicator **19** may include a short-range communication module and/or a long-distance communication module.

The communicator **19** may transmit data to an external device or receive data from the external device. For example, the communicator **19** may establish communication with a server, a user device, and/or another home appliance, and transmit/receive various data to/from the server, the user device, and/or the other home appliance.

For this, the communicator **19** may support establishment of a direct (for example, wired) communication channel or a wireless communication channel with an external device, and communications through an established communication channel. According to an embodiment of the disclosure, the communicator **19** may include a wireless communication module (for example, a cellular communication module, a short-range wireless communication module, or a global navigation satellite system (GNSS) communication module) or a wired communication module (for example, a local area network (LAN) communication module or a power line communication module). A corresponding communication module among the communication modules may communicate with an external device through a first network (for example, a short-range wireless communication network, such as Bluetooth, wireless fidelity (WiFi) Direct, or Infrared data association (IrDA)) or a second network (for example, a long-distance wireless communication network, such as a legacy cellular network, a 5th Generation (5G) network, a next-generation communication network, the Internet, or a computer network (for example, a LAN or a wide area network (WAN)). The various kinds of communication modules may be integrated into a single component (for example, a single chip) or implemented with a plurality of separate components (for example, a plurality of chips).

The short-range wireless communication module may include a Bluetooth communication module, a Bluetooth Low Energy (BLE) communication module, a Near Field Communication (NFC) module, a Wireless Local Area Network (WLAN; WiFi) communication module, a Zigbee communication module, an IrDA communication module, a Wi-Fi Direct (WFD) communication module, a Ultrawideband (UWB) communication module, an Ant+ communication module, a microwave (uWave) communication module, etc., although not limited thereto.

The long-distance wireless communication module may include a communication module that performs various kinds of long-distance communications, and may include a mobile communicator. The mobile communicator may transmit/receive a wireless signal to/from at least one of a base station, an external terminal, or a server on a mobile communication network.

According to an embodiment of the disclosure, the communicator **19** may communicate with an external device, such as a server, a user device, another home appliance, etc., through a surrounding Access Point (AP). The AP may connect a LAN to which the first clothes treating apparatus **10** and/or a user device and/or another home appliance is connected to a WAN to which a server is connected. The first clothes treating apparatus **10** and/or the user device and/or the other home appliance may be connected to the server through the WAN.

The controller **23** may control various components (for example, the first driver **40**, the water supply **50**, and the drain device **54**) of the first clothes treating apparatus **10**. The controller **23** may control various components of the first clothes treating apparatus **10** to perform at least one operation including water supply, washing, rinsing, and/or dehydrating according to a user input. For example, the controller **23** may control the first driving motor **41** of the first driver **40** to regulate RPM of the first drum **30**, control the water supply valve **52** of the water supply **50** to supply water to the tub **20**, or control the drain pump **57** of the drain device **54** to discharge water of the tub **20** to the outside.

The controller **23** may include hardware, such as a central processing unit (CPU), a micro-computer (Micom), or a memory, and software such as a control program. For example, the controller **23** may include at least one memory **25** that stores data in a form of an algorithm or program for controlling operations of components in the first clothes treating apparatus **10**, and at least one processor **24** that performs the above-described operations and operations which will be described below by using data stored in the at least one memory **25**. The memory **25** and the processor **24** may be implemented as separate chips. The processor **24** may include one, two, or more processor chips or one, two, or more processing cores. The memory **25** may include one, two, or more memory chips or one, two, or more memory

blocks. Also, the memory **25** and the processor **24** may be implemented as a single chip.

FIG. **7** shows an example of a driver included in a first clothes treating apparatus according to an embodiment of the disclosure. FIG. **8** shows an example of a controller included in a first clothes treating apparatus according to an embodiment of the disclosure.

Referring to FIG. **7**, the first driver **40** may include a rectifying circuit **401** for rectifying alternating current power of an external power source (ES), a direct current link circuit **402** for removing ripples of rectified power and outputting direct current power, an inverter circuit **403** for converting direct current power into driving power in a form of sine waves and outputting driving current I_{abc} to the first drum motor **41**, a current sensor **18***a* for measuring driving current I_a, I_b, and I_c to be supplied to the first drum motor **41**, a driving controller **405** for controlling driving power conversion of the inverter circuit **430**, and a gate driver **406** for turning on/off switching devices Q**1**, Q**2**, Q**3**, Q**4**, Q**5**, and Q**6** included in the inverter circuit **430** based on a driving signal from the driving controller **405**.

Also, a position sensor **18***b* for measuring a position (for example, an electrical angle) of a rotor of the first drum motor **41** may be provided at the first drum motor **41**.

The rectifying circuit **410** may include a diode bridge including a plurality of diodes D**1**, D**2**, D**3**, and D**4**. The diode bridge may be provided between a positive terminal P and a negative terminal N of the first driver **40**. The rectifying circuit **410** may rectify alternating current power (alternating current voltage and alternating current) of which a magnitude and direction change over time to power having a constant direction.

The direct current link circuit **402** may include a direct current link capacitor C that stores electricity energy. The direct current link capacitor C may be provided between the positive terminal P and the negative terminal N of the first driver **40**. The direct current link circuit **402** may receive power rectified by the rectifying circuit **410** and output direct current power having a constant magnitude and direction.

The inverter circuit **430** may include three pairs Q**1** and Q**2**, Q**3** and Q**4**, and Q**5** and Q**6** of switching devices provided between the positive terminal P and the negative terminal N of the first driver **40**. More specifically, the inverter circuit **430** may include a plurality of upper switching devices Q**1**, Q**3**, and Q**5** and a plurality of lower switching devices Q**2**, Q**4**, and Q**6**.

The pairs Q**1** and Q**2**, Q**3** and Q**4**, and Q**5** and Q**6** of switching devices may respectively include two switching devices Q**1** and Q**2**, Q**3** and Q**4**, and Q**5** and Q**6**, which are connected in series to each other. Each of the switching devices Q**1**, Q**2**, Q**3**, Q**4**, Q**5**, and Q**6** included in the inverter circuit **430** may be turned on/off according to an output from the gate driver **406**, and according to turning on/off of the switching devices Q**1**, Q**2**, Q**3**, Q**4**, Q**5**, and Q**6**, three-phase driving current I_a, I_b, and I_c may be supplied to the first drum motor **41**.

The current sensor **18***a* may measure three-phase driving current (a-phase current, b-phase current, and c-phase current) output from the inverter circuit **430**, and output data representing measured three-phase driving current values I_a, I_b, and I_c (I_{abc}) to the driving controller **405**. Also, the current sensor **18***a* may measure only two-phase driving current among the three-phase driving current I_{abc}, and the driving controller **405** may estimate another driving current from the two-phase driving current.

The position sensor **18***b* may be provided at the first drum motor **41**, measure a position (for example, an electrical angle) **8** of the rotor of the first drum motor **41**, and output position data representing the electrical angle θ of the rotor. The position sensor **18***b* may be implemented as a hall sensor, an encoder, a resolver, etc.

The gate driver **406** may output a gate signal for turning on/off the plurality of switching devices Q**1**, Q**2**, Q**3**, Q**4**, Q**5**, and Q**6** included in the inverter circuit **430** based on an output from the driving controller **405**.

The driving controller **405** may be separated from the controller **23** or integrated into the controller **23**. The driving controller **405** may include, for example, an application specific integrated circuit (ASIC) that outputs a driving signal based on a RPM command ω*, driving current values I_{abc}, and a rotor position θ. Alternatively, the driving controller **405** may include a memory that stores a series of commands for outputting a driving signal based on a RPM command ω*, driving current values I_{abc}, and a rotor position θ, and a processor that processes the series of commands stored in the memory.

The driving controller **405** may be integrated into the controller **23**. For example, the driving controller **405** may be implemented as a series of commands for outputting a driving signal based on a RPM command ω*, driving current values I_{abc}, and a rotor position θ, which are stored in the memory **25** of the controller **23**.

The RPM command ω* stored in the memory **25** of the controller **23** may be selected based on an algorithm of an operation course.

The driving controller **405** may receive a motor control signal (for example, a RPM command) from the controller **230**, receive driving current values I_{abc} from the current sensor **18***a*, and receive a rotor position θ of the first drum motor **41** from the position sensor **18***b*. The driving controller **405** may identify a driving current value that is to be supplied to the first drum motor **41**, based on the RPM command ω*, the driving current values I_{abc}, and the rotor position θ, and output a driving signal (PWM signal) for controlling the inverter circuit **430** according to the identified driving current value.

The driving controller **405** and/or the controller **23** may include, as shown in FIG. **8**, a speed calculator **23***a*, an input coordinate converter **23***b*, a speed controller **23***c*, a current controller **23***d*, an output coordinate converter **23***e*, and a pulse width modulator **23***f*.

The speed calculator **23***a* may calculate a RPM value w of the first drum motor **41** based on a rotor electrical angle θ of the first drum motor **41**. Herein, the rotor electrical angle θ may be received from the position sensor **18***b* provided at the first drum motor **41**. For example, the speed calculator **23***a* may calculate a RPM value w of the first drum motor **41** based on an amount of change of the rotor electrical angle θ with respect to a sampling time interval.

According to an embodiment of the disclosure, in a case in which the position sensor **18***b* is not provided, the speed calculator **23***a* may calculate a RPM value w of the first drum motor **41** based on driving current values I_{abc} measured by the current sensor **18***a*.

The input coordinate converter **23***b* may convert three-phase driving current values I_{abc} into a d-axis current value I_d and a q-axis current value I_q based on the rotor electrical angle θ. In other words, the input coordinate converter **23***b* may perform axis-conversion of an a-axis, a b-axis, and a c-axis of the three-phase driving current values I_{abc} into a d-axis and a q-axis. Herein, the d-axis may be an axis extending in a direction that is identical to a direction of a

magnetic field generated by the rotor of the first drum motor **41**, and the q-axis may be an axis extending in a direction that is earlier by 90 degrees than the direction of the magnetic field generated by the rotor of the first drum motor **41**. Herein, the 90 degrees may be an electrical angle not a mechanical angle of the rotor, and the electrical angle may be an angle obtained by changing an angle between neighboring N poles of the rotor or an angle between neighboring S poles of the rotor with respect to 360 degrees.

Also, the d-axis current value I_d may represent a current component that generates a magnetic field in a d-axis direction among driving current, and the q-axis current value I_q may represent a current component that generates a magnetic field in a q-axis direction among driving current.

The input coordinate converter **23***b* may calculate the q-axis current value I_q and the d-axis current value I_d from the three-phase driving current values I_{abc} by using a known method.

Accordingly, the driving controller **405** may detect the q-axis current value I_q and the d-axis current value I_d that are currently applied to the motor.

The speed controller **23***c* may compare the RPM command ω* to the RPM value w of the first drum motor **41**, and output a q-axis current reference value I_q* and a d-axis current reference value I_d* based on a result of the comparison. For example, the speed controller **23***c* may calculate a q-axis current reference value I_q* and a d-axis current reference value I_d* for controlling the first drum motor **41** based on a difference between a RPM command ω* and a RPM value w by using Proportional Integral (PI) control.

According to various embodiments of the disclosure, upon a reduction in RPM of the first drum motor **41**, the speed controller **23***c* may calculate a q-axis current reference value I_q* and a d-axis current reference value I_d* regardless of a RPM command ω*.

The current controller **23***d* may compare the q-axis current reference value I_q* and the d-axis current reference value I_d* output from the speed controller **23***c* to the q-axis current value I_q and the d-axis current value I_d output from the input coordinate converter **23***b*, and output a q-axis voltage reference value V_q* and a d-axis voltage reference value V_d* based on a result of the comparison. More specifically, the current controller **23***d* may identify the q-axis voltage reference value V_q* based on a difference between the q-axis current reference value ω* and the q-axis current value I_q by using PI control, and identify the d-axis voltage reference value V_d* based on a difference between the d-axis current reference value I_d* and the d-axis current value I_d.

The output coordinate converter **23***e* may convert the d-axis and q-axis voltage reference values V_d* and V_q* into three-phase voltage commands (an a-phase voltage command, a b-phase voltage command, and a c-phase voltage command) V_{abc}* based on the rotor electrical angle θ of the first drum motor **41**.

The output coordinate converter **23***e* may convert the d-axis and q-axis voltage reference values V_d* and V_q* into the three-phase voltage commands V_{abc}* by using a known method.

The pulse width modulator **23***f* may generate a PWM control signal V_{pwm} for turning on/off the switching devices Q1, Q2, Q3, Q4, Q5, and Q6 of the inverter circuit **430** from the three-phase voltage commands V_{abc}*. More specifically, the pulse width modulator **23***f* may perform pulse width modulation (PWM) on the three-phase voltage commands V_{abc}* and output a PWM signal V_{pwm} obtained by the pulse width modulation to the gate driver **406**.

As such, the driving controller **405** may output a driving signal (PWM signal) to the gate driver **406** based on the d-axis and q-axis current values I_d and I_q and the d-axis and q-axis current reference values I_d* and I_q.

As described above, the first driver **40** may supply driving current to the first drum motor **41** according to a motor control signal from the controller **23**.

The first drum motor **41** may rotate or slow down the first drum **30** depending on the driving current applied from the first driver **40**.

The controller **23** may generate a motor control signal corresponding to an algorithm of an operation washing course.

FIG. **9** shows an example of an operation cycle of a first clothes treating apparatus according to an embodiment of the disclosure.

Referring to FIG. **9**, the first clothes treating apparatus **10** may perform a washing operation **1010**, a rinsing operation **1020**, and a dehydrating operation **1030** sequentially according to a user input.

According to an embodiment of the disclosure, the first clothes treating apparatus **10** may perform the washing operation **1010**, the rinsing operation **1020**, and the dehydrating operation **1030** sequentially based on an operation course algorithm selected by the user interface device **15**.

By the washing operation **1010**, laundry may be washed. More specifically, foreign materials adhered to the laundry may be separated from the laundry by chemical actions of a detergent and/or physical actions such as falling.

The washing operation **1010** may include laundry measurement **1011** of measuring an amount of laundry, water supply **1012** of supplying water to the tub **20**, washing **1013** of washing laundry by rotating the first drum **30** at low speed, drainage **1014** of discharging water stored in the tub **20**, and midway dehydrating **1015** of separating water from laundry by rotating the first drum **30** at high speed.

For the washing **1013**, the controller **23** may control the first driver **40** to rotate the first drum motor **41** forward (for example, a clockwise direction) or backward (for example, a counterclockwise direction). While the first drum **30** rotates, laundry may fall from an upper portion of the first drum **30** to a lower portion of the first drum **30** to be washed.

For the midway dehydrating **1015**, the controller **23** may control the first driver **40** to rotate the first drum motor **41** at high speed. While the first drum **30** rotates at high speed, water may be separated from the laundry accommodated in the first drum **30** and discharged to outside of the first clothes treating apparatus **10**.

During the midway dehydrating **1015**, RPM of the first drum **30** may increase in stages. For example, the controller **23** may control the first driver **40** to rotate the first drum motor **41** at first RPM, and while the first drum motor **41** rotates at the first RPM, the controller **23** may control the first drum motor **41** to increase the first RPM to second RPM, based on a change of driving current of the first drum motor **41**. While the first drum motor **41** rotates at the second RPM, the controller **23** may control the first drum motor **41** to increase the second RPM to third RPM or to decrease the second RPM to the first RPM, based on a change of driving current of the first drum motor **41**.

By the rinsing operation **1020**, the laundry may be rinsed. More specifically, a detergent or foreign materials remaining in the laundry may be washed away by water.

The rinsing operation **1020** may include water supply **1021** of supplying water to the tub **20**, rinsing **1022** of rinsing the laundry by driving the first drum **30**, drainage

1023 of discharging water stored in the tub **20**, and midway dehydrating **1024** of separating water from the laundry by driving the first drum **30**.

The water supply **1021**, the drainage **1023**, and the midway dehydrating **1024** of the rinsing operation **1020** may be the same as the water supply **1012**, the drainage **1014**, and the midway dehydrating **1015** of the washing operation **1010**, respectively. During the rinsing operation **1020**, the water supply **1021**, the rinsing **1022**, the drainage **1023**, and the midway dehydrating **1024** may be performed once or several times.

By the dehydrating operation **1030**, the laundry may be dehydrated. More specifically, water may be separated from the laundry by a high-speed rotation of the first drum **30**, and the separated water may be discharged to the outside of the first clothes treating apparatus **10**.

The dehydrating operation **1030** may include first dehydrating **1031** and second dehydrating **1032** of separating water from the laundry by rotating the first drum **30** at high speed. Due to the first dehydrating **1031** and the second dehydrating **1032**, final midway dehydrating **1024** of the rinsing operation **1020** may be omitted.

The first dehydrating **1031** and the second dehydrating **1032** will be described below with reference to FIG. **10**.

For the dehydrating operation **1030**, the controller **23** may control the first driver **40** to rotate the first drum motor **41** at high speed. While the first drum **30** rotates at high speed, water may be separated from the laundry accommodated in the first drum **30** and discharged to the outside of the first clothes treating apparatus **10**. Also, RPM of the first drum motor **41** may increase in stages.

Because an operation of the first clothes treating apparatus **10** terminates by the dehydrating operation **1030**, an execution time of the dehydrating operation **1030** may be longer than execution times of the midway dehydrating **1015** and **1024**.

As described above, the first clothes treating apparatus **10** may perform the washing operation **1010**, the rinsing operation **1020**, and the dehydrating operation **1030** to wash laundry. Particularly, during the midway dehydrating **1015** and **1024** and the dehydrating operation **1030**, the first clothes treating apparatus **10** may increase RPM of the first drum motor **41** for rotating the first drum **30** in stages, and increase or decrease RPM of the first drum motor **41** based on a change of driving current of the first drum motor **41**.

A dehydrating operation described in the entire specification may represent all of the midway dehydrating **1015** that is performed in the washing operation **1010**, the midway dehydrating **1024** that is performed in the rinsing operation **1020**, and the dehydrating operation **1030**. Hereinafter, for convenience of description, a dehydrating operation is assumed to be the dehydrating operation **1030** that is performed after the rinsing operation **1020**.

FIG. **10** shows an example of an operation RPM profile of a drum motor in an operation of an operation cycle of a first clothes treating apparatus according to an embodiment of the disclosure.

Referring to FIG. **10**, a dehydrating operation **1030** may include a weight detection section SWS for detecting a weight of laundry, an unbalance detection section SUB for detecting eccentricity of the laundry, a resonance acceleration section SR in which vibrations are generated by a rotation of the first drum **30**, a pre-spin section SPS for a preliminary dehydration rotation, a rebalancing section SRB for equally distributing the laundry inside the first drum **30**, and a high-speed rotation section SH for a main dehydration rotation.

The first dehydrating **1031** may include the resonance acceleration section SR and the pre-spin section SP.

In the first dehydrating **1031**, target maximum RPM of the first drum motor **41** may be a first value J**1**. The first value J**1** may be set to different values depending on operation course algorithms. According to various embodiments of the disclosure, the first value J**1** may be set between about 300 RPM and about 600 RPM.

A first value J**1** in the low noise course may be smaller than a first value J**1** in the time saving course.

The second dehydrating **1032** may include the high-speed rotation section SH.

In the second dehydrating **1032**, target maximum RPM of the first drum motor **41** may be a second value J**2**.

The second value J**2** may be greater than the first value J**1**. According to various embodiments of the disclosure, the second value J**2** may be set between about 800 RPM and about 1300 RPM.

The second value J**2** may be set to different values depending on operation course algorithms.

For example, a second value J**2** in the low noise course may be smaller than a second value J**2** in the time saving course.

A dehydration profile shown in FIG. **10** may be corrected, or changed or adjusted, according to an operation course algorithm.

According to various embodiments of the disclosure, a first value J**1** and a second value J**2** shown in FIG. **10** may be changeable according to an operation course algorithm.

FIG. **11** is a control block diagram of a second clothes treating apparatus according to an embodiment of the disclosure.

Referring to FIG. **11**, according to an embodiment of the disclosure, the second clothes treating apparatus **60** may include a user interface device **75**, a second driver **73**, a heater **86**, a fan motor **91**, a heat pump **80**, a communicator **94**, a sensor **79**, and a controller **97**.

The user interface device **75** may provide a user interface to enable a user to interact with the second clothes treating apparatus **60**.

The user interface device **75** may include at least one input interface **76** and at least one output interface **77**.

According to an embodiment of the disclosure, the user interface device **75** may be positioned at one side of the second housing **61**, although a location of the user interface device **75** is not limited thereto.

The least one input interface **76** may convert sensory information received from a user into an electrical signal.

The at least one input interface **76** may include a power button, an operation button, a course selection dial (or a course selection button), and a drying setting button. The at least one input button **76** may include, for example, a tact switch, a push switch, a slide switch, a toggle switch, a micro switch, a touch switch, a touch pad, a touch screen, a jog dial, and/or a microphone, etc.

The at least one output interface **77** may generate sensory information and transfer various data related to an operation of the second clothes treating apparatus **60** to a user.

For example, the at least one output interface **77** may transfer information related to drying courses and operation times of the second clothes treating apparatus **60** or drying settings to a user. Information related to operations of the second clothes treating apparatus **10** may be output through a screen, an indicator, a voice, etc. The at least one output interface **77** may include, for example, a LCD panel, a LED panel, a speaker, etc.

The drying courses may include drying settings (for example, drying temperature, a drying time, strength of drying, etc.) set in advance by a designer of the second clothes treating apparatus **60** according to kinds (for example, bedclothes, underwear, etc.) and materials (for example, wool, etc.) of an object to be dried. For example, standard drying may include drying settings capable of being applied to most of objects to be dried, and bedclothes drying may include drying settings optimized to dry bedclothes. The drying courses may be divided into, for example, standard drying, strong drying, delicate clothes drying, bedclothes drying, baby clothes drying, towel drying, small drying, power saving drying, outdoor clothes drying, etc.

According to various embodiments of the disclosure, the drying courses may include a plurality of courses according to users' needs. For example, the drying courses may include an energy saving course, a time saving course, a low noise course, etc.

The energy saving course may be a course for reducing energy that is consumed to perform a drying course. While the second clothes treating apparatus **60** performs a drying cycle corresponding to the energy saving course, an operation of the heater **86** may be reduced.

The time saving course may correspond to a course for reducing a time that is consumed to perform a drying course. While the second clothes treating apparatus **60** performs a drying cycle corresponding to the time saving course, an operation time of the heater **86** and/or an operating frequency of the compressor **83** may increase.

The low noise course may be a course for reducing noise that is generated from the second clothes treating apparatus **60** while a drying operation is performed. While the second clothes treating apparatus **60** performs a drying operation corresponding to the low noise course, maximum RPM of the second drum **70** may be reduced.

In the disclosure, courses, such as the energy saving course, the time saving course, and the low noise course, according to users' special needs may be defined as specialized courses.

In the disclosure, remaining courses (for example, a standard course) except for the specialized courses may be defined as normal courses.

A memory **99** may store a plurality of drying course algorithms corresponding to a plurality of drying courses. The plurality of drying course algorithms may be algorithms for controlling a plurality of components (for example, the second driver **73**, the heater **86**, the fan motor **91**, and/or the compressor **83**) in a drying operation.

A processor **98** may perform a drying operation based on an algorithm of an operation course selected based on a user input from among the plurality of drying course algorithms stored in the memory **99**.

The second driver **73** may include the second drum motor **73***a* that provides a driving force for rotating the second drum **70**. The second driver **73** may operate based on a control signal from the controller **97**.

According to various embodiments of the disclosure, the controller **97** may control the second driver **73** based on an algorithm of an operation course selected by a user.

An aspect of the second driver **73** may be the same as that of the first driver **40** described above with reference to FIG. **7**.

The heater **86** may further heat air heated by passing through the condenser **82**, or the heater **86** may heat air received from the outside without being heated through the heat pump **80**.

The heater **86** may operate based on a control signal from the controller **97**.

According to various embodiments of the disclosure, the controller **97** may control the heater **86** based on an algorithm of an operation course selected by a user.

The fan motor **91** may rotate the fan **90** for circulating inside air of the second housing **61**.

The fan motor **91** may operate based on a control signal from the controller **97**.

According to various embodiments of the disclosure, the controller **97** may control the fan motor **91** based on an algorithm of an operation course selected by a user.

As described above, the fan motor **91** for rotating the fan **90** and the second drum motor **73***a* for rotating the second drum **70** may be the same component.

According to an embodiment of the disclosure, in a case in which a single motor **91** and **73***a* is connected to different rotating shafts to rotate the fan **90** and the second drum **70** simultaneously, the controller **97** may drive the single motor **91** and **73***a* at target RPM corresponding to target RPM of the fan **90** or target RPM of the second drum **70**.

According to various embodiments of the disclosure, the fan motor **91** for rotating the fan **90** and the second drum motor **73***a* for rotating the second drum **70** may be separate components. In this case, the controller **97** may drive the fan motor **91** based on target RPM of the fan **90** and drive the second drum motor **73***a* based on target RPM of the second drum **70**.

The heat pump **80** may be a component for generating hot air that is to be supplied to the second drum **70**, and may include the compressor **83** for compressing a refrigerant.

The compressor **83** may operate based on a control signal from the controller **97**.

According to various embodiments of the disclosure, the controller **97** may control the compressor **83** based on an algorithm of an operation course selected by a user.

The sensor **79** may include at least one sensor for obtaining information related to an operation state of the second clothes treating apparatus **60**.

According to various embodiments of the disclosure, the sensor **79** may include at least one sensor for detecting a weight of an object to be dried, accommodated in the second drum **70**.

According to various embodiments of the disclosure, the sensor **79** may include a temperature sensor for detecting inside temperature of the second housing **61** and/or a sensor for detecting an operation state of the second driver **73**.

The temperature sensor for detecting inside temperature of the second housing **61** may be provided at any location inside the second housing **61**. According to various embodiments of the disclosure, the temperature sensor may be provided at an exit of the condenser **82** or at downstream of the heater **86**.

According to various embodiments of the disclosure, the sensor **79** may include a vibration sensor for detecting a vibration value of the second housing **61**.

The second clothes treating apparatus **60** may include the communicator **94** for communicating with an external device (for example, a server, a user device, and/or another home appliance) in a wired and/or wireless manner.

The user device and/or the other home appliance may include various electronic devices, such as a smart phone, a notebook, a laptop, a smart watch, an IoT hub device, another home appliance (for example, a television and/or the second clothes treating apparatus **60**), a stationary type tablet, and a speaker.

The communicator **94** may include a short-range communication module and/or a long-distance communication module.

The communicator **94** may transmit data to an external device or receive data from the external device. For example, the communicator **94** may establish communication with a server, a user device, and/or another home appliance, and transmit/receive various data to/from the server, the user device, and/or the other home appliance.

For this, the communicator **94** may support establishment of a direct (for example, wired) communication channel or a wireless communication channel with an external device, and communications through an established communication channel. According to an embodiment of the disclosure, the communicator **94** may include a wireless communication module (for example, a cellular communication module, a short-range wireless communication module, or a GNSS communication module) or a wired communication module (for example, a LAN communication module or a power line communication module). A corresponding communication module among the communication modules may communicate with an external electronic device through a first network (for example, a short-range wireless communication network, such as Bluetooth, WiFi Direct, or IrDA) or a second network (for example, a long-distance wireless communication network, such as a legacy cellular network, a 5G network, a next-generation communication network, the Internet, or a computer network (for example, a LAN or WAN)). The various kinds of communication modules may be integrated into a single component (for example, a single chip) or implemented with a plurality of separate components (for example, a plurality of chips).

The short-range wireless communication module may include a Bluetooth communication module, a BLE communication module, a NFC module, a WLAN (WiFi) communication module, a Zigbee communication module, an IrDA communication module, a WFD communication module, a UWB communication module, an Ant+ communication module, a uWave communication module, etc., although not limited thereto.

The long-distance wireless communication module may include a communication module that performs various kinds of long-distance communications, and may include a mobile communicator. The mobile communicator may transmit/receive a wireless signal to/from at least one of a base station, an external terminal, or a server on a mobile communication network.

According to an embodiment of the disclosure, the communicator **94** may communicate with an external device, such as a server, a user device, another home appliance, etc., through a surrounding AP. The AP may connect a LAN to which the second clothes treating apparatus **60** and/or a user device and/or another home appliance is connected to a WAN to which a server is connected. The second clothes treating apparatus **60** and/or the user device and/or the other home appliance may be connected to the server through the WAN.

The controller **97** may control various components (for example, the second driver **73**, the heater **86**, the fan motor **91**, and/or the compressor **83**) of the second clothes treating apparatus **60**. The controller **97** may control various components of the second clothes treating apparatus **60** to perform a drying operation according to a user input. For example, the controller **97** may control the second drum motor **73***a* of the second driver **73** to regulate RPM of the second drum **70**, control an operation of the heater **86** to rapidly heat inside air of the second drum **70**, regulate an operation of the compressor **83** to generate hot air that is to be supplied to the second drum **70**, or control an operation of the fan motor **91** to circulate hot air generated by the heat pump **80** to the inside of the second drum **70**.

The controller **97** may include hardware, such as a CPU, a Micom, ora memory, and software such as a control program. For example, the controller **97** may include at least one memory **99** that stores data in a form of an algorithm or program for controlling operations of components in the second clothes treating apparatus **60**, and at least one processor **98** that performs the above-described operations and operations which will be described below by using data stored in the at least one memory **99**. The memory **99** and the processor **98** may be implemented as separate chips. The processor **98** may include one, two, or more processor chips or one, two, or more processing cores. The memory **99** may include one, two, or more memory chips or one, two, or more memory blocks. Also, the memory **99** and the processor **98** may be implemented as a single chip.

FIG. **12** shows examples of operation RPM profiles of a plurality of electronic components in an operation of a second clothes treating apparatus according to an embodiment of the disclosure.

Referring to FIG. **12**, the second clothes treating apparatus **60** may control the compressor **83**, the fan motor **91**, and/or the second drum motor **73***a*, based on an operation course algorithm.

According to an embodiment of the disclosure, the second clothes treating apparatus **60** may start a drying operation in response to reception of a start command for a course selected through a user interface device **100**.

The second clothes treating apparatus **60** may control a plurality of electronic components (for example, the compressor **83**, the heater **86**, the fan motor **91**, and/or the second drum motor **73***a*) based on an operation course algorithm.

The drying operation may include operating the compressor **83**, the heater **86**, the fan motor **91**, and/or the second drum motor **73***a* according to an operation course algorithm.

According to various embodiments of the disclosure, in a case in which the fan motor **91** and the second drum motor **73***a* are implemented as a single second motor **91** and **73***a*, the drying operation may include operating the single second motor **91** and **73***a* according to an operation course algorithm.

According to various embodiments of the disclosure, in a case in which the fan motor **91** and the second drum motor **73***a* are implemented as different motors **91** and **73***a*, the drying operation may include operating the fan motor **91** and the second drum motor **73***a* according to an operation course algorithm.

The controller **97** may set target RPM of the fan motor **91** to a preset value a**1**, set target RPM of the compressor **83** to a preset value b**1**, and set target RPM of the second drum motor **73***a* to a preset value c**1**, according to an operation course algorithm, in response to a start of a drying operation.

In the case in which the fan motor **91** and the second drum motor **73***a* are implemented as a single motor, the controller **97** may set target RPM of the fan motor **91** or the second drum motor **73***a* to a preset value, according to an operation course algorithm, in response to a start of a drying operation.

The controller **97** may rapidly heat inside air of the second housing **61** by operating the heater **86** for a preset time in an initial stage of the drying operation.

According to an embodiment of the disclosure, the controller **97** may simply set target RPM of the compressor **83**, or the controller **97** may set target temperature and then dynamically control target RPM of the compressor **83** such

that temperature detected through the sensor **79** follows the target temperature, according to various operation course algorithms.

According to an embodiment of the disclosure, the controller **97** may simply set target RPM of the fan motor **91** and/or the second drum motor **73***a*, or the controller **97** may set target temperature and then dynamically control target RPM of the fan motor **91** and/or the second drum motor **73***a* based on a weight of an object to be dried, detected through the sensor **79**, according to various operation course algorithms.

As such, the first clothes treating apparatus **10** may perform various operations (for example, the washing operation **1010**, the rinsing operation **1020**, and the dehydrating operation **1030**), whereas the second clothes treating apparatus **60** may relatively simply perform only the drying operation.

FIG. **13** is a control block diagram of a clothes treating system according to an embodiment of the disclosure.

Referring to FIG. **13**, a clothes treating system **1** according to an embodiment of the disclosure may include the first clothes treating apparatus **10** and the second clothes treating apparatus **60**.

The first clothes treating apparatus **10** may be connected operatively and/or electrically to the second clothes treating apparatus **60**.

Various information obtained in the first clothes treating apparatus **10** may be transferred to the second clothes treating apparatus **60**, and various information obtained in the second clothes treating apparatus **60** may be transferred to the first clothes treating apparatus **10**.

According to an embodiment of the disclosure, the clothes treating system **1** may include the user interface device **100**.

The user interface device **100** may be provided in the first clothes treating apparatus **10** and/or the second clothes treating apparatus **60**.

According to an embodiment of the disclosure, the user interface device **100** may be positioned at one side of the first housing **11**.

The user interface device **100** of the clothes treating system **1** may be a component for controlling both the first clothes treating apparatus **10** and the second clothes treating apparatus **60**, and may be defined as an integrated user interface device **100**.

According to an embodiment of the disclosure, in the clothes treating system **1** including the user interface device **100**, the first clothes treating apparatus **10** may not include the user interface device **15** for controlling only the first clothes treating apparatus **10**.

According to an embodiment of the disclosure, in the clothes treating system **1** including the user interface device **100**, the second clothes treating apparatus **60** may not include the user interface device **75** for controlling only the second clothes treating apparatus **60**.

According to various embodiments of the disclosure, although the clothes treating system **1** includes the user interface device **100**, the first clothes treating apparatus **10** may include the user interface device **15** for controlling only the first clothes treating apparatus **10**. As another example, although the clothes treating system **1** includes the user interface device **100**, the second clothes treating apparatus **60** may include the user interface device **75** for controlling only the second clothes treating apparatus **60**. As another example, although the clothes treating system **1** includes the user interface device **100**, the first clothes treating apparatus **10** may include the user interface device **15** for controlling only the first clothes treating apparatus **10**, and the second clothes treating apparatus **60** may include the user interface device **75** for controlling only the second clothes treating apparatus **60**.

That is, according to an embodiment of the disclosure, the clothes treating system **1** may include the user interface device **100** for controlling the first clothes treating apparatus **10** and the second clothes treating apparatus **60**, the user interface device **15** for controlling the first clothes treating apparatus **10**, and/or the user interface device **75** for controlling the second clothes treating apparatus **60**.

The user interface device **100** may provide a user interface for enabling a user to interact with the clothes treating system **1**. The user interface for enabling a user to interact with the clothes treating system **1** may be a user interface for enabling a user to interact with the first clothes treating apparatus **10** and the second clothes treating apparatus **60**.

The user interface device **100** may include at least one input interface **110** and at least one output interface **120**.

The at least one input interface **110** may convert sensory information received from a user into an electrical signal and transfer the electrical signal to the first clothes treating apparatus **10** and/or the second clothes treating apparatus **60**.

The at least input interface **110** may include a tact switch, a push switch, a slide switch, a toggle switch, a micro switch, a touch switch, a touch pad, a touch screen, a jog dial, and/or a microphone, etc.

According to an embodiment of the disclosure, the at least one input interface **110** may transfer a control command corresponding to a user input to the controller **23** (hereinafter, also referred to as a 'first controller **23**') of the first clothes treating apparatus **10** and the controller **97** (hereinafter, also referred to as a 'second controller **97**') of the second clothes treating apparatus **60**.

The at least one output interface **120** may transfer various data related to operations of the first clothes treating apparatus **10** and the second clothes treating apparatus **60** to a user by generating sensory information.

The at least one output interface **120** may include a LCD panel, a LED panel, a speaker, etc.

A panel on which the at least one input interface **110** and the at least one output interface **120** are formed may be defined as a control panel.

The at least one input interface **110** and the at least one output interface **120** will be described in more detail with reference to FIGS. **14**A and **14**B, below.

The first clothes treating apparatus **10** and the second clothes treating apparatus **60** may communicate with each other through the communicator **19** (hereinafter, referred to as a 'first communicator **19**') of the first clothes treating apparatus **10** and the communicator **94** (hereinafter, referred to as a 'second communicator **94**') of the second clothes treating apparatus **60**.

According to an embodiment of the disclosure, the communicator **19** may directly communicate with the communicator **94** through a Device-to-Device (D2D) wireless communication module (for example, a Bluetooth module).

According to an embodiment of the disclosure, the communicator **19** may communicate with the communicator **94** via a server through a WAN.

According to various embodiments of the disclosure, each of the communicators **19** and **94** may include a wired communication module (for example, a communication connector and/or a communication wire), and the first clothes treating apparatus **10** may be connected to the second clothes treating apparatus **60** in a wired manner.

According to various embodiments of the disclosure, the user interface device **100** may further include a connection

circuit board **130**. The connection circuit board **130** may be implemented as a printed circuit board.

The connection circuit board **130** may include a communication wire and/or a communication connector that is connected to the first communicator **19** and the second communicator **94**.

The connection circuit board **130** may connect the first communicator **19** to the second communicator **94** through a wire.

Each of the first communicator **19** and the second communicator **94** may be connected to the connection circuit board **130**.

The connection circuit board **130** may mediate data exchange between the first controller **23** and the second controller **97**.

For example, the connection circuit board **130** may transfer a signal transferred from the first controller **23** through the first communicator **19** to the second controller **97** through the second communicator **94**.

As another example, the connection circuit board **130** may transfer a signal transferred from the second controller **97** through the second communicator **94** to the first controller **23** through the first communicator **19**.

According to various embodiments of the disclosure, the connection circuit board **130** may transfer course information selected by the at least one input interface **110** to the first controller **23** through the first communicator **19**.

According to various embodiments of the disclosure, the connection circuit board **130** may transfer course information selected by the at least one input interface **110** to the second controller **97** through the second communicator **94**.

According to the disclosure, because the user interface device **100** includes the connection circuit board **130**, communication between the first clothes treating apparatus **10** and the second clothes treating apparatus **60** may be stably performed, and also, communication of the user interface device **100** with the first clothes treating apparatus **10** and the second clothes treating apparatus **60** may be stably performed.

FIGS. **14**A and **14**B show an example of an appearance of the user interface device **100** according to an embodiment of the disclosure.

Referring to FIGS. **14**A and **14**B, the user interface device **100** may include a power button **111**, device selection indicators **121** and **122**, operation buttons **131** and **132**, a device and course selection dial (ora device and course selection button) **141**, a display **151**, washing/rinsing/dehydrating/drying setting indicators **161**, **162**, **163**, **171**, **172**, and **173**, a communication button **181**, and a communication indicator **191**.

The device selection indicators **121** and **122** and/or the washing/rinsing/dehydrating/drying setting indicators **161**, **162**, **163**, **171**, **172**, and **173** may function as both the output interface **120** and the input interface **110**.

Power may be supplied to the user interface device **100** in response to a selection of the power button **111**.

The device selection indicators **121** and **122** may represent a device selected by the device and course selection dial **141**.

A user may select a device which he/she wants to use from among the first clothes treating apparatus **10** and the second clothes treating apparatus **60** through the device and course selection dial **141**, and check the currently selected device through the device selection indicators **121** and **122**.

In the clothes treating system **1** in which the second clothes treating apparatus **60** is stacked on the first clothes treating apparatus **10**, the device selection indicator **121** corresponding to the first clothes treating apparatus **10** among the device selection indicators **121** and **122** may be positioned below the device selection indicator **122** corresponding to the second clothes treating apparatus **60**. Meanwhile, in the clothes treating system **1** in which the first clothes treating apparatus **10** is stacked on the second clothes treating apparatus **60**, the device selection indicator **121** corresponding to the first clothes treating apparatus **10** among the device selection indicators **121** and **122** may be positioned above the device selection indicator **122** corresponding to the second clothes treating apparatus **60**. According to the disclosure, the user may intuitively select a clothes treating apparatus which he/she wants to use.

The user may finally select the currently selected device by pressing the device and course selection dial **141**.

According to various embodiments of the disclosure, each of the device selection indicators **121** and **122** may be implemented as a tact switch, a push switch, a slide switch, a toggle switch, a micro switch, a touch switch, a touch pad, a touch screen, etc. In this case, the user may select a device by selecting one of the device selection indicators **121** and **122**.

Each of the device selection indicators **121** and **122** may have a device selection function. In this case, the device and course selection dial **141** may be used to select a course.

A visual mark output through the at least one output interface **120** upon a selection of the first clothes treating apparatus **10** by the device selection indicators **121** and **122** or the device and course selection dial **141** may be different from a visual mark output through the at least one output interface **120** upon a selection of the second clothes treating apparatus **60** by the device selection indicators **121** and **122** or the device and course selection dial **141**.

According to a selection of the first clothes treating apparatus **10**, a user interface for setting an operation course of the first clothes treating apparatus **10** may be provided through the at least one output interface **120**, and according to a selection of the second clothes treating apparatus **60**, a user interface for setting an operation course of the second clothes treating apparatus **60** may be provided through the at least one output interface **120**.

The display **151** may provide information about a course currently selected from among a plurality of courses.

To perform a clothes treating operation in the currently selected course, the user may perform the clothes treating operation by selecting one of the operation buttons **131** and **132**.

According to an embodiment of the disclosure, the operation buttons **131** and **132** may include a button for starting an operation course of a clothes treating apparatus currently selected from among the first clothes treating apparatus **10** or the second clothes treating apparatus **60**.

According to various embodiments of the disclosure, the operation buttons **131** and **132** may include a button **131** for starting an operation course of the first clothes treating apparatus **10** and/or a button **132** for starting an operation course of the second clothes treating apparatus **60**.

The button **131** for starting an operation course of the first clothes treating apparatus **10** may be separated from the button **132** for starting an operation course of the second clothes treating apparatus **60**. In this case, the user who has set an operation course of the first clothes treating apparatus **10** and then set an operation course of the second clothes treating apparatus **60** may start the operation course of the first clothes treating apparatus **10** and the operation course of the second clothes treating apparatus **60** at the same time.

According to a selection of the first clothes treating apparatus **10**, the washing/rinsing/dehydrating/drying setting indicators **161**, **162**, **163**, **171**, **172**, and **173** may be converted to washing/rinsing/dehydrating setting indicators.

After the user selects a course, the user may make detail washing/rinsing/dehydrating settings in the course through the washing/rinsing/dehydrating setting indicators.

For example, the user may select an indicator **161** for a washing setting and then regulate a washing setting value through the device and course selection dial **141**. A currently selected washing setting value may be displayed in a corresponding indicator **171**.

The washing setting value may include, for example, temperature of washing water.

As another example, the user may select an indicator **162** for a rinsing setting and then regulate a rinsing setting value through the device and course selection dial **141**. A currently selected rinsing setting value may be displayed in a corresponding indicator **172**.

The rinsing setting value may include, for example, a number of times of rinsing.

As another example, the user may select an indicator **163** for a dehydrating setting and then regulate a dehydrating setting value through the device and course selection dial **141**. A currently selected dehydrating setting value may be displayed in a corresponding indicator **173**.

The dehydrating setting value may include, for example, strength of dehydrating.

According to a selection of the second clothes treating apparatus **60**, the washing/rinsing/dehydrating/drying setting indicators **161**, **162**, **163**, **171**, **172**, and **173** may be converted to drying setting indicators.

The user may select a course and then make detail drying settings in the course through the drying setting indicators.

For example, the user may select the indicator **161** for a degree-of-dryness setting and then regulate a degree-of-dryness setting value through the device and course selection dial **141**. A currently selected degree-of-dryness setting value may be displayed in the corresponding indicator **171**.

The degree-of-dryness setting value may include, for example, inside target temperature of the second drum **70**.

As another example, the user may select the indicator **162** for an anti-wrinkle setting and then regulate an anti-wrinkle value through the device and course selection dial **141**. A currently selected anti-wrinkle value may be displayed in the corresponding indicator **172**.

The anti-wrinkle value may include, for example, target RPM of the second drum **70**.

As another example, the user may select the indicator **163** for a time setting and then regulate a dehydrating setting value through the device and course selection dial **141**. A currently selected time setting value may be displayed in the corresponding indicator **173**.

The time setting value may include, for example, an operation time of the heater **86**.

The communication button **181** may be a button for activating a communication function of the clothes treating system **1**.

For example, the communication button **181** may include a button for activating a wireless communication module (for example, a WiFi communication module, a Bluetooth communication module, etc.) of the first communicator **19** and/or the second communicator **94**.

The communication indicator **191** may provide a visual indicator representing a current communication state of the first clothes treating apparatus **10** and/or the second clothes treating apparatus **60**.

According to the disclosure, a user may easily control both the first clothes treating apparatus **10** and the second clothes treating apparatus **60** through the single user interface device **100**.

According to various embodiments of the disclosure, a command for starting a clothes treating operation according to a selected operation course may be received from an external device through the communicators **19** and **94**.

According to various embodiments of the disclosure, the user interface device **100** may include an integrated controller functioning as the first controller **23** for controlling a plurality of electronic components of the first clothes treating apparatus **10** and the second controller **97** for controlling a plurality of electronic components of the second clothes treating apparatus **60**.

In the case in which the user interface device **100** includes the integrated controller, the first clothes treating apparatus **10** and the second clothes treating apparatus **60** may not include the corresponding controllers **23** and **97**, respectively.

FIG. **15** is a flowchart showing an example of a method for controlling a clothes treating system according to an embodiment of the disclosure.

Referring to FIG. **15**, the clothes treating system **1** may obtain information (hereinafter, referred to as 'information of a first operation course') about an operation course of the first clothes treating apparatus **10** and information (hereinafter, referred to as 'information of a second operation course') about an operation course of the second clothes treating apparatus **60** (operation **1100**).

According to an embodiment of the disclosure, the user interface device **100** may transfer a start command for the first operation course of the first clothes treating apparatus **10** to the first controller **23**, in response to reception of the start command for starting the first operation course.

The first controller **23** may control a plurality of electronic components (for example, the first drum motor **41**, the water supply **50**, and the drain device **54**) based on an algorithm corresponding to the first operation course, in response to reception of the start command for starting the first operation course through the user interface device **100**.

According to an embodiment of the disclosure, the user interface device **100** may transfer a start command for the second operation course of the second clothes treating apparatus **60** to the second controller **97**, in response to reception of the start command for starting the second operation course.

The second controller **97** may control a plurality of electronic components (for example, the second drum motor **73***a* and/or the fan motor **91**, the compressor **83**, and the heater **86**) based on an algorithm corresponding to the second operation course, in response to reception of the start command for starting the second operation course through the user interface device **100**.

The first operation course may be a clothes treating course that is selected by a user and starts by the first clothes treating apparatus **10**.

The second operation course may be a clothes treating course that is selected by a user and starts by the second clothes treating apparatus **60**.

According to various embodiments of the disclosure, the user interface device **100** may transfer a start command for the second operation course of the second clothes treating apparatus **60** to the first controller **23**, in response to reception of the start command for starting the second operation course. The first controller **23** may estimate an operation

state of the second clothes treating apparatus **60** in response to reception of the start command for the second operation course.

According to various embodiments of the disclosure, the user interface device **100** may transfer a start command for the first operation course of the first clothes treating apparatus **10** to the second controller **97**, in response to reception of the start command for starting the first operation course. The second controller **97** may estimate an operation state of the first clothes treating apparatus **10** in response to reception of the start command for the first operation course.

The clothes treating system **1** may identify priorities of the first operation course and the second operation course (operation **1200**).

According to an embodiment of the disclosure, the first controller **23** may identify the priorities of the first operation course and the second operation course based on reception of the information about the first operation course and the information about the second operation course from the user interface device **100**.

According to an embodiment of the disclosure, the second controller **97** may identify the priorities of the first operation course and the second operation course based on reception of the information about the first operation course and the information about the second operation course from the user interface device **100**.

According to an embodiment of the disclosure, the integrated controller of the user interface device **100** may identify the priorities of the first operation course and the second operation course.

The priorities of the first operation course and the second operation course may have been set in advance.

According to an embodiment of the disclosure, an algorithm and/or a lookup table for identifying the priorities of the first operation course and the second operation course may have been stored in at least one of the memory **25** of the first controller **23**, the memory **99** of the second controller **97**, or a memory of the integrated controller included in the user interface device **100**.

At least one of the first controller **23**, the second controller **97**, or the integrated controller included in the user interface device **100** may identify the priorities of the first operation course and the second operation course based on a lookup table to which priorities of a plurality of operation courses capable of being performed by the first clothes treating apparatus **10** and the second clothes treating apparatus **60** are mapped.

FIG. **16** is a lookup table showing an example of a priority list for operation courses of a clothes treating system according to an embodiment of the disclosure.

Referring to FIG. **16**, priorities for operation courses of the clothes treating system **1** may be set according to purposes of the operation courses.

For example, the specialized courses, such as the energy saving course, the time saving course, and the low noise course, according to a user's special needs may have lower priorities than the normal courses (for example, the delicate clothes course and the standard course).

A priority of a first specialized course among the plurality of specialized courses may be higher than a priority of a second specialized course. For example, a priority of the energy saving course may be higher than a priority of the time saving course.

According to various embodiments of the disclosure, a priority of a first specialized course of the first clothes treating apparatus **10** may be different from a priority of a first specialized course of the second clothes treating apparatus **60**.

For example, a priority of the energy saving course of the first clothes treating apparatus **10** may be higher than a priority of the energy saving course of the second clothes treating apparatus **60**.

However, the priority of the energy saving course of the first clothes treating apparatus **10** may be equal to the priority of the energy saving course of the second clothes treating apparatus **60**.

A priority of a first normal course among the plurality of normal courses may be higher than a priority of a second normal course. For example, a priority of the delicate clothes course may be higher than a priority of the standard course.

According to various embodiments of the disclosure, a priority of a first normal course of the first clothes treating apparatus **10** may also be different from a priority of a first normal course of the second clothes treating apparatus **60**.

For example, a priority of a delicate clothes course of the first clothes treating apparatus **10** may be higher than a priority of a delicate clothes course of the second clothes treating apparatus **60**.

However, the priority of the delicate clothes course of the first clothes treating apparatus **10** may be equal to the priority of the delicate clothes course of the second clothes treating apparatus **60**.

Priorities of a plurality of courses that are executable in the first clothes treating apparatus **10** and a plurality of courses that are executable in the second clothes treating apparatus **60** are not limited to the above-described examples, and priorities of the plurality of courses that may be performed by the clothes treating system **1** may have been set in advance according to a designer's intention.

According to various embodiments of the disclosure, a user may set priorities of the plurality of courses that may be performed by the clothes treating system **1** through the user interface device **100**.

There may be a case in which a certain course has a special purpose that may be not achieved upon a change of an algorithm of the certain course. In this case, the certain course may be set to have a high priority according to a designer's intention.

According to an embodiment of the disclosure, a preset priority of the first operation course may be equal to a preset priority of the second operation course.

According to an embodiment of the disclosure, the clothes treating system **1** may identify the priorities of the first operation course and the second operation course based on a start time of an operation corresponding to the first operation course and a start time of the second operation course.

For example, in a case in which the preset priority of the first operation course is equal to the preset priority of the second operation course, the priorities may be identified based on a start time of an operation corresponding to the first operation course and a start time of the second operation course.

FIGS. **17**A and **17**B are views for describing an example of a method for setting the same priorities of a first operation course and a second operation course to different priorities.

According to an embodiment of the disclosure, in a case in which a preset priority of a first operation course is equal to a preset priority of a second operation course, the clothes treating system **1** may identify priorities of the first operation course and the second operation course based on a start time

of a dehydrating operation corresponding to the first operation course and a start time of the second operation course.

Referring to FIG. **17**A, the first clothes treating apparatus **10** may start the first operation course by receiving a start command for the first operation course at a first time t**1**, and the second clothes treating apparatus **60** may start the second operation course by receiving a start command for the second operation course at a second time t**2** that is later than the first time t**1**.

Under an assumption that a preset priority of the first operation course is equal to a preset priority of the second operation course, in a case in which a start time t**3** of a dehydrating operation of the first operation course is later than the second time t**2**, the clothes treating system **1** may identify that the priority of the second operation course is higher than the priority of the first operation course.

For example, the first controller **23** may recognize a start time t**3** of a dehydrating operation according to an algorithm of the first operation course, recognize a start time t**2** of the second operation course based on information about the second operation course received through the first communicator **19**, and identify that a priority of the second operation course is higher than a priority of the first operation course in response to identification that the start time t**3** of the dehydrating operation is later than the start time t**2** of the second operation course.

As another example, the second controller **97** may recognize a start time t**2** of the second operation course, recognize a start time t**3** of a dehydrating operation of the first operation course based on information about the first operation course received through the second communicator **94**, and identify that a priority of the second operation course is higher than a priority of the first operation course in response to identification that the start time t**3** of the dehydrating operation is later than the start time t**2** of the second operation course.

The clothes treating system **1** may change the algorithm of the first operation course, identified to have the lower priority, without changing an algorithm of the second operation course.

Thereafter, the clothes treating system **1** may restore the algorithm of the first operation course at a time t**4** at which the second clothes treating apparatus **60** completes the second operation course.

According to various embodiments of the disclosure, in a case in which a priority of the first operation course is equal to a priority of the second operation course, the clothes treating system **1** may change the algorithm of the first operation course according to identification that operation RPM of the first drum motor **41** is smaller than a preset value.

Referring to FIG. **17**B, the first clothes treating apparatus **10** may start a first operation course by receiving a start command for the first operation course at a fifth time t**5**, and enter a dehydrating operation at a sixth time t**6**.

The second clothes treating apparatus **60** may start a second operation course by receiving a start command for the second operation course at a seventh time t**7** that is later than the sixth time t**6**.

Under an assumption that a preset priority of the first operation course is equal to a preset priority of the second operation course, in a case in which the time t**6** at which the dehydrating operation of the first operation course starts is earlier than the seventh time t**7**, the clothes treating system **1** may identify that a priority of the first operation course is higher than a priority of the second operation course.

For example, the first controller **23** may recognize a time t**6** at which a dehydrating operation starts according to an algorithm of the first operation course, recognize a start time t**7** of the second operation course based on information about the second operation course, received through the first communicator **19**, and identify that a priority of the first operation course is higher than a priority of the second operation course in response to identification that the start time t**6** of the dehydrating operation is earlier than the start time t**7** of the second operation course.

As another example, the second controller **97** may recognize a start time t**7** of the second operation course, recognize a start time t**6** of a dehydrating operation of the first operation course, based on information about the first operation course, received through the second communicator **94**, and identify that a priority of the first operation course is higher than a priority of the second operation course, in response to identification that the start time t**6** of the dehydrating operation is earlier than the start time t**7** of the second operation course.

The clothes treating system **1** may change the algorithm of the second operation course, identified to have the lower priority, without changing the algorithm of the first operation course.

Thereafter, the clothes treating system **1** may restore the algorithm of the second operation course at a time t**8** at which the first clothes treating apparatus **10** completes the second operation course.

According to various embodiments of the disclosure, in a case in which a priority of the first operation course is equal to a priority of the second operation course, the clothes treating system **1** may change the algorithm of the second operation course according to identification that operation RPM of the first drum motor **41** is greater than or equal to a preset value.

The clothes treating system **1** may change the algorithm of the first operation course or the algorithm of the second operation course based on the priorities of the first operation course and the second operation course (operation **1300**).

For example, the clothes treating system **1** may change the algorithm of the first operation course in response to identification that a priority of the first operation course is lower than a priority of the second operation course.

As another example, the clothes treating system **1** may change the algorithm of the second operation course in response to identification that a priority of the second operation course is lower than a priority of the first operation course.

According to various embodiments of the disclosure, in a case in which a preset condition is not satisfied although a priority of the first operation course is different from a priority of the second operation course, the clothes treating system **1** may change neither the algorithms of the first operation course nor the second operation course.

Changing the algorithm of the first operation course or the algorithm of the second operation course based on priorities may include preferentially changing the algorithm of the first operation course or the algorithm of the second operation course upon satisfaction of a preset condition.

The preset condition may include a condition under which there is a risk that a great vibration will occur in the clothes treating system **1** by frequency resonance while the first clothes treating apparatus **10** controls a plurality of electronic components according to the algorithm of the first operation course and the second clothes treating apparatus **60** controls a plurality of electronic components according to the algorithm of the second operation course.

For example, the preset condition may include a condition under which target RPM of the first drum motor **41** according to the algorithm of the first operation course and target RPM of the fan motor **91** according to the algorithm of the second operation course are in an integer multiple relationship.

As another example, the preset condition may include a condition under which target RPM of the first drum motor **41** according to the algorithm of the first operation course and target RPM of the second drum motor **73***a* according to the algorithm of the second operation course are in an integer multiple relationship.

As another example, the preset condition may include a condition under which target RPM of the first drum motor **41** according to the algorithm of the first operation course and target RPM of the compressor **83** according to the algorithm of the second operation course are in an integer multiple relationship.

The target RPM of the first drum motor **41** according to the algorithm of the first operation course may be maximum target RPM of the first drum motor **41** in a first dehydrating operation **1031** and/or a second dehydrating operation **1032**.

According to various embodiments of the disclosure, the target RPM of the first drum motor **41** may correspond to an RPM command ω* that is calculated in real time by the first controller **23**.

The target RPM of the fan motor **91** according to the algorithm of the second operation course may be target RPM of the fan motor **91** in a drying operation.

According to various embodiments of the disclosure, the target RPM of the fan motor **91** may correspond to an RPM command of the fan motor **91**, which is calculated in real time by the second controller **97**.

The target RPM of the second drum motor **73***a* according to the algorithm of the second operation course may be target RPM of the second drum motor **73***a* in a drying operation.

According to various embodiments of the disclosure, the target RPM of the second drum motor **73***a* may correspond to an RPM command of the second drum motor **73***a*, which is calculated in real time by the second controller **97**.

The target RPM of the compressor **83** according to the algorithm of the second operation course may be target RPM of the compressor **83** in a drying operation.

According to various embodiments of the disclosure, the target RPM of the compressor **83** may correspond to an RPM command of the compressor **83**, which is calculated in real time by the second controller **97**.

The second controller **97** may transfer information about a RPM command of the compressor **83**, an RPM command of the second drum motor **73***a*, and/or an RPM command of the fan motor **91**, which are calculated in real time, to the first controller **23**. The first controller **23** may transfer information about maximum target RPM of the first drum motor **41** to the second controller **97**.

The first controller **23** and/or the second controller **97** may identify whether to change the algorithm of the first operation course or the algorithm of the second operation course, based on the information about the maximum target RPM of the first drum motor **41** and the information about the RPM command of the compressor **83**, the RPM command of the second drum motor **73***a*, and/or the RPM command of the fan motor **91**, which are calculated in real time. Also, the first controller **23** and/or the second controller **97** may identify a method for changing the algorithm of the first operation course or the algorithm of the second operation course, based on the information about the maximum target RPM of the first drum motor **41** and the information about the RPM command of the compressor **83**, the RPM command of the second drum motor **73***a*, and/or the RPM command of the fan motor **91**, which are calculated in real time.

A condition under which excessive vibrations are generated in the clothes treating system **1** may be a condition under which the first drum **30** rotates at high speed, and correspond to a condition in which the first clothes treating apparatus **10** performs a dehydrating operation.

According to the disclosure, by changing a course algorithm of a clothes treating apparatus that performs a course having a lower priority to prevent a frequency resonance phenomenon while the first clothes treating apparatus **10** and the second clothes treating apparatus **60** operate simultaneously, it may be possible to achieve a purpose of a course having a higher priority while reducing generation of excessive vibrations.

FIG. **18** shows an example of a method for controlling a clothes treating system according to an embodiment of the disclosure in a case in which a priority of a first operation course is higher than a priority of a second operation course.

A method for controlling the clothes treating system **1** in a case in which a priority of a first operation course is higher than a priority of a second operation course will be described with reference to FIG. **18**.

The clothes treating system **1** may receive operation information of the first clothes treating apparatus **10** and operation information of the second clothes treating apparatus **60** (operation **2000**).

An object that performs the control method shown in FIG. **18** may be the first controller **23** and/or the second controller **97**, or may be an integrated controller included in a user interface device.

The clothes treating system **1** may identify whether the first clothes treating apparatus **10** performs a dehydrating operation **1030** according to a first operation course, based on the operation information of the first clothes treating apparatus **10** (operation **2100**).

According to identification that the first clothes treating apparatus **10** does not perform the dehydrating operation **1030** according to the first operation course (NO in operation **2100**) and a dehydrating operation has been completed (YES in operation **2150**), the second clothes treating apparatus **60** may perform an operation corresponding to a second operation course without changing an algorithm of the second operation course.

While the first clothes treating apparatus **10** performs a first dehydrating operation **1031** in the dehydrating operation **1030** according to the first operation course (YES in operation **2200**), the clothes treating system **1** may change operation RPM of a plurality of electronic components of the second clothes treating apparatus **60** to prevent target RPM J1 (see FIG. **10**) of the first drum motor **41** and operation RPM of a plurality of electronic components of the second clothes treating apparatus **60** according to the second operation course from being in an integer multiple relationship (operations **2300** and **2400**).

According to the disclosure, by changing only the operation RPM of the plurality of electronic components of the second clothes treating apparatus **60** without changing the target RPM J1 of the first drum motor **41**, it may be possible to prevent excessive vibrations from being generated in the clothes treating system **1** due to satisfaction of a resonance condition caused because the RPM of the first drum motor **41** and the operation RPM of the plurality of electronic components of the second clothes treating apparatus **60** are in an integer multiple relationship.

According to an embodiment of the disclosure, the clothes treating system **1** may control target RPM of the second motor **91** and **73***a* of the second clothes treating apparatus **60** to prevent the target RPM J1 (see FIG. **10**) of the first drum motor **41** and target RPM of the fan motor **91** and/or the second drum motor **73***a* (hereinafter, also referred to as a 'second motor **91** and **73***a*') of the second clothes treating apparatus **60** according to the second operation course from being in an integer multiple relationship (operation **2300**).

For example, while target RPM J1 of the first drum motor **41** is 500 RPM and target RPM of the second motor **91** and **73***a* of the second clothes treating apparatus **60** according to the algorithm of the second operation course is 2500 RPM, the clothes treating system **1** may change the algorithm of the second operation course such that target RPM of the second motor **91** and **73***a* of the second clothes treating apparatus **60** is greater or smaller than 2500 RPM by a preset value.

According to an embodiment of the disclosure, the clothes treating system **1** may control target RPM of the compressor **83** of the second clothes treating apparatus **60** to prevent the target RPM J1 (see FIG. **10**) of the first drum motor **41** and target RPM of the compressor **83** of the second clothes treating apparatus **60** according to the second operation course from being in an integer multiple relationship (operation **2400**).

For example, while target RPM J1 of the first drum motor **41** is 600 RPM and target RPM of the compressor **83** of the second clothes treating apparatus **60** according to the algorithm of the second operation course is 1800 RPM (=30 Hz), the clothes treating system **1** may change the algorithm of the second operation course such that target RPM of the compressor **83** of the second clothes treating apparatus **60** is greater or smaller than 1800 RPM by a preset value.

According to various embodiments of the disclosure, target RPM of the compressor **83** may be regulated in real time according to target temperature set according to the algorithm of the second operation course.

According to an embodiment of the disclosure, changing the algorithm of the second operation course such that target RPM of the compressor **83** is greater or smaller than a preset value may include changing the algorithm of the second operation course such that target RPM of the compressor **83** is greater than the preset value in response to identification that temperature detected through the sensor **79** is lower than target temperature set according to the algorithm of the second operation course, and changing the algorithm of the second operation course such that target RPM of the compressor **83** is smaller than the preset value in response to identification that temperature detected through the sensor **79** is higher than target temperature set according to the algorithm of the second operation course.

Temperature detected through the sensor **79** may correspond to inside temperature of the second clothes treating apparatus **60**, and may correspond to temperature at the exit of the condenser **82**.

According to the disclosure, by changing target RPM of the compressor **83** according to a difference between target temperature and actual temperature, a resonance phenomenon may be prevented while the second clothes treating apparatus **60** follows the target temperature at higher speed.

While the first clothes treating apparatus **10** performs a second dehydrating operation **1032** in the dehydrating operation **1030** according to the first operation course (operation **2500**), the clothes treating system **1** may change operation RPM of the plurality of electronic components of the second clothes treating apparatus **60** to prevent target RPM J2 (see FIG. **10**) of the first drum motor **41** and operation RPM of the plurality of electronic components of the second clothes treating apparatus **60** according to the second operation course from being in an integer multiple relationship (operations **2600** and **2700**).

According to an embodiment of the disclosure, the clothes treating system **1** may control target RPM of the second motor **91** and **73***a* of the second clothes treating apparatus **60** to prevent the target RPM J2 (see FIG. **10**) of the first drum motor **41** and target RPM of the second motor **91** and **73***a* of the second clothes treating apparatus **60** according to the second operation course from being in an integer multiple relationship (operation **2600**).

For example, while target RPM of the first drum motor **41** is 1000 RPM and target RPM of the second motor **91** and **73***a* of the second clothes treating apparatus **60** according to the algorithm of the second operation course is 2000 RPM, the clothes treating system **1** may change the algorithm of the second operation course to down-regulate the target RPM of the second motor **91** and **73***a* of the second clothes treating apparatus **60** to be lower than 2000 RPM by a preset value.

According to an embodiment of the disclosure, the clothes treating system **1** may control the target RPM of the compressor **83** of the second clothes treating apparatus **60** to prevent the target RPM J2 (see FIG. **10**) of the first drum motor **41** and target RPM of the compressor **83** of the second clothes treating apparatus **60** according to the second operation course from being in an integer multiple relationship (operation **2700**).

For example, while target RPM of the first drum motor **41** is 1200 RPM and target RPM of the compressor **83** of the second clothes treating apparatus **60** according to the algorithm of the second operation course is 3600 RPM (=60 Hz), the clothes treating system **1** may change the algorithm of the second operation course such that target RPM of the compressor **83** of the second clothes treating apparatus **60** is greater or smaller than 3600 RPM by a preset value.

According to various embodiments of the disclosure, target RPM of the compressor **83** may be regulated in real time according to target temperature set according to the algorithm of the second operation course.

According to an embodiment of the disclosure, changing the algorithm of the second operation course such that target RPM of the compressor **83** is greater or smaller than a preset value may include changing the algorithm of the second operation course such that target RPM of the compressor **83** is greater than the preset value in response to identification that temperature detected through the sensor **79** is lower than target temperature set according to the algorithm of the second operation course, and changing the algorithm of the second operation course such that target RPM of the compressor **83** is smaller than the preset value in response to identification that temperature detected through the sensor **79** is higher than target temperature set according to the algorithm of the second operation course.

According to an embodiment of the disclosure, operations **2300**, **2400**, **2600**, and **2700** may be performed in a case in which target RPM of the first drum motor **41** and operation RPM of the plurality of electronic components of the second clothes treating apparatus **60** belong to a range in which a resonance phenomenon may occur, as well as in a case in which target RPM of the first drum motor **41** and operation RPM of the plurality of electronic components of the second clothes treating apparatus **60** are exactly in an integer multiple relationship.

That is, the second clothes treating apparatus **60** may regulate operation RPM of the plurality of electronic components such that target RPM of the first drum motor **41** and operation RPM of the plurality of electronic components of the second clothes treating apparatus **60** do not belong to a preset range corresponding to an integer multiple relationship.

For example, while target RPM of the first drum motor **41** is 1200 RPM and target RPM of the compressor **83** of the second clothes treating apparatus **60** according to the algorithm of the second operation course is 3540 RPM (=59 Hz), the clothes treating system **1** may change the algorithm of the second operation course such that target RPM of the compressor **83** of the second clothes treating apparatus **60** is smaller than 3540 RPM by a preset value.

As another example, for example, while target RPM of the first drum motor **41** is 1200 RPM and target RPM of the compressor **83** of the second clothes treating apparatus **60** according to the algorithm of the second operation course is 3660 RPM (=61 Hz), the clothes treating system **1** may change the algorithm of the second operation course such that target RPM of the compressor **83** of the second clothes treating apparatus **60** is smaller than 3660 RPM by a preset value.

FIG. **19** shows an example of a method for controlling a clothes treating system according to an embodiment of the disclosure in a case in which a priority of a second operation course is higher than a priority of a first operation course.

The method for controlling the clothes treating system **1** in a case in which a priority of the second operation course is higher than a priority of the first operation course will be described with reference to FIG. **19**.

The clothes treating system **1** may receive operation information of the first clothes treating apparatus **10** and operation information of the second clothes treating apparatus **60** (operation **3000**).

An object that performs the control method shown in FIG. **19** may be the first controller **23** and/or the second controller **97**, or may be an integrated controller included in a user interface device.

The clothes treating system **1** may identify whether the first clothes treating apparatus **10** performs a dehydrating operation **1030** according to the first operation course, based on the operation information of the first clothes treating apparatus **10** (operation **3100**).

According to identification that the first clothes treating apparatus **10** does not perform the dehydrating operation **1030** according to the first operation course (NO in operation **3100**) and a dehydrating operation has been completed (YES in operation **3150**), the first clothes treating apparatus **10** may perform an operation corresponding to the first operation course without changing an algorithm of the first operation course.

While the first clothes treating apparatus **10** performs a first dehydrating operation **1031** in the dehydrating operation **1030** according to the first operation course (YES in operation **3200**), the clothes treating system **1** may change target RPM J1 (see FIG. **10**) of the first drum motor **41** of the first clothes treating apparatus **10** to prevent target RPM J1 of the first drum motor **41** and operation RPM of a plurality of electronic components of the second clothes treating apparatus **60** according to the second operation course from being in an integer multiple relationship (operation **3300**).

According to an embodiment of the disclosure, the clothes treating system **1** may change the target RPM J1 of the first drum motor **41** to prevent the target RPM J1 of the first drum motor **41** and target RPM of the second motor **91** and **73***a* according to the second operation course from being in an integer multiple relationship.

For example, while target RPM J1 of the first drum motor **41** is 500 RPM and target RPM of the second motor **91** and **73***a* of the second clothes treating apparatus **60** according to an algorithm of the second operation course is 2500 RPM, the clothes treating system **1** may change the algorithm of the first operation course such that target RPM J1 of the first drum motor **41** is greater or smaller than 500 RPM by a preset value.

According to an embodiment of the disclosure, the clothes treating system **1** may change the target RPM J1 of the first drum motor **41** to prevent the target RPM

J1 (see FIG. **10**) of the first drum motor **41** and target RPM of the compressor **83** according to the second operation course from being in an integer multiple relationship.

For example, while target RPM J1 of the first drum motor **41** is 600 RPM and target RPM of the compressor **83** of the second clothes treating apparatus **60** according to the algorithm of the second operation course is 2400 RPM (=40 Hz), the clothes treating system **1** may change the algorithm of the first operation course such that target RPM J1 of the first drum motor **41** is greater or smaller than 600 RPM by a preset value.

According to the disclosure, by changing only target RPM of the first drum motor **41** without changing operation RPM of the plurality of electronic components of the second clothes treating apparatus **60**, it may be possible to prevent excessive vibrations from being generated in the clothes treating system **1** because the RPM of the first drum motor **41** and the operation RPM of the plurality of electronic components of the second clothes treating apparatus **60** are in an integer multiple relationship.

While the first clothes treating apparatus **10** performs a second dehydrating operation **1032** in the dehydrating operation **1030** according to the first operation course (operation **3400**), the clothes treating system **1** may change target RPM J2 of the first drum motor **41** of the first clothes treating apparatus **10** to prevent the target RPM J2 (see FIG. **10**) of the first drum motor **41** and the operation RPM of the plurality of electronic components of the second clothes treating apparatus **60** according to the second operation course from being in an integer multiple relationship (operation **3500**).

According to an embodiment of the disclosure, the clothes treating system **1** may change the target RPM J2 of the first drum motor **41** to prevent the target RPM J2 of the first drum motor **41** and target RPM of the second motor **91** and **73***a* according to the second operation course from being in an integer multiple relationship.

For example, while target RPM of the first drum motor **41** is 1000 RPM and target RPM of the second motor **91** and **73***a* of the second clothes treating apparatus **60** according to the algorithm of the second operation course is 2000 RPM, the clothes treating system **1** may change the algorithm of the first operation course such that the target RPM of the first drum motor **41** increases or decreases by a preset value.

According to an embodiment of the disclosure, the clothes treating system **1** may change the target RPM J2 of the first drum motor **41** to prevent the target RPM J2 of the first drum motor **41** and target RPM of the compressor **83** according to the second operation course from being in an integer multiple relationship.

For example, while target RPM of the first drum motor **41** is 1200 RPM and target RPM of the compressor **83** of the second clothes treating apparatus **60** according to the algo-

rithm of the second operation course is 3600 RPM (=60 Hz), the clothes treating system **1** may change the algorithm of the second operation course such that the target RPM J**2** of the first drum motor **41** increases or decreases by a preset value.

According to an embodiment of the disclosure, operations **3300** and **3500** may be performed in a case in which target RPM of the first drum motor **41** and operation RPM of the plurality of electronic components of the second clothes treating apparatus **60** belong to a range in which a resonance phenomenon may occur, as well as in a case in which target RPM of the first drum motor **41** and operation RPM of the plurality of electronic components of the second clothes treating apparatus **60** are exactly in an integer multiple relationship.

That is, the second clothes treating apparatus **60** may regulate the target RPM of the first drum motor **41** such that the target RPM of the first drum motor **41** and the operation RPM of the plurality of electronic components of the second clothes treating apparatus **60** do not correspond to a preset range corresponding to an integer multiple relationship.

For example, while target RPM of the first drum motor **41** is 1200 RPM and target RPM of the compressor **83** of the second clothes treating apparatus **60** according to the algorithm of the second operation course is 3540 RPM (=59 Hz), the clothes treating system **1** may change the algorithm of the first operation course such that target RPM of the first drum motor **41** is greater than 1200 RPM by a preset value.

As another example, for example, while target RPM of the first drum motor **41** is 1200 RPM and target RPM of the compressor **83** of the second clothes treating apparatus **60** according to the algorithm of the second operation course is 3660 RPM (=61 Hz), the clothes treating system **1** may change the algorithm of the first operation course such that target RPM of the compressor **83** of the second clothes treating apparatus **60** is smaller than 1200 RPM by a preset value.

FIG. **20** is a flowchart showing an example of a method for controlling a clothes treating system according to an embodiment of the disclosure.

An object that performs the control method shown in FIG. **20** may be the first controller **23** and/or the second controller **97**, or may be an integrated controller included in a user interface device.

In various situations, abnormal vibrations may be generated in the clothes treating system **1** although RPM of the first drum motor **41** and operation RPM of a plurality of electronic components of the second clothes treating apparatus **60** are not in a resonance relation.

Referring to FIG. **20**, the clothes treating system **1** may obtain vibration values M and T of vibrations generated in the clothes treating system **1** (operation **4000**).

According to an embodiment of the disclosure, the sensor **18** of the first clothes treating apparatus **10** and/or the sensor **79** of the second clothes treating apparatus **60** may include at least one vibration sensor.

The at least one vibration sensor may include an acceleration sensor and/or a torque sensor. The acceleration sensor may be installed in the tub **20**, although not limited thereto.

For example, the acceleration sensor may be installed in the first housing **11** and/or the second housing **61**.

The torque sensor may be installed in the first driver **40** and/or the second driver **73**, although not limited thereto.

The vibration values M and T of the vibrations generated in the clothes treating system **1** may be obtained by the sensors **18** and **79**.

The vibration values M and T may include a first vibration value M obtained from the acceleration sensor and/or a second vibration value T obtained from the torque sensor.

According to an embodiment of the disclosure, in a case in which the sensors **18** and **79** include both an acceleration sensor and a torque sensor, the clothes treating system **1** may identify abnormal vibrations of the clothes treating system **1** by using both a first vibration value M and a second vibration value T.

According to an embodiment of the disclosure, in a case in which the sensors **18** and **79** include only torque sensors, the clothes treating system **1** may identify abnormal vibrations of the clothes treating system **1** by using second vibration values T.

The clothes treating system **1** may identify whether the first vibration value M is greater than a first threshold value $m_{abnormal}$ (operation **4100**).

According to an embodiment of the disclosure, according to identification that a state in which the first vibration value M is greater than the first threshold value $M_{abnormal}$ is maintained for a preset time (for example, 10 seconds), the clothes treating system **1** may identify that the first vibration value M is greater than the first threshold value $M_{abnormal}$.

The clothes treating system **1** may identify whether the second vibration value T is greater than a second threshold value $T_{abnormal}$ (operation **4200**).

According to an embodiment of the disclosure, according to identification that a state in which the second vibration value T is greater than the second threshold value $T_{abnormal}$ is maintained for a preset time (for example, 10 seconds), the clothes treating system **1** may identify that the second vibration value T is greater than the second threshold value $T_{abnormal}$.

The clothes treating system **1** may stop an operation of the second clothes treating apparatus **60** in response to identification (YES in operation **4100**) that the first vibration value M is greater than the first threshold value $M_{abnormal}$ or identification (YES in operation **4200**) that the second vibration value T is greater than the second threshold value $T_{abnormal}$ (operation **4150**).

According to the disclosure, by preferentially stopping an operation of the second clothes treating apparatus **60** according to generation of abnormal vibrations in the clothes treating apparatus **1**, components of the clothes treating system **1** may be prevented from being damaged.

According to various embodiments of the disclosure, the clothes treating system **1** may omit a dehydrating operation in a first operation course in response to identification (YES in operation **4100**) that the first vibration value M is greater than the first threshold value $M_{abnormal}$ or identification (YES in operation **4200**) that the second vibration value T is greater than the second threshold value $T_{abnormal}$.

For example, according to identification that a first vibration value M is greater than the first threshold value $M_{abnormal}$ or a second vibration value T is greater than the second threshold value $T_{abnormal}$ while the clothes treating system **1** performs a midway dehydrating operation **1015** of a washing operation **1010**, the clothes treating system **1** may control the first clothes treating apparatus **10** to perform only remaining operations except for dehydrating operations **1015**, **1024**, and **1030**.

According to the disclosure, by performing a clothes treating cycle while omitting an operation in which abnormal vibrations may be generated in the first clothes treating apparatus **10**, regeneration of abnormal vibrations may be prevented.

The clothes treating system **1** may resume an operation of the second clothes treating apparatus **60** in response to identification that an operation of the first clothes treating apparatus **10** is completed (operation **4250**).

According to various embodiments of the disclosure, according to identification that a state in which a first vibration value M is smaller than the first threshold value $M_{abnormal}$ is maintained for a preset time while the clothes treating system **1** controls the first clothes treating apparatus **10** to perform only the remaining operations except for dehydrating operations **1015**, **1024**, and **1030**, the clothes treating system **1** may resume the operation of the second clothes treating apparatus **60**.

According to various embodiments of the disclosure, according to identification that a state in which a second vibration value T is smaller than the second threshold value $T_{abnormal}$ is maintained for a preset time while the clothes treating system **1** controls the first clothes treating apparatus **10** to perform only the remaining operations except for dehydrating operations **1015**, **1024**, and **1030**, the clothes treating system **1** may resume the operation of the second clothes treating apparatus **60**.

According to various embodiments of the disclosure, according to identification that there is a history in which a first vibration value M is greater than the first threshold value $M_{abnormal}$ or a history in which a second vibration value T is greater than the second threshold value $T_{abnormal}$, the clothes treating system **1** may notify a user that an abnormal vibration has been generated, through the user interface device **100**.

Also, according to various embodiments of the disclosure, according to identification that there is a history in which a first vibration value M is greater than the first threshold value $M_{abnormal}$ or a history in which a second vibration value T is greater than the second threshold value $T_{abnormal}$, the clothes treating system **1** may transmit a signal notifying that an abnormal vibration has been generated, to an external device, through the communicators **19** and **94**.

According to the disclosure, by omitting some operations of the first clothes treating apparatus **10** and stopping an operation of the second clothes treating apparatus **60** according to identification that an abnormal vibration is generated in the clothes treating system **1**, components may be prevented from being damaged.

Also, according to the disclosure, by notifying a user of an abnormal vibration of the clothes treating apparatus **1**, dissatisfaction about incomplete clothes treating by the clothes treating system **1** may be more or less mitigated.

According to an embodiment of the disclosure, there is provided a method for controlling a clothes treating system **1** including a first clothes treating apparatus **10** and a second clothes treating apparatus **60** electrically connected to the first clothes treating apparatus **10**, the method including: obtaining information about a first operation course of the first clothes treating apparatus **10** and information about a second operation course of the second clothes treating apparatus **60**; identifying a priority between the first operation course and the second operation course; and changing an algorithm of the first operation course or an algorithm of the second operation course based on the priority.

The changing of the algorithm of the first operation course or the algorithm of the second operation course based on the priority may include changing the algorithm of the second operation course in response to identification that the first operation course has the priority over the second operation course.

The changing of the algorithm of the first operation course or the algorithm of the second operation course based on the priorities may include changing the algorithm of the first operation course in response to identification that the second operation course has the priority over the first operation course.

The identifying of the priority between the first operation course and the second operation course may include identifying the priority between the first operation course and the second operation course based on a lookup table to which priorities of a plurality of operation courses capable of being performed by the first clothes treating apparatus and the second clothes treating apparatus are mapped.

The first clothes treating apparatus may be a washing machine including a drum motor **41** for rotating a drum **30**, and the second clothes treating apparatus may be a dryer including at least one of a compressor **83** or a fan motor **91** for rotating a fan.

The changing of the algorithm of the first operation course may include changing target RPM of the drum motor, corresponding to the first operation course, to prevent the target RPM of the drum motor, corresponding to the first operation course, and target RPM of the fan motor, corresponding to the second operation course, from being in an integer multiple relationship.

The changing of the algorithm of the first operation course may include changing the target RPM of the drum motor, corresponding to the first operation course, to prevent the target RPM of the drum motor, corresponding to the first operation course, and target RPM of the compressor, corresponding to the second operation course, from being in an integer multiple relationship.

The changing of the algorithm of the second operation course may include changing target RPM of the fan motor to prevent the target RPM of the drum motor, corresponding to the first operation course, and the target RPM of the fan motor, corresponding to the second operation course, from being in an integer multiple relationship.

The changing of the algorithm of the second operation course may include changing target RPM of the compressor to prevent the target RPM of the drum motor, corresponding to the first operation course, and the target RPM of the compressor, corresponding to the second operation course, from being in an integer multiple relationship.

The changing of the target RPM of the compressor may include up-regulating the target RPM of the compressor in response to identification that inside temperature of the dryer is lower than target temperature.

The changing of the target RPM of the compressor may include down-regulating the target RPM of the compressor in response to identification that inside temperature of the dryer is higher than the target temperature.

The method for controlling the clothes treating system may further include: obtaining a vibration value of the clothes treating system; and stopping an operation of the second clothes treating apparatus according to identification that the vibration value of the clothes treating system is greater than a preset value.

The method for controlling the clothes treating system may further include resuming the operation of the second clothes treating apparatus in response to operation completion of the first clothes treating apparatus.

The method for controlling the clothes treating system may further include changing the target RPM of the compressor or the target RPM of the fan motor according to identification that the first operation course and the second operation course has the same priority.

The method for controlling the clothes treating system may further include changing, while the first operation course and the second operation course having the same priority, the target RPM of the compressor or the target RPM of the fan motor according to identification that RPM of the drum motor is greater than or equal to a preset value.

The method for controlling the clothes treating system may further include changing, while the first operation course and the second operation course having the same priority, the target RPM of the drum motor according to identification that RPM of the drum motor is smaller than the preset value.

According to an embodiment of the disclosure, there is provided a clothes treating system including: a first clothes treating apparatus including a drum motor configured to rotate a drum, and a first controller configured to control the drum motor; a second clothes treating apparatus including a fan motor configured to rotate a fan, a compressor, and a second controller configured to control the fan motor and the compressor; and a user interface device configured to receive a user input of selecting an operation course of the first clothes treating apparatus and an operation course of the second clothes treating apparatus, wherein the first controller is configured to change an algorithm of the operation course of the first clothes treating apparatus based on a priority between the operation course of the first clothes treating apparatus and the operation course of the second clothes treating apparatus, and the second controller is configured to change an algorithm of the operation course of the second clothes treating apparatus based on the priority between the operation course of the first clothes treating apparatus and the operation course of the second clothes treating apparatus.

The first controller may change the algorithm of the operation course of the first clothes treating apparatus in response to identification that the operation course of the second clothes treating apparatus has the priority over the operation course of the first clothes treating apparatus.

The first controller may change target RPM of the drum motor, corresponding to the operation course of the first clothes treating apparatus, to prevent the target RPM of the drum motor, corresponding to the operation course of the first clothes treating apparatus, and at least one of target RPM of the compressor or target RPM of the fan motor, corresponding to the operation course of the second clothes treating apparatus from being in an integer multiple relationship.

The second controller may change the algorithm of the operation course of the second clothes treating apparatus in response to identification that the operation course of the first clothes treating apparatus has the priority over the operation course of the second clothes treating apparatus.

The second controller may change the target RPM of the fan motor to prevent the target RPM of the fan motor, corresponding to the operation course of the second clothes treating apparatus, from being in an integer multiple relationship with the target RPM of the drum motor, corresponding to the operation course of the first clothes treating apparatus.

The second controller may change the target RPM of the compressor to prevent the target RPM of the compressor, corresponding to the operation course of the second clothes treating apparatus, from being in an integer multiple relationship with the target RPM of the drum motor, corresponding to the operation course of the first clothes treating apparatus.

Meanwhile, the disclosed embodiments may be implemented in the form of a recording medium that stores instructions executable by a computer. The instructions may be stored in the form of program codes, and when executed by a processor, the instructions may create a program module to perform operations of the disclosed embodiments. The recording medium may be implemented as a computer-readable recording medium.

The computer-readable recording medium may include all kinds of recording media storing instructions that can be interpreted by a computer. For example, the computer-readable recording medium may be read only memory (ROM), random access memory (RAM), a magnetic tape, a magnetic disc, a flash memory, an optical data storage device, etc.

Also, the computer-readable recording medium may be provided in the form of a non-transitory storage medium, wherein the term 'non-transitory storage medium' simply means that the storage medium is a tangible device, and does not include a signal (e.g., an electromagnetic wave), but this term does not differentiate between where data is semi-permanently stored in the storage medium and where the data is temporarily stored in the storage medium. For example, a 'non-transitory storage medium' may include a buffer in which data is temporarily stored.

According to an embodiment of the disclosure, a method according to various embodiments of the disclosure may be included and provided in a computer program product. The computer program product may be traded as a product between a seller and a buyer. The computer program product may be distributed in the form of a machine-readable storage medium (e.g., compact disc read only memory (CD-ROM)), or be distributed (e.g., downloadable or uploadable) online via an application store (e.g., Play Store™) or between two user devices (e.g., smart phones) directly. When distributed online, at least part of the computer program product (e.g., a downloadable app) may be temporarily generated or at least temporarily stored in the machine-readable storage medium, such as a memory of the manufacturers server, a server of the application store, or a relay server.

So far, the disclosed embodiments have been described with reference to the accompanying drawings. It will be apparent that those skilled in the art can make various modifications thereto without changing the technical spirit and essential features of the present disclosure. Thus, it should be understood that the embodiments described above are merely for illustrative purposes and not for limitation purposes in all aspects.

What is claimed is:

1. A method of controlling a clothes treating system including a first clothes treating apparatus and a second clothes treating apparatus electrically connected to the first clothes treating apparatus, the method comprising:

obtaining information about an operation course of the first clothes treating apparatus and information about an operation course of the second clothes treating apparatus;

identifying a priority between the operation course of the first clothes treating apparatus and the operation course of the second clothes treating apparatus based on the obtained information about the operation course of the first clothes treating apparatus and the obtained information about the operation course of the second clothes treating apparatus; and

changing an algorithm of the operation course of the first clothes treating apparatus or an algorithm of the operation course of the second clothes treating apparatus

based on the identified priority between the operation course of the first clothes treating apparatus and the operation course of the second clothes treating apparatus.

2. The method of claim 1, wherein

the changing the algorithm of the operation course of the first clothes treating apparatus or the algorithm of the operation course of the second clothes treating apparatus includes:

changing the algorithm of the operation course of the second clothes treating apparatus in response to identifying that the operation course of the first clothes treating apparatus has the priority over the operation course of the second clothes treating apparatus.

3. The method of claim 2, wherein

the changing the algorithm of the operation course of the first clothes treating apparatus or the algorithm of the operation course of the second clothes treating apparatus includes:

changing the algorithm of the operation course of the first clothes treating apparatus in response to identifying that the operation course of the second clothes treating apparatus has the priority over the operation course of the first clothes treating apparatus.

4. The method of claim 1, wherein

the identifying the priority between the operation course of the first clothes treating apparatus and the operation course of the second clothes treating apparatus includes:

identifying the priority between the operation course of the first clothes treating apparatus and the operation course of the second clothes treating apparatus based on a lookup table in which priorities of a plurality of operation courses capable of being performed by the first clothes treating apparatus and the second clothes treating apparatus are mapped.

5. The method of claim 1, wherein

the first clothes treating apparatus is a washing machine including:

a drum, and

a drum motor to rotate the drum, and

the second clothes treating apparatus is a dryer including at least one of:

a compressor, and

a fan and a fan motor to rotate the fan.

6. The method of claim 5, wherein

the changing the algorithm of the operation course of the first clothes treating apparatus includes:

changing a target revolutions per minute (RPM) of the drum motor, corresponding to the operation course of the first clothes treating apparatus, to prevent the target RPM of the drum motor and a target RPM of the fan motor, corresponding to the operation course of the second clothes treating apparatus, from being in an integer multiple relationship.

7. The method of claim 5, wherein

the changing the algorithm of the operation course of the first clothes treating apparatus includes:

changing a target revolutions per minute (RPM) of the drum motor, corresponding to the operation course of the first clothes treating apparatus, to prevent the target RPM of the drum motor and a target RPM of the compressor, corresponding to the operation course of the second clothes treating apparatus, from being in an integer multiple relationship.

8. The method of claim 5, wherein

the changing the algorithm of the operation course of the second clothes treating apparatus includes:

changing a target revolutions per minute (RPM) of the fan motor, corresponding to the operation course of the second clothes treating apparatus, to prevent a target RPM of the drum motor, corresponding to the operation course of the first clothes treating apparatus, and the target RPM of the fan motor from being in an integer multiple relationship.

9. The method of claim 5, wherein

the changing the algorithm of the operation course of the second clothes treating apparatus includes:

changing a target revolutions per minute (RPM) of the compressor, corresponding to the operation course of the second clothes treating apparatus, to prevent a target RPM of the drum motor, corresponding to the operation course of the first clothes treating apparatus, and the target RPM of the compressor from being in an integer multiple relationship.

10. The method of claim 9, further comprising:

obtaining an inside temperature of the dryer,

wherein the changing the target RPM of the compressor includes:

up-regulating the target RPM of the compressor in response to the obtained inside temperature of the dryer being lower than a target temperature, and

down-regulating the target RPM of the compressor in response to the obtained inside temperature of the dryer being higher than the target temperature.

11. The method of claim 5, further comprising:

obtaining a vibration value of the clothes treating system; and

stopping the operation course of the second clothes treating apparatus in response to the obtained vibration value of the clothes treating system being greater than a preset value.

12. The method of claim 11, further comprising:

resuming the operation course of the second clothes treating apparatus in response to the operation course of the first clothes treating apparatus being completed.

13. The method of claim 5, further comprising:

changing a target revolutions per minute (RPM) of the compressor or a target RPM of the fan motor in response to the operation course of the first clothes treating apparatus and the operation course of the second clothes treating apparatus having the same priority.

14. The method of claim 5, further comprising:

obtaining a revolutions per minute (RPM) of the drum motor corresponding to the operation course of the first clothes treating apparatus;

changing, while the operation course of the first clothes treating apparatus and the operation course of the second clothes treating apparatus having the same priority, a target revolutions per minute (RPM) of the compressor or a target RPM of the fan motor according to the obtained RPM of the drum motor being greater than a preset value; and

changing, while the operation course of the first clothes treating apparatus and the operation course of the second clothes treating apparatus having the same priority, a target RPM of the drum motor according to the obtained RPM of the drum motor being smaller than the preset value.

15. A clothes treating system comprising:

a first clothes treating apparatus including:

a drum,

a drum motor configured to rotate the drum, and

a first controller configured to control the drum motor;

a second clothes treating apparatus including:

a fan,

a fan motor configured to rotate the fan,

a compressor, and

a second controller configured to control the fan motor and the compressor; and

a user interface device configured to receive a user input selecting an operation course of the first clothes treating apparatus and an operation course of the second clothes treating apparatus,

wherein the first controller is configured to change an algorithm of the operation course of the first clothes treating apparatus based on a priority between the operation course of the first clothes treating apparatus and the operation course of the second clothes treating apparatus, and

the second controller is configured to change an algorithm of the operation course of the second clothes treating apparatus based on the priority between the operation course of the first clothes treating apparatus and the operation course of the second clothes treating apparatus.

* * * * *