



(22) Date de dépôt/Filing Date: 2010/07/29

(41) Mise à la disp. pub./Open to Public Insp.: 2011/01/31

(45) Date de délivrance/Issue Date: 2013/08/20

(30) Priorités/Priorities: 2009/07/31 (US61/230,568);
2009/07/31 (KR10-2009-0071032);
2009/07/31 (KR10-2009-0071033);
2009/07/31 (KR10-2009-0071034);
2009/07/31 (KR10-2009-0071035);
2009/07/31 (US61/230,588); 2009/07/31 (US61/230,519);
2009/07/31 (US61/230,624);
2009/10/30 (KR10-2009-0104443);
2009/10/30 (KR10-2009-0104444);
2010/07/27 (KR10-2010-0072496)

(51) Cl.Int./Int.Cl. *D06F 37/28* (2006.01),
D06F 39/14 (2006.01), *D06F 58/20* (2006.01)

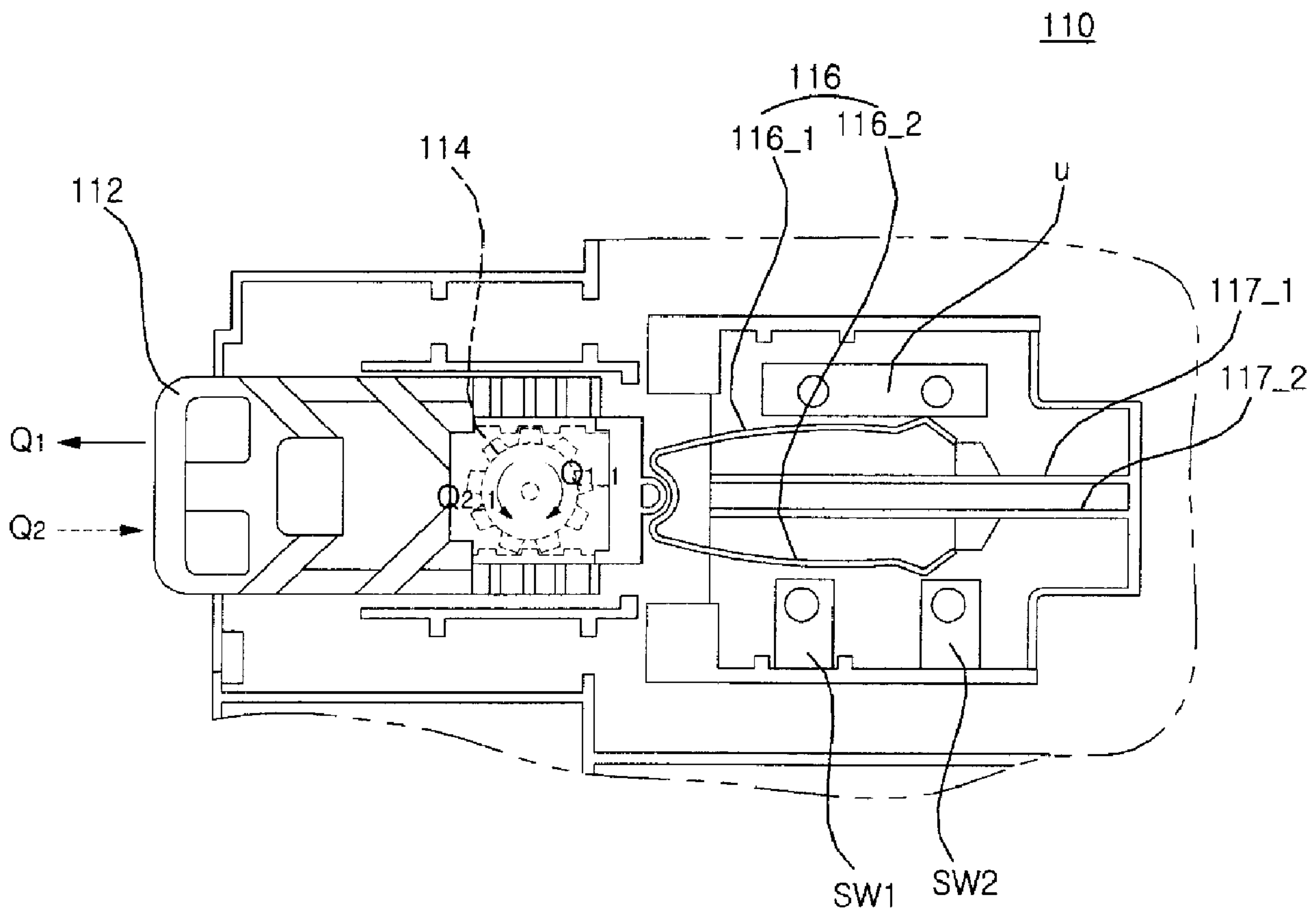
(72) Inventeurs/Inventors:
YOUNGJONG, KIM, KR;
CHANGWOO, SON, KR

(73) Propriétaire/Owner:
LG ELECTRONICS INC., KR

(74) Agent: SMART & BIGGAR

(54) Titre : MACHINE DE TRAITEMENT DE LESSIVE ET METHODE DE COMMANDE CONNEXE

(54) Title: LAUNDRY TREATMENT MACHINE AND CONTROL METHOD THEREOF



(57) Abrégé/Abstract:

A laundry treatment machine and a control method thereof are provided. The laundry treatment machine includes a device driving unit configured to control a lock device including a lock element, which locks or unlocks a lead assembly and a top cover, and a lead, which moves along with the lock element, when the lead assembly and the top cover are coupled, wherein the device driving



(57) Abrégé(suite)/Abstract(continued):

unit includes a position detector, which, if the lock element is moved from its initial unlock position to a lock position where it can lock the lead assembly and the top cover, determines whether the lead is moved from its initial position to a predetermined position and outputs a first detection signal as the result of the determination, and a device controller, which determines that the lead assembly and the top cover are locked and outputs lock information if the first detection signal is received, and which determines that the lead assembly and the top cover are not locked and outputs lock error information if the first detection signal is not received. Therefore, it is possible to easily determine whether laundry is stuck between the lead assembly and the top cover and whether the motor is broken by locking or unlocking the lead assembly and the top cover with the use of the lock element.

ABSTRACT OF THE DISCLOSURE

A laundry treatment machine and a control method thereof are provided. The laundry treatment machine includes a device driving unit configured to control a lock device including a lock element, which locks or unlocks a lead assembly and a top cover, and a lead, which moves along with the lock element, when the lead assembly and the top cover are coupled, wherein the device driving unit includes a position detector, which, if the lock element is moved from its initial unlock position to a lock position where it can lock the lead assembly and the top cover, determines whether the lead is moved from its initial position to a predetermined position and outputs a first detection signal as the result of the determination, and a device controller, which determines that the lead assembly and the top cover are locked and outputs lock information if the first detection signal is received, and which determines that the lead assembly and the top cover are not locked and outputs lock error information if the first detection signal is not received. Therefore, it is possible to easily determine whether laundry is stuck between the lead assembly and the top cover and whether the motor is broken by locking or unlocking the lead assembly and the top cover with the use of the lock element.

LAUNDRY TREATMENT MACHINE AND CONTROL METHOD THEREOF

BACKGROUND OF THE INVENTION

1. Field of the Invention

5 The present invention relates to a laundry treatment machine and a control method thereof, and more particularly, to a laundry treatment machine, which can drive a locking element when coupling a lid assembly and a top cover and then lock or unlock the lid assembly and the top cover with the aid of the lock element so as to determine whether laundry is stuck between the lid assembly and the top cover and can easily
10 determine whether a motor that moves the locking element is broken, and a control method of the laundry treatment machine.

2. Description of the Related Art

 Laundry treatment machines include various types of machines that can treat laundry by causing a physical and/or chemical reaction with laundry such as a washing
15 machine for washing laundry by using a chemical reaction between water and detergent and the friction between water and laundry, a dryer for drying wet laundry, and a refresher capable of preventing allergies from laundry and facilitating the washing of laundry by spraying heated water vapor onto laundry.

 Washing machines, which are a type of laundry treatment machine, are largely
20 classified into an agitator-type washing machine, a drum-type washing machine and a pulsator-type washing machine. In general, washing machines wash laundry by sequentially performing a wash process, a rinse process and a spin-dry process. Washing machines may be configured to selectively perform only some of the wash process, the rinse process and the spin-dry process at users' choice and to choose an
25 appropriate washing method for laundry.

SUMMARY OF THE INVENTION

In accordance with one aspect, the invention provides a laundry treatment machine, which can drive a locking element when coupling a lead assembly and a top cover and then lock or unlock the lead assembly and the top cover with the aid of the lock element so as to determine whether laundry is stuck between the lead assembly and the top cover and can easily determine whether a motor that moves the locking element is broken, and a control method of the laundry treatment machine.

In accordance with another aspect of the invention there is provided a laundry treatment machine. The laundry treatment machine includes a top cover configured to have a laundry entrance hole through which laundry is put in or taken out of the laundry treatment machine. The laundry treatment machine also includes a lid assembly configured to be disposed above the top cover so as to be rotatable, the lid assembly opening or shutting the laundry entrance hole, and a lock device configured to include a lock element and a lid, the lock element locking or unlocking the lid assembly and the top cover, and the lid moving in the same direction as the lock element. The laundry treatment machine further includes a device driving unit configured to detect a position of the lid, determine an operating state of the lock device based on the detected position of the lid, and control an operation of the lock device, and, if the lock element is moved from its initial unlock position to a lock position where it can lock the lid assembly and the top cover, the device driving unit receives an initial detection signal. If no detection signal is received within a first setting time of the receipt of the initial detection signal, the device driving unit determines that the lid assembly and the top cover are not properly locked, and outputs first error information. Even if a first detection signal is received within the first setting time of the receipt of the initial detection signal, the device driving unit outputs second error information if no other detection signal is received within a second setting time of the receipt of the first detection signal.

The first error information may include information indicating that laundry is stuck between the lid assembly and the top cover.

5 The second error information may include information indicating that the lid assembly and the top cover are locked when not coupled.

10 In accordance with another aspect of the invention there is provided a laundry treatment machine. The laundry treatment machine includes a device driving unit configured to control a lock device including a lock element, which locks or unlocks a lid assembly and a top cover. The laundry treatment machine also includes a lid, which moves along with the lock element, when the lid assembly and the top cover are coupled. The device driving unit includes a position detector, which, if the lock element is moved from its initial unlock position to a lock position where it can lock the lid assembly and the top cover. The device driving unit determines whether the lid is moved from its initial position to a predetermined position and outputs a first detection signal as the result of the determination. The laundry treatment machine further includes a device controller, which determines that the lid assembly and the top cover are locked and outputs lock information if the first detection signal is received, and which determines that the lid assembly and the top cover are not locked and outputs lock error information if the first detection signal is not received. If no other detection signal is received within a second setting time of the receipt of the first detection signal, the device controller determines that the lid assembly and the top cover are detached from each other and outputs detachment information.

25 The lock device may include a common contact which is contacted by an upper portion of the lid, an initial contact which is contacted by a lower portion of the lid when the lid is located at its initial position, and a lock contact which is contacted by the lower portion of the lid when the lid is located at the predetermined position, and the position detector outputs an initial detection signal if the upper and lower portions of the lid

contact the common contact and the initial contact, respectively, and outputs the detection signal if the upper and lower portions of the lid contact the common contact and the lock contact respectively.

5 If the first detection signal is not received within a first setting time of the receipt of the initial detection signal, the device controller determines that laundry is stuck between the lid assembly and the top cover and outputs the lock error information.

10 If magnets respectively attached to the lid assembly and the top cover contact each other, the device controller determines that the lid assembly and the top cover may be coupled, and controls the lock element to be moved from the unlock position to the lock position.

The laundry treatment machine may include a display unit configured to display the lock information, the lock error information and the detachment information.

15 The lock device further may include a motor, which may be rotated so as to move the lock element, and the device driving unit further may include a voltage detector, which detects a driving voltage supplied to the motor when the motor is rotated.

If the driving voltage detected by the voltage detector is lower than a reference voltage, the device controller determines that the motor is broken and controls the motor driving unit accordingly.

20 In accordance with another aspect of the invention there is provided a control method of a laundry treatment machine. The method involves, if a lid assembly and a top cover are coupled, moving a lock element from its initial unlock position in response to an input command, detecting a position of the lock element, and generating lock information if the lock element is located at a lock position. The method also involves generating lock error information if the lock element is not located at the lock position, 25 and after generating the lock information or the lock error information, determining whether the lid assembly and the top cover are detached from each other. Determining whether the lid assembly and the top cover are detached from each other involves

determining that the lid assembly and the top cover are detached from each other if the lock element is located at a maximum position a second setting time after located at the lock position, and generating detachment information.

5 The control method may further involve, before the moving the lock element, determining whether the lid assembly and the top cover may be coupled.

Determining whether the lid assembly and the top cover are coupled may involve determining that the lid assembly and the top cover are coupled if magnets respectively attached to the lid assembly and the top cover contact each other.

10 Detecting the position of the lock element may involve detecting a lid which moves along with the lock element.

Detecting the position of the lock element may further involve determining whether the lid may be moved from its initial position to a predetermined position.

15 Detecting the position of the lock element may further involve detecting an initial detection signal if the lock element is located at the unlock position and upper and lower portions of the lid contact a common contact and an initial contact respectively, and detecting a detection signal if the lock element is located at the lock position a first setting time after located at the unlock position and the upper and lower portions of the lid contact a common contact and a lock contact, respectively.

20 Generating the lock information or the lock error information may involve determining that the lid assembly and the top cover are locked and generating the lock information if the detection signal is received and determining that laundry is stuck between the lid assembly and the top cover and generating the lock error information if the detection signal is not received.

25 The control method may involve displaying at least one of the lock information, the lock error information and the detachment information.

BRIEF DESCRIPTION OF THE DRAWINGS

The above and other features and advantages of the present invention will become more apparent by describing in detail preferred embodiments thereof with reference to the attached drawings in which:

5 FIG. 1 illustrates a perspective view of a laundry treatment machine according to a first exemplary embodiment of the present invention;

 FIG. 2 illustrates a side cross-sectional view of the laundry treatment machine;

 FIG. 3 illustrates detailed side-cross sectional views of a lid assembly and a top cover shown in FIG. 2;

10 FIG. 4 illustrates a block diagram of the laundry treatment machine;

 FIG. 5 illustrates a cross-sectional view of a lock device shown in FIG. 1;

 FIG. 6 illustrates a block diagram of a device driving unit shown in FIG. 4;

 FIG. 7 illustrates a circuit diagram of a first embodiment of the device driving unit shown in FIG. 6;

15 FIG. 8 illustrates a current path diagram for explaining a first path formed when a motor shown in FIG. 7 rotates in a first rotation direction;

 FIG. 9 illustrates a current path diagram for explaining a second path formed when the motor shown in FIG. 7 rotates in a second rotation;

20 FIG. 10 illustrates a circuit diagram of a second embodiment of the device driving unit shown in FIG. 6;

 FIG. 11 illustrates a current path diagram for explaining a first path formed when a motor shown in FIG. 10 rotates in a first rotation direction;

 FIG. 12 illustrates a current path diagram for explaining a second path formed when the motor shown in FIG. 10 rotates in a second rotation;

25 FIG. 13 illustrates a signal waveform diagram of signals for detecting the position of a lock element shown in FIG. 6;

FIG. 14 illustrates a schematic diagram for explaining the operations of the lock device and the device driving unit during a first time period shown in FIG. 13;

FIG. 15 illustrates a schematic diagram for explaining the operations of the lock device and the device driving unit during a second time period shown in FIG. 13;

5 FIG. 16 illustrates a schematic diagram for explaining the operations of the lock device and the device driving unit during a third time period shown in FIG. 13;

FIG. 17 illustrates a schematic diagram for explaining the operations of the lock device and the device driving unit during a fourth time period shown in FIG. 13;

10 FIG. 18 illustrates a flowchart of a control method of a laundry treatment machine, according to a first exemplary embodiment of the present invention; and

FIG. 19 illustrates a flowchart of a control method of a laundry treatment machine, according to a second exemplary embodiment of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

15 The present invention will hereinafter be described in detail with reference to the accompanying drawings in which exemplary embodiments of the invention are shown. In the drawings, like reference numerals indicate like elements.

FIG. 1 illustrates a perspective view of a laundry treatment machine 100 according to a first exemplary embodiment of the present invention, FIG. 2 illustrates a side cross-sectional view of the laundry treatment machine 100, and FIG. 3 illustrates detailed side-cross sectional views of a lid assembly 30 and a top cover 20 shown in FIG. 2. Referring to FIGS. 1 through 3, the laundry treatment machine 100 may include a cabinet 10, the top cover 20, which is placed on an upper end of the cabinet 10 and has a laundry entrance through which laundry can be put into or taken out of the laundry treatment machine 100, the lid assembly 30, which is disposed at the front of the top of the top cover 20 so as to be rotatable and to open or shut the laundry inlet/outlet hole, and

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a control panel **40**, which is disposed at the rear of the top of the top cover **20** and provides an interface for manipulating the laundry treatment machine **100**.

5 The laundry treatment machine **100** may also include an outer tub **12**, which is disposed in the cabinet **10** and is suspended on a supporting element **11**, and an inner tub **13**, which is disposed in the outer tub **12** so as to be rotatable.

10 The laundry treatment machine **100** may also include a damper **14**, which is disposed below the supporting element **11** and can reduce the fluctuation of the outer tub **12** when vibration is generated upon the rotation of the inner tub **13**, and a pulsator **15**, which is disposed at the bottom of the inner tub **13** and generates a rotating water current in the inner tub **13**.

15 The laundry treatment machine **100** may also include a motor **16**, which is disposed below the outer tub **12** and rotates the inner tub **13** and the pulsator **15**. The motor **16** may be connected to the inner tub **13** via a rotation axial member **17** and may thus be able to rotate the inner tub **13**. A clutch (not shown) may be disposed between the inner tub **13** and the pulsator **15**. The clutch may selectively transmit the rotation force of the motor **16** to the inner tub **13** and the pulsator **15**. Thus, only one of the inner tub **13** and the pulsator **15** may be rotated at a time by the motor **16**, or the inner tub **13** and the pulsator **15** may both be rotated at the same time by the motor **16**.

20 A detergent box **21**, a water supply hose (not shown), and a water supply valve may be disposed in the top cover **20**. The detergent box **21** may be installed so as to be able to be moved in and out of the top cover **20**. The water supply hose may be connected to an external water source, and may thus be used to supply wash water into the detergent box **21**. The water supply valve may control the supply of wash water through the water supply hose. When the water supply valve is opened, wash water
25 from the external water source can be supplied into the detergent box **21** and then into the inner tub **13**.

A drain hose **23** and a drain valve **24** may be disposed below the outer tub **12**. The drain hose **23** may be used to discharge wash water from the outer tub **12**. The drain valve **24** may be used to control the discharge of wash water through the drain hose **23**.

5 A lock device **110** may be housed in the top cover **20**. The lock device **110** may lock or unlock the lid assembly **30** when coupling the lid assembly **30** to the top cover **20**.

More specifically, the lock device **110** may include a lock element (not shown) and may thus be able to lock or unlock the top cover **20** and the lid assembly **30** by moving the lock element.

10 FIG. **4** illustrates a block diagram of the laundry treatment machine **100**. Referring to FIG. **4**, the laundry treatment machine **100** may include a display unit **210**, an input unit **220**, a device driving unit **240**, a memory **250**, a sensing unit **270**, a driving unit **280**, an audio output unit **290**, and a control unit **230**, which controls the general operation of the laundry treatment machine **100**.

15 The input unit **220** may include at least one input tool for inputting signals or data to the laundry treatment machine in response to user manipulation thereof. More specifically, the input unit **220** may include a manipulator **221** and a selector **222**.

20 The manipulator **221** may receive various data such as wash courses or wash settings and may transmit the received data to the control unit **230** during the course of the operation of the laundry treatment machine **100**.

25 The input unit **220** may include, but is not restricted to buttons, a dome switch, a resistive or capacitive touch pad, a jog wheel, a jog switch, a finger mouse, a rotary switch, and/or a jog dial. That is, nearly all types of device that can generate predetermined input data by being appropriately manipulated (for example, by being pushed, rotated, pressed or touched) may be used as the input unit **220**.

The sensing unit **270** may include at least one sensing tool for sensing temperature, pressure, a voltage, a current, a water level and the number of revolutions, and may transmit data obtained by the sensing to the control unit **230**.

5 For example, the sensing unit **270** may measure the water level in the laundry treatment machine **100** during a water supply or drain operation, and may measure the temperature of water supplied into the laundry treatment machine **100** or the number of revolutions of a washing tub or a drum of the laundry treatment machine **100**.

10 The driving unit **280** may control the laundry treatment machine **100** to perform a predefined operation in response to a control command applied thereto by the control unit **230**. Therefore, the laundry treatment machine **100** can perform a series of processes such as washing, rinsing and spin-drying and can thus remove dirt from laundry.

15 For example, the driving unit **280** may drive the motor **16** to rotate a washing tub or drum of the laundry treatment machine **100** and may control the operation of the motor **16** so as for the laundry treatment machine **100** to effectively remove dirt from laundry. In addition, the driving unit **280** may control various valves in the laundry treatment machine **100** in response to a control command applied thereto by the control unit **230** so as for the laundry treatment machine **100** to effectively perform water supply and drain operations.

20 Examples of the memory **250** include, but are not restricted to a read-only memory and an electrically erasable programmable ROM (EEPROM) for storing control data regarding the laundry treatment machine **100**, and a data storage means for storing data obtained by processing various operations performed by the laundry treatment machine **100**. The storage unit **260** may be a buffer of the control unit **230**, and may be
25 used to store data temporarily. Examples of the storage unit **260** include, but are not restricted to a dynamic random access memory (DRAM) and a static random access

memory (SRAM). The storage unit **260** may be incorporated into the control unit **230** or the memory **250**.

The memory **250** may store operation information such as operating state data generated during a predetermined operation of the laundry treatment machine **100** and settings data input to the laundry treatment machine **100** via the manipulator **221** for driving the laundry treatment machine **100** to perform a predetermined operation; usage information such as the number of times the laundry treatment machine **100** has performed a predetermined operation and product specifications information of the laundry treatment machine **100**; and failure information such as the cause and location of failure.

The memory **250** may store product information of the laundry treatment machine **100**, including the operation information, the usage information and the failure information. The storage unit **260** may store temporary data corresponding to the operation information and the failure information. For example, the product information may include the number of times the laundry treatment machine **100** has been used, wash courses provided by the laundry treatment machine **100**, option settings information, error code, sensor measurements, calculation data provided by the control unit **230**, and operation information regarding each part of the laundry treatment machine **100**.

The operation information may include various information necessary for driving the laundry treatment machine **100** such as wash operation information, spin-dry operation information and rinse operation information.

The failure information may include operation failure information regarding failure that may occur during the operation of the laundry treatment machine **100**, defect information, error code, information provided by the control unit **230**, measurement data provided by the sensing unit **270**, measurement data obtained from the motor **16**, failure information of a wash water supply device, and failure information of a drain device.

The usage information may include the number of times the laundry treatment machine **100** has been used, wash courses selected by a user, and option settings information regarding options set in the laundry treatment machine **100**. That is, the usage information may include various data input to the laundry treatment machine **100** by a user and initial settings information of the laundry treatment machine **100**.

The device driving unit **240** may operate in response to a control command applied thereto by the control unit **230**. The device driving unit **240** may rotate a motor included in the lock device **110** in consideration of whether the lid assembly **30** and the top cover **20** are placed in contact with each other, and may thus move a lock element (not shown) so as to lock or unlock the lid assembly **30** and the top cover **20**.

The control unit **230** may control the general operation of the laundry treatment machine **100**. The control unit **230** may perform a wash operation (including washing, rinsing, and spin-drying) according to a wash mode set via the input unit **220** and a wash command issued by a user. The control unit **230** may determine the duration, speed and mode of driving of a driving device (not shown) based on various measurement data provided by the sensing unit **270** such as the level and temperature of water contained in a washing tub **122** or a drum (not shown) and the amount of laundry.

That is, the control unit **230** may appropriately control a wash operation set by a user with reference to sensing results provided by the sensing unit **270**. In addition, the control unit **230** may control various valves provided in the laundry treatment machine **100** so as for the laundry treatment machine **100** to properly perform water supply and drain operations according to the progress in a whole wash process.

The display unit **210** may display various information input to the laundry treatment machine **100** via the selector **222** and the manipulator **221**, operating state information of the laundry treatment machine **100**, and status information of the laundry treatment machine **100** (such as information indicating whether the laundry treatment machine **100** has completed a predetermined operation) in response to a control signal

applied thereto by the control unit **230**. If the laundry treatment machine **100** malfunctions, the display unit **210** may display failure information indicating the malfunction of the laundry treatment machine **100**.

5 Examples of the display unit **210** include a light-emitting diode (LED) display, a liquid crystal display (LCD) an organic electroluminescent display (OLED) and any other display that can visualize information by emitting light.

FIG. **5** illustrates a cross-sectional view of the lock device **110**. Referring to FIG. **5**, the lock device **110** may include a lock element **112**, a motor **114**, a lid **116**, a common contact U, an initial contact SW**1** and a lock contact SW**2**.

10 The lock element **112** may be moved by the rotation of the motor **114**.

More specifically, when the motor **114** rotates in a first rotation direction Q**1_1**, the lock element **114** may be moved to a first direction Q**1**, and may thus lock the top cover **20** and the lid assembly **30**. On the other hand, when the motor **114** rotates in a second rotation direction Q**2_1**, the lock element **114** may be moved to a second direction Q**2**, and may thus unlock the top cover **20** and the lid assembly **30**.

The motor **114** may be controlled by the device driving unit **240**. When a first driving voltage is supplied, the motor **114** may rotate in the first rotation direction Q**1_1**. When a second driving voltage is supplied, the motor **114** may rotate in the second rotation direction Q**2_1**.

20 The lid **116** may be connected to the lid element **112**. An upper portion **116_1** of the lid **116** may be placed in contact with the common contact U, and a lower portion **116_2** of the lid **116** may be placed in contact with at least one of the initial contact SW**1** and the lock contact SW**2** according to the position of the lock element **112**. Lid bars **117_1** and **117_2** may be provided at the ends of the upper and lower portions **116_1** and **116_2**, respectively, of the lid **116**. When the lock element **112** is moved, the lid **116** may also be moved in the first or second direction Q**1** and Q**2** along the lid bars **117_1** and **117_2**.

The lid **116** may be electrically connected to at least one of the common contact U, the initial contact SW1 and the lock contact SW2, and may thus transmit an initial sensing signal or another sensing signal to the device driving unit **240** in order to indicate whether the top cover **20** and the lid assembly **30** are locked or unlocked.

FIG. **6** illustrates a block diagram of the device driving unit **240**, and FIG. **7** illustrates a circuit diagram of a first embodiment of the device driving unit **240**. Referring to FIGS. **6** and **7**, the device driving unit **240** may include a motor driver **242**, which rotates the motor **114** in the first or second rotation direction Q1_1 and Q2_1, a detector **244**, which detects first and second driving voltages V1 and V2 supplied to the motor **114** and the position of the lock element **112**, and a device controller **246**, which determines whether the motor **114** is broken and whether the lid assembly **30** and the top cover are locked or unlocked based on the position of the lock element **112** and at least one of the first and second driving voltages V1 and V2 detected by the detector **244** and thus controls the motor driver **242** based on the results of the determination.

The motor driver **242** may include first and second switches SH1 and SH2, which are switched on or off under the control of the device controller **246** so as to supply the first and second driving voltages V1 and V2 to the motor **114**.

The first and second switches SH1 and SH2 may be alternately switched on or off by the device controller **246**. The first switch SH1 may be connected between a first power source VCC_1, which supplies the first driving voltage V1, and the motor **114**. The second switch SH2 may be connected between a second power source VCC_2, which supplies the second driving voltage V2, and the motor **114**.

The first and second power sources VCC_1 and VCC_2 are illustrated as being separate elements, but the present invention is not restricted to this. That is, the first and second power sources VCC_1 and VCC_2 may be incorporated into a single power source with opposite polarities.

The first and second switches SH1 and SH2 may be switched on or off in response to first and second control signals SC_1 and SC_2 generated by the device controller 246.

5 For example, if the first control signal SC_1 is applied, the first switch SH1 may be switched on in response to the first control signal SC_1. Then, the second control signal SC_2 may be applied, and thus, the second switch SH2 may be switched off in response to the second control signal SC_2.

10 The detector 244 may include a voltage detector 244_1, which detects one of the first and second driving voltages V1 and V2 that are supplied to the motor 114 by the device controller 246, and a position detector 244_2, which detects the position of the lid 116 that moves along with the lock element 114 during the movement of the lock element 114 in the first or second direction Q1 or Q2.

The voltage detector 244_1 may include a shunt resistor SR which detects one of the first and second driving voltages V1 and V2.

15 The shunt resistor SR may be connected to one side of the motor 114, may detect one of the first and second driving voltages V1 and V2, and may supply the detected driving voltage to the device controller 246.

20 The position detector 244_2 may detect the position of the lid 116, which moves along with the lock element 112 when the lock element 112 moves in the first or second direction Q1 and Q2.

When the lock element 112 is located at its initial position, the common contact U and the initial contact SW1 are electrically connected by the lid 116. In this case, the position detector 244_2 may transmit an initial detection signal S1 to the device controller 246.

25 Then, if the motor 114 rotates in the first rotation direction Q1_1 and thus the lock element 112 is moved in the first direction Q1 by the motor 114, the lid 116 may also be moved in the first direction Q1 and may thus lock the lid assembly 30 and the top cover

20. In this case, the lock element **112** may be referred to as being located at a lock position. When the lock element **112** is located at the lock position, the common contact U and the lock contact SW2 may be electrically connected by the lid **116**, and the position detector **244_2** may transmit a detection signal S2 to the device controller **246**.

5 That is, if the lock element **112** is moved to a lock position where it can lock the lid assembly **30** and the top cover **20**, the lid **116** may be moved from its initial position to a position where the lower portion of the lid **116** can contact the lock contact SW2.

 The device controller **246** may determine whether the motor **114** is broken based on the driving voltage detected by the voltage detector **244_1**, and may determine
10 whether the lid assembly **30** and the top cover **20** are locked or unlocked and whether laundry is stuck between the lid assembly **30** and the top cover **20** based on the initial detection signal S1 and the detection signal S2 provided by the position detector **244_2**.

 The device controller **246** may compare the driving voltage detected by the voltage detector **244_1** with a reference voltage. Then, if the driving voltage detected
15 by the voltage detector **244_1** is higher than or the same as the reference voltage, the device controller **246** may determine that the motor **114** operates normally. On the other hand, if the driving voltage detected by the voltage detector **244_1** is lower than the reference voltage, the device controller **246** may determine that the motor **114** is broken.

 If the motor **114** is determined to be broken, the device controller **180** may control
20 both the first and second switches SH1 and SH2 of the device driver **242** to be switched off.

 The device controller **246** may determine whether the lid assembly **30** and the top cover **20** are locked or unlocked based on the initial sensing signal and the detection signal S2.

25 If the detection signal S2 is not received even when the motor **114** operates normally or if the initial detection signal S1 is received, the device controller **246** may

control the first and second switches SH1 and SH2 to be switched off so as to stop the motor 114 from rotating.

The device controller 246 may apply the first and second control signals SC_1 and SC_2 to the motor 114 so as to rotate the motor 114 in the first or second rotation Q1_1 or Q2_1, and may switch on the first and second switches SH1 and SH2 so as to form first and second paths I_1 and I_2.

In this exemplary embodiment, the device controller 246 may serve the same functions as the control unit 230 shown in FIG. 4.

FIG. 8 illustrates a current path diagram for explaining a first path I_1 that may be formed when the motor 114 shown in FIG. 6 rotates in the first rotation direction Q1_1, and FIG. 9 illustrates a current path diagram for explaining the second path I_2 that may be formed when the motor 114 shown in FIG. 6 rotates in the second rotation direction Q2_1. Referring to FIGS. 8 and 9, the device controller 246 may rotate the motor 114 in the first rotation direction Q1_1 and may thus form the first path I_1 so as to move the lock element 112 in the first direction Q1.

That is, the first path I_1 may be formed by applying the first control signal SC_1 to the first switch SH1 so as to switch on the first switch SH1 and supplying the first driving voltage V1 provided by the first power source VCC_1 to the motor 114.

In this case, the second switch SH2 may be switched off in response to the second control signal SC_2, and thus, the second path I_2 may not be formed.

When the first path I_1 is formed, the lock element 112 may be moved in the first direction Q1 and may thus lock the lid assembly 30 and the top cover 20.

The device controller 246 may apply the first and second control signals SC_1 and SC_2 according to whether the lid assembly 30 and the top cover 20 are placed in contact with each other. The device controller 246 may determine whether the lid assembly 30 and the top cover 20 contact each other based on whether magnets respectively attached to the lid assembly 30 and the top cover 20 contact each other.

The device controller **246** may rotate the motor **114** in the second rotation direction **Q2_1** and may thus form the second path **I_2** so as to move the lock element **112** in the second direction **Q2**.

That is, the second path **I_2** may be formed by applying the second control signal **SC_2** to the second switch **SH2** so as to switch on the first switch **SH1** and supplying the second driving voltage **V2** provided by the second power source **VCC_2** to the motor **114**.

In this case, the first switch **SH1** may be switched off in response to the first control signal **SC_1**, and thus, the first path **I_1** may not be formed.

When the second path **I_2** is formed, the lock element **112** may be moved in the second direction **Q2** and may thus unlock the lid assembly **30** and the top cover **20**.

The device controller **246** may receive one of the first and second driving voltages **V1** and **V2** detected by the voltage detector **244_1**. Thereafter, if the received driving voltage is higher than or the same as the reference voltage, the device controller **246** may determine that the motor **114** operates normally. On the other hand, if the received driving voltage is lower than the reference voltage, the device controller **246** may determine that the motor **114** malfunctions.

The device controller **246** may alert a user to the operating state of the motor **114** by using the display unit **210** or the audio output unit **280** shown in FIG. 4.

FIG. 10 illustrates a circuit diagram of a second embodiment of the device driving unit **240** shown in FIG. 6, FIG. 11 illustrates a current path diagram for explaining a first path **I_1** that may be formed when a motor **114** shown in FIG. 10 rotates in the first rotation direction **Q1_1**, and FIG. 12 illustrates a current path diagram for explaining a second path **I_2** that may be formed when the motor **114** shown in FIG. 10 rotates in the second rotation direction **Q2_1**.

The exemplary embodiment of FIGS. 10 through 12 is similar to the exemplary embodiment of FIGS. 6 through 9, and thus will hereinafter be described, focusing mainly on differences with the exemplary embodiment of FIGS. 6 through 9.

Referring to FIG. 10, the device driving unit **240** may supply the first and second driving voltages **V1** and **V2** to or detect the first and second driving voltages **V1** and **V2** from the motor **114**.

5 The device driving unit **240** may include a motor driver **242**, which rotates the motor **114** in the first or second rotation **Q1_1** or **Q2_1**, a voltage detector **244_1**, which detects one of the first and second driving voltages **V1** and **V2** that are supplied to the motor **114**, and a device controller **246**, which determines whether the motor **114** is broken based on the driving voltage detected by the voltage detector **244_1** and controls the motor driver **242** based on the results of the determination.

10 The motor driver **242** and the voltage detector **244_1** are the same as their respective counterparts of FIGS. 6 and 7, and thus, detailed descriptions thereof will be omitted.

The device driving unit **240** may also include a comparer **246_1**, which is connected between a shunt resistor **SR** of the voltage detector **244_1** and the device controller **246** and compares the driving voltage detected by the voltage detector **244_1** with a reference voltage.

More specifically, if the driving voltage detected by the voltage detector **244_1** is higher than or the same as the reference voltage, the comparer **246_1** may output a first comparison signal **B1** to the device controller **246**. On the other hand, if the driving voltage detected by the voltage detector **244_1** is lower than the reference voltage, the comparer **246_1** may output a second comparison signal **B2** to the device controller **246**.

The comparer **246_1** may be an operational amplifier and may be used as a voltage follower.

25 The device controller **246** may apply first and second control signals **SC_1** and **SC_2** to the motor **114** so as to rotate the motor **114** in the first or second rotation direction **Q1_1** or **Q2_1**, and may switch on the first and second switches **SH1** and **SH2** so as to form first and second paths **I_1** and **I_2**.

The device controller **246** may control the motor driver **242** to rotate the motor **114** in the first or second rotation direction **Q1_1** or **Q2_1** in response to the first or second comparison signal **B1** or **B2** provided by the comparer **246_1**.

Referring to FIG. **11**, the device controller **246** may rotate the motor **114** in the first rotation direction **Q1_1** and may thus form the first path **I_1** so as to move the lock element **112** in the first direction **Q1**.

The first path **I_1** may be formed by applying the first control signal **SC_1** to the first switch **SH1** so as to switch on the first switch **SH1** and supplying the first driving voltage **V1** provided by the first power source **VCC_1** to the motor **114**.

In this case, the second switch **SH2** may be switched off in response to the second control signal **SC_2**, and thus, the second path **I_2** may not be formed.

When the first path **I_1** is formed, the lock element **112** may be moved in the first direction **Q1** and may thus lock the lid assembly **30** and the top cover **20**.

The comparer **246_1** may compare the first driving voltage **V1** detected by the voltage detector **244_1** with the reference voltage and may transmit one of the first and second comparison signals **B1** and **B2** to the device controller **246** based on the results of the comparison.

Then, the device controller **246** may determine whether the motor **114** operates normally or malfunctions based on the comparison signal provided by the comparer **246_1**.

The device controller **246** may apply the first and second control signals **SC_1** and **SC_2** according to whether the lid assembly **30** and the top cover **20** are placed in contact with each other. The device controller **246** may determine whether the lid assembly **30** and the top cover **20** contact each other based on whether the magnets of the lid assembly **30** and the top cover **20** contact each other.

Referring to FIG. 12, the device controller **246** may rotate the motor **114** in the second rotation direction **Q2_1** and may thus form the second path **I_2** so as to move the lock element **112** in the second direction **Q2**.

That is, the second path **I_2** may be formed by applying the second control signal **SC_2** to the second switch **SH2** so as to switch on the first switch **SH1** and supplying the second driving voltage **V2** provided by the second power source **VCC_2** to the motor **114**.

In this case, the first switch **SH1** may be switched off in response to the first control signal **SC_1**, and thus, the first path **I_1** may not be formed.

When the second path **I_2** is formed, the lock element **112** may be moved in the second direction **Q2** and may thus unlock the lid assembly **30** and the top cover **20**.

The comparer **246_1** may compare the second driving voltage **V2** detected by the voltage detector **244_1** with the reference voltage and may transmit one of the first and second comparison signals **B1** and **B2** to the device controller **246** based on the results of the comparison.

The device controller **246** may determine whether the motor **114** operates normally or malfunctions based on the comparison signal provided by the comparer **246_1**.

More specifically, the device controller **246** may receive one of the first and second driving voltages **V1** and **V2** detected by the voltage detector **244_1**. Thereafter, if the received driving voltage is higher than or the same as the reference voltage, the device controller **246** may determine that the motor **114** operates normally. On the other hand, if the received driving voltage is lower than the reference voltage, the device controller **246** may determine that the motor **114** malfunctions.

The device controller **246** may alert a user to the operating state of the motor **114** by using the display unit **210** or the audio output unit **280** shown in FIG. 4.

FIG. 13 illustrates a signal waveform diagram of signals for detecting the position of the lock element **112**, FIG. 14 illustrates a schematic diagram for explaining the

operations of the lock device **110** and the device driving unit **240** during a first time period **T1** shown in FIG. **13**, FIG. **15** illustrates a schematic diagram for explaining the operations of the lock device **110** and the device driving unit **240** during a second time period **T2** shown in FIG. **13**, FIG. **16** illustrates a schematic diagram for explaining the operations of the lock device **110** and the device driving unit **240** during a third time period **T3** shown in FIG. **13**, and FIG. **17** illustrates a schematic diagram for explaining the operations of the lock device **110** and the device driving unit **240** during a fourth time period **T4** shown in FIG. **13**.

More specifically, FIG. **13** illustrates the waveforms of the initial detection signal **S1** and the detection signal **S2**. Referring to FIG. **13**, the initial detection signal **S1** may be output when the common contact **U** and the initial contact **SW1** are electrically connected by the lid **116**, and the detection signal **S2** may be output when the common contact **U** and the lock contact **SW2** are electrically connected by the lid **116**.

During the first time period **T1**, the lock element **112** may be maintained at an unlock position **SP1**, and the initial detection signal **S1** may be output.

During the second time period **T2**, the lock element **112** may be moved from the unlock position **SP1** to a lock position **SP2**, and none of the initial detection signal **S1** and the detection signal **S2** may be output.

During the third time period **T3**, the lock element **112** may be maintained at the lock position **SP2**, and the detection signal **S2** may be output.

During the fourth period **T4**, the lock element **112** may be moved from the lock position **SP2** to a maximum position **SP3**, and none of the initial detection signal **S1** and the detection signal **S2** may be output.

FIG. **14** illustrates the position of the lock element **112** during the first time period **T1**. Referring to FIG. **14**, during the first time period **T1**, the lock element **112** may be located at its initial position, i.e., the unlock position **SP1**, and the lid **116**, which moves

along with the lock element **112**, may be located at a position where it can electrically connect the common contact U and the initial contact SW1.

During the first time period T1, the device controller **246** of the device driving unit **240** may control the motor driver **242** not to rotate the motor **114** since the lid assembly **30** and the top cover **20** are yet to be coupled, and may receive the initial detection signal S1 from the position detector **244_2**.

FIG. 15 illustrates the position of the lock element **112** during the second time period T2. Referring to FIG. 15, during the second time period T2, the lock element **112** may be located between the unlock position SP1 and the lock position SP2.

The device controller **246** may determine whether the lid assembly **30** and the top cover **20** are coupled based on whether the magnets of the lid assembly **30** and the top cover **20** are placed in contact with each other. If the lid assembly **30** and the top cover **20** are determined to be coupled, the device controller **246** may transmit the first control signal SC_1 to the motor driver **242**.

Then, the motor driver **242** may rotate the motor **114** in the first rotation direction Q1_1 in response to the first control signal SC_1 and may thus move the lock element **112** in the first direction Q1.

In this case, since the lock element **112** is still in the middle of being moved to the lock position SP2, the device controller **246** may not be provided with the initial detection signal S1 and the detection signal S2 by the position detector **244_2**.

Thereafter, if the detection signal S2 is not received within a first setting time of the receipt of the initial detection signal S1, the device controller **246** may stop the rotation of the motor **114**, and may determine that laundry is stuck between the lid assembly **30** and the top cover **20**. Therefore, the device controller **246** may generate lock error information and may thus output the lock error information to a user.

That is, during the second time period T2, the upper portion **116_1** of the lid **116** contacts the common contact U, but the lower portion **116_2** of the lid **116** does not

contact any one of the initial contact SW1 and the lock contact SW2. If this condition continues for more than the first setting time, the device controller 246 may control the motor driver 242 to stop rotating the motor 114.

5 FIG. 16 illustrates the position of the lock element 112 during the third time period T3. Referring to FIG. 16, during the third time period T3, the lock element 112 may be located at the lock position SP2.

When the lock element 112 is moved in the first direction Q1 and thus reaches the lock position SP2, the device controller 246 may receive the detection signal S2 from the position detector 244_2 because the upper and lower portions 116_1 and 116_2 of the lid 10 116 are placed in contact with the common contact U and the lock contact SW2, respectively.

In this case, the device controller 246 may determine that the lid assembly 30 and the top cover 20 are locked by the lock element 112.

15 FIG. 17 illustrates the position of the lock element 112 during the fourth time period T4. Referring to FIG. 17, during the fourth time period T4, the lock element 112 may be moved past the lock position SP2 and may thus reach the maximum position SP3.

In this case, if no other detection signal S2 is received within a second setting time of the receipt of the detection signal S2 during the third time period T3, the device controller 246 may determine that the lock element 112 is located at the maximum 20 position SP3, and that the lid assembly 30 and the top cover 20 are detached from each other. Therefore, the device controller 246 may generate detachment information indicating that the lid assembly 30 and the top cover 20 are no longer coupled, and may output the detachment information to a user.

25 The detachment information may also indicate whether laundry is stuck between the lid assembly 30 and the top cover 20 and whether the lid assembly 30 and the top cover 20 are opened.

During the fourth time period T4, the upper portion **116_1** of the lid **116** contacts the common contact U, but the lower portion **116_2** of the lid **116** does not contact any one of the initial contact SW1 and the lock contact SW2.

When the lock element **112** is located at the maximum position SP3, the device controller **246** may control the motor driver **242** to rotate the motor **114** in the second rotation direction Q2_1 and may thus move the lock element **112** in the second direction Q2.

FIG. 18 illustrates a flowchart of a control method of a laundry treatment machine, according to a first exemplary embodiment of the present invention, and particularly, how to determine whether the motor **114** is broken. Referring to FIG. 18, when the lid assembly **30** and the top cover **20** are coupled, the motor **114** may be rotated in the first rotation direction Q1_1 in response to an input command so as to move the lock element **112** from the unlock position SP1 to the lock position SP2 (S100). More specifically, the device controller **246** may determine whether the lid assembly **30** and the top cover **20** are coupled. If the lid assembly **30** and the top cover **20** are determined to be coupled, the device controller **246** may transmit the first control signal SC_1 to the motor driver **242** and may thus control the motor driver **242** to rotate the motor **114** in the first rotation direction Q1_1 in order to move the lock element **112** from the unlock position SP1 to the lock position SP2.

Thereafter, if the motor **114** rotates in the first rotation direction Q1_1, a driving voltage supplied to the motor **114** may be detected (S102). Thereafter, the detected driving voltage may be compared with a reference voltage, and it may be determined whether the motor **114** is broken based on the results of the comparison (S104). More specifically, when the motor **114** rotates in the first rotation direction Q1_1, the voltage detector **244_1** may detect the first driving voltage V1 from the motor **114**. Then, the device controller **246** may compare the first driving voltage V1 with the reference voltage. Thereafter, if the first driving voltage V1 is lower than the reference voltage, the device

controller **246** may determine that the motor **114** is broken. On the other hand, if the first driving voltage **V1** is higher than or the same as the reference voltage, the device controller **246** may determine that the motor **114** operates normally.

Thereafter, if the motor **114** is determined to be broken, failure information may be output in order to alert a user (S106).

FIG. **19** illustrates a flowchart of a control method of a laundry treatment machine, according to a second exemplary embodiment of the present invention, and particularly, how to determine whether the lid assembly **30** and the top cover **20** are locked or unlocked and whether laundry is stuck between the lid assembly **30** and the top cover **20** based on the position of the lock element **112**. Referring to FIG. **19**, it may be determined whether the lid assembly **30** and the top cover **20** are coupled (S200). More specifically, the device controller **246** may determine whether the lid assembly **30** and the top cover **20** are coupled by determining whether the magnets of the lid assembly **30** and the top cover **20** are placed in contact with each other.

When the lid assembly **30** and the top cover **20** are coupled, the device controller **246** can detect voltage variations caused by variations in the magnetic fields of the magnets of the lid assembly **30** and the top cover **20**.

Thereafter, the lock element **112** may be moved from the unlock position **SP1** to the lock position **SP2** in response to an input command (S202). More specifically, the device controller **246** may control the motor driver **242** to rotate the motor **114** in the first rotation direction **Q1_1** and may thus move the lock element **112** in the first direction **Q1**. As a result, the lock element **112** can be moved in the first direction **Q1** from the unlock position **SP1** to the lock position **SP2**.

Thereafter, it may be determined whether the lock element **112** is located at the lock position **SP2** (S204). More specifically, the device controller **246** may determine whether the lock element **112** has been moved from the unlock position **SP1** to the lock position **SP2**. The position detector **244_2** may detect the positions of the upper and

lower portions **116_1** and **116_2** of the lid **116**, which moves along with the lock element **112**. Since the distance by which the lock element **112** moves is the same as the distance by which the lid **116** moves, the position detector **244_2** can determine the position of the lock element **112** based on the position of the lid **116**.

5 When the lock element **112** is located at the unlock position **SP1**, the upper and lower portions **116_1** and **116_2** of the lid **116** may contact the common contact **U** and the initial contact **SW1**, respectively, and the position detector **244_2** may transmit the initial detection signal to the device controller **246** as the result of the detection of the position of the lock element **112**.

10 Thereafter, if the lock element **112** is moved from the unlock position **SP1** to the lock position **SP2**, the upper and lower portions **116_1** and **116_2** of the lid may be placed in contact with the common contact **U** and the lock contact **SW2**, respectively, and the position detector **244_2** may transmit the detection signal **S2** to the device controller **246** as the result of the detection of the position of the lock element **112**.

15 If it is determined in operation **S204** that the lock element **112** is located at the lock position **SP2**, it may be determined that the lid assembly **30** and the top cover **20** are locked, and thus, lock information may be generated (**S206**). On the other hand, if it is determined in operation **S204** that the lock element **112** is not located at the lock position **SP2**, it may be determined that the lid assembly **30** and the top cover **20** are yet to be
20 locked, and thus, lock error information may be generated (**S208**). More specifically, if the detection signal **S2** is received from the position detector **244_2**, the device controller **246** may determine that the lid assembly **30** and the top cover **20** are locked, and may thus generate and output the lock information in order to alert a user.

 However, if the detection signal **S2** is not received within a first setting time of
25 the receipt of the initial detection signal **S1**, the device controller **246** may determine that laundry is stuck between the lid assembly **30** and the top cover **20**, and may thus generate and output the lock error information in order to alert a user.

Thereafter, it may be determined whether the lid assembly **30** and the top cover **20** are detached from each other (S210). More specifically, the device controller **246** may determine whether the lock element **112** has been moved past the lock position SP2 and is located at the maximum position SP3.

5 If the lock element **112** is moved past the lock position SP2, the lower portion **116_2** of the lid **116** may not contact the lock contact SW2 any longer, and thus, the detection signal S2 may not be detected any longer.

10 Therefore, if no other detection signal S2 is received within a second setting time of the receipt of the detection signal S2 in operation S204, the device controller **246** may determine that the lid assembly **30** and the top cover **20** are no longer coupled, and may thus generate and output detachment information in order to alert a user.

15 Once the lock error information or the detachment information is generated because of laundry stuck between the lid assembly **30** and the top cover **20** or the detachment of the lid assembly **30** and the top cover **20** from each other, the device controller **246** may rotate the motor **112** in the second rotation direction Q2_1 and may thus move the lock element **112** back to the unlock position SP1.

20 As described above, according to the present invention, it is possible to easily determine whether a motor, which is provided for moving a lock element that locks or unlocks a lid assembly and a top cover, is broken by detecting a driving voltage supplied to the motor.

In addition, according to the present invention, it is possible to easily determine whether the lid assembly and the top cover are locked or unlocked and whether laundry is stuck between the lid assembly and the top cover by detecting the position of the lock element.

5 Moreover, according to the present invention, it is possible to easily determine whether the lid assembly and the top cover are coupled.

While specific embodiments have been described and illustrated, such embodiments should be considered illustrative only and not as limiting the invention as defined by the accompanying claims.

**THE EMBODIMENTS OF THE INVENTION IN WHICH AN EXCLUSIVE
PROPERTY OR PRIVILEGE IS CLAIMED ARE DEFINED AS FOLLOWS:**

1. A laundry treatment machine comprising:

5 a top cover configured to have a laundry entrance hole through which laundry is put in or taken out of the laundry treatment machine;

a lid assembly configured to be disposed above the top cover so as to be rotatable, the lid assembly opening or shutting the laundry entrance hole;

10 a lock device configured to include a lock element and a lid, the lock element locking or unlocking the lid assembly and the top cover, and the lid moving in the same direction as the lock element; and

a device driving unit configured to detect a position of the lid, determine an operating state of the lock device based on the detected position of the lid, and control an operation of the lock device; and

15 wherein, if the lock element is moved from its initial unlock position to a lock position where it can lock the lid assembly and the top cover, the device driving unit receives an initial detection signal, and if no detection signal is received within a first setting time of the receipt of the initial detection signal, the device driving unit determines that the lid assembly
20 and the top cover are not properly locked, and outputs first error information, and

wherein even if a first detection signal is received within the first setting time of the receipt of the initial detection signal, the device driving unit outputs second error information if no other detection signal is received
25 within a second setting time of the receipt of the first detection signal.

2. The laundry treatment machine of claim 1, wherein the first error information includes information indicating that laundry is stuck between the lid assembly and the top cover.

3. The laundry treatment machine of claim 1, wherein the second error information includes information indicating that the lid assembly and the top cover are locked when not coupled.

4. A laundry treatment machine comprising:

a device driving unit configured to control a lock device including a lock element, which locks or unlocks a lid assembly and a top cover, and a lid, which moves along with the lock element, when the lid assembly and the top cover are coupled,

wherein the device driving unit includes:

a position detector, which, if the lock element is moved from its initial unlock position to a lock position where it can lock the lid assembly and the top cover, the device driving unit determines whether the lid is moved from its initial position to a predetermined position and outputs a first detection signal as the result of the determination, and

a device controller, which determines that the lid assembly and the top cover are locked and outputs lock information if the first detection signal is received, and which determines that the lid assembly and the top cover are not locked and outputs lock error information if the first detection signal is not received;

wherein, if no other detection signal is received within a second setting time of the receipt of the first detection signal, the device controller determines that the lid assembly and the top cover are detached from each other and outputs detachment information.

5. The laundry treatment machine of claim 4, wherein the lock device includes a common contact which is contacted by an upper portion of the lid, an initial contact which is contacted by a lower portion of the lid when the lid is located at its initial position, and a lock contact which is contacted by the lower portion of the lid when the lid is located at the predetermined position, and wherein the position detector outputs an initial detection signal if the upper and lower portions of the lid contact the common contact and the initial contact, respectively, and outputs the detection signal if the upper and lower portions of the lid contact the common contact and the lock contact respectively.
6. The laundry treatment machine of claim 5, wherein, if the first detection signal is not received within a first setting time of the receipt of the initial detection signal, the device controller determines that laundry is stuck between the lid assembly and the top cover and outputs the lock error information.
7. The laundry treatment machine of claim 4, wherein, if magnets respectively attached to the lid assembly and the top cover contact each other, the device controller determines that the lid assembly and the top cover are coupled, and controls the lock element to be moved from the unlock position to the lock position.
8. The laundry treatment machine of claim 4, further comprising a display unit configured to display the lock information, the lock error information and the detachment information.
9. The laundry treatment machine of claim 4, wherein the lock device further includes a motor, which is rotated so as to move the lock element, and the device driving unit further includes a voltage detector, which detects a driving voltage supplied to the motor when the motor is rotated.

10. The laundry treatment machine of claim 9, wherein, if the driving voltage detected by the voltage detector is lower than a reference voltage, the device controller determines that the motor is broken and controls the motor driving unit accordingly.
- 5 11. A control method of a laundry treatment machine, the control method comprising:
- if a lid assembly and a top cover are coupled, moving a lock element from its initial unlock position in response to an input command;
- detecting a position of the lock element;
- 10 style="padding-left: 40px;">generating lock information if the lock element is located at a lock position, and generating lock error information if the lock element is not located at the lock position; and
- after generating the lock information or the lock error information, determining whether the lid assembly and the top cover are detached from each other; and
- 15 style="padding-left: 40px;">wherein determining whether the lid assembly and the top cover are detached from each other comprises determining that the lid assembly and the top cover are detached from each other if the lock element is located at a maximum position a second setting time after located at the lock position, and generating detachment information.
- 20 12. The control method of claim 11, further comprising, before the moving the lock element, determining whether the lid assembly and the top cover are coupled.
13. The control method of claim 12, wherein the determining whether the lid assembly and the top cover are coupled comprises determining that the lid assembly and the top cover are coupled if magnets respectively attached to the lid assembly and the top cover contact each other.
- 25

14. The control method of claim 11, wherein the detecting the position of the lock element comprises detecting a lid which moves along with the lock element.

5 15. The control method of claim 14, wherein the detecting the position of the lock element further comprises determining whether the lid is moved from its initial position to a predetermined position.

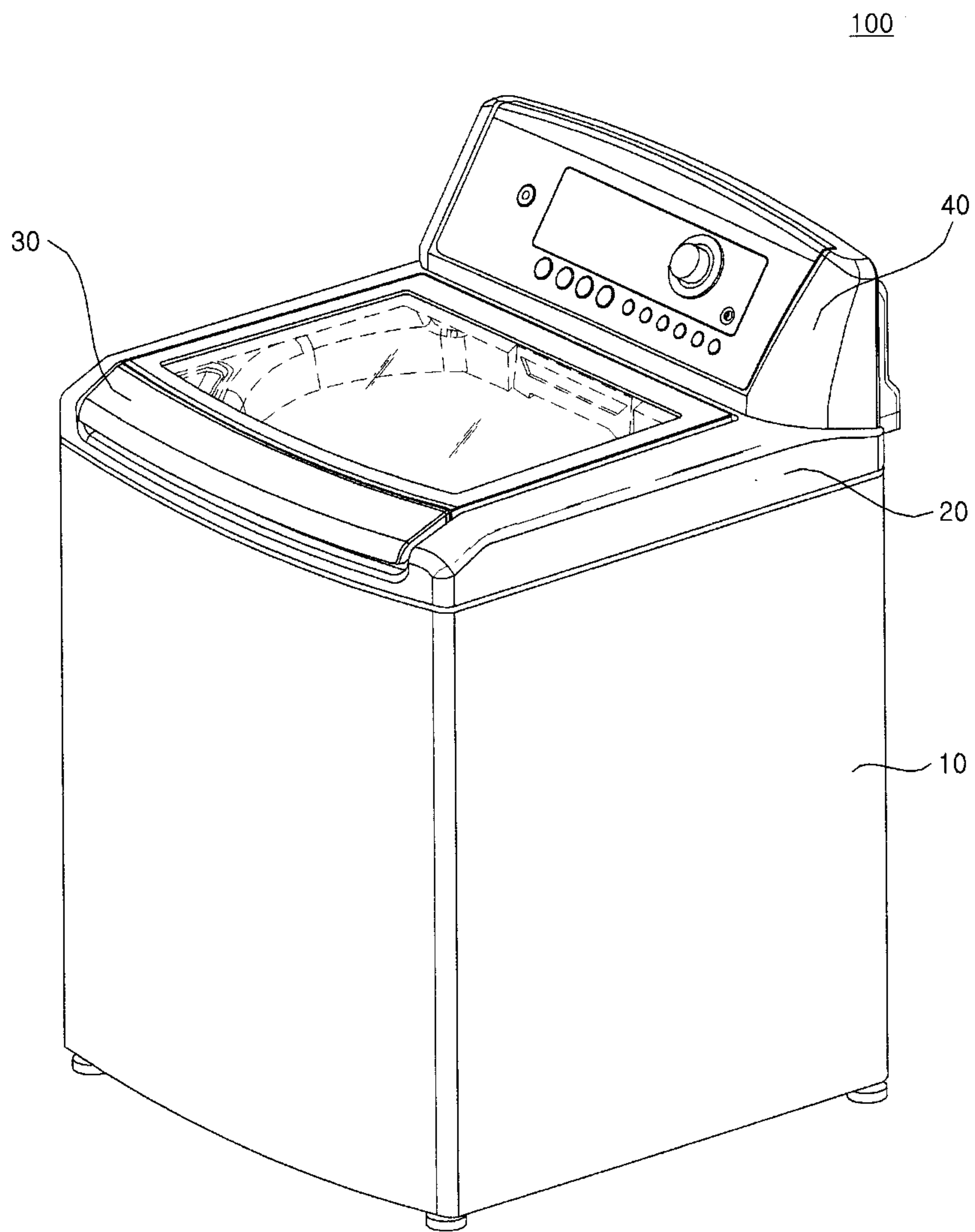
10 16. The control method of claim 15, wherein detecting the position of the lock element further comprises detecting an initial detection signal if the lock element is located at the unlock position and upper and lower portions of the lid contact a common contact and an initial contact respectively, and detecting a detection signal if the lock element is located at the lock position a first setting time after located at the unlock position and the upper and lower portions of the lid contact a common contact and a lock contact, respectively.

15 17. The control method of claim 16, wherein generating the lock information or the lock error information comprises determining that the lid assembly and the top cover are locked and generating the lock information if the detection signal is received and determining that laundry is stuck between the lid assembly and the top cover and generating the lock error information if the detection signal is not received.

20 18. The control method of claim 11, further comprising displaying at least one of the lock information, the lock error information and the detachment information.

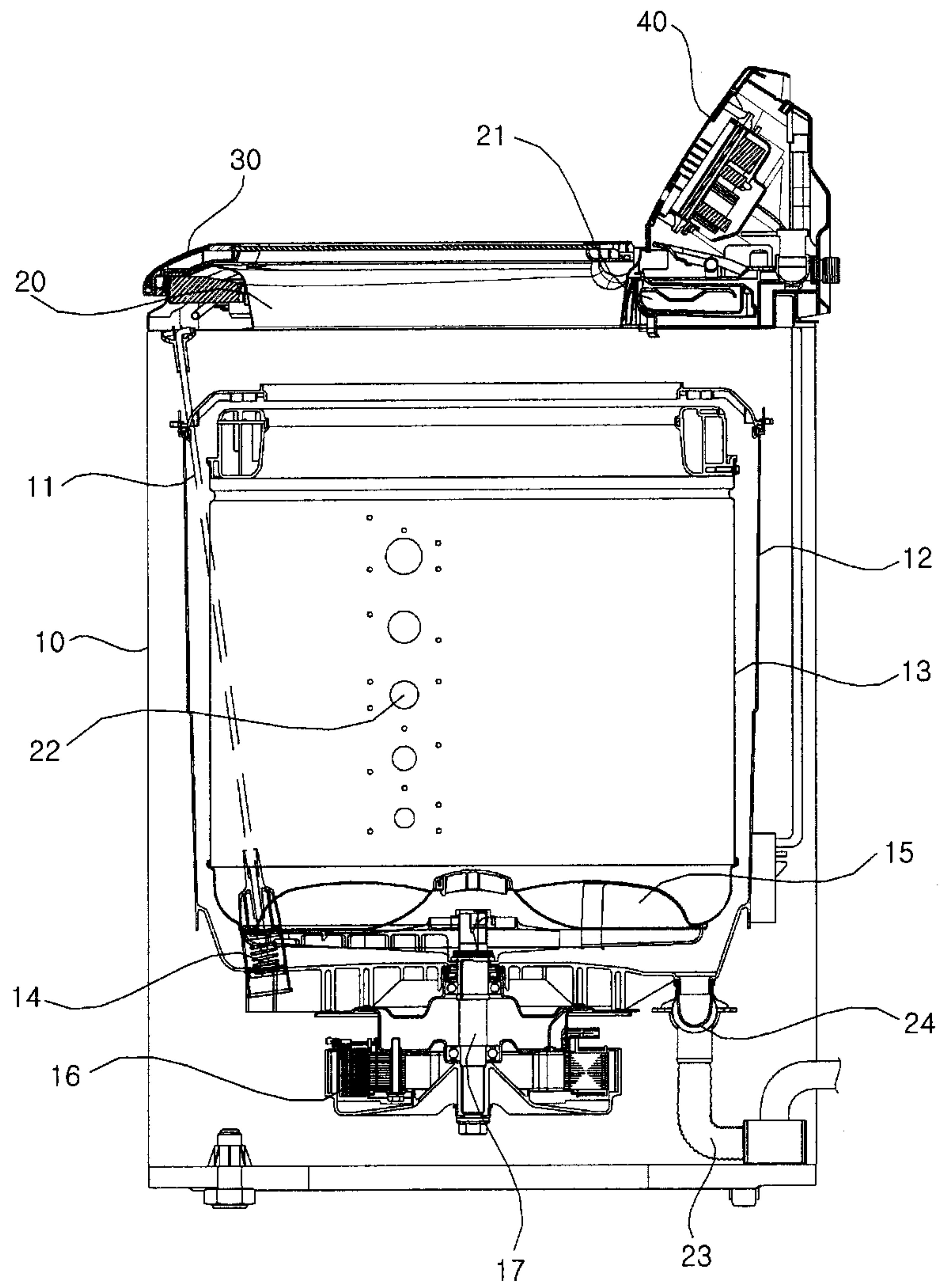
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FIG. 1



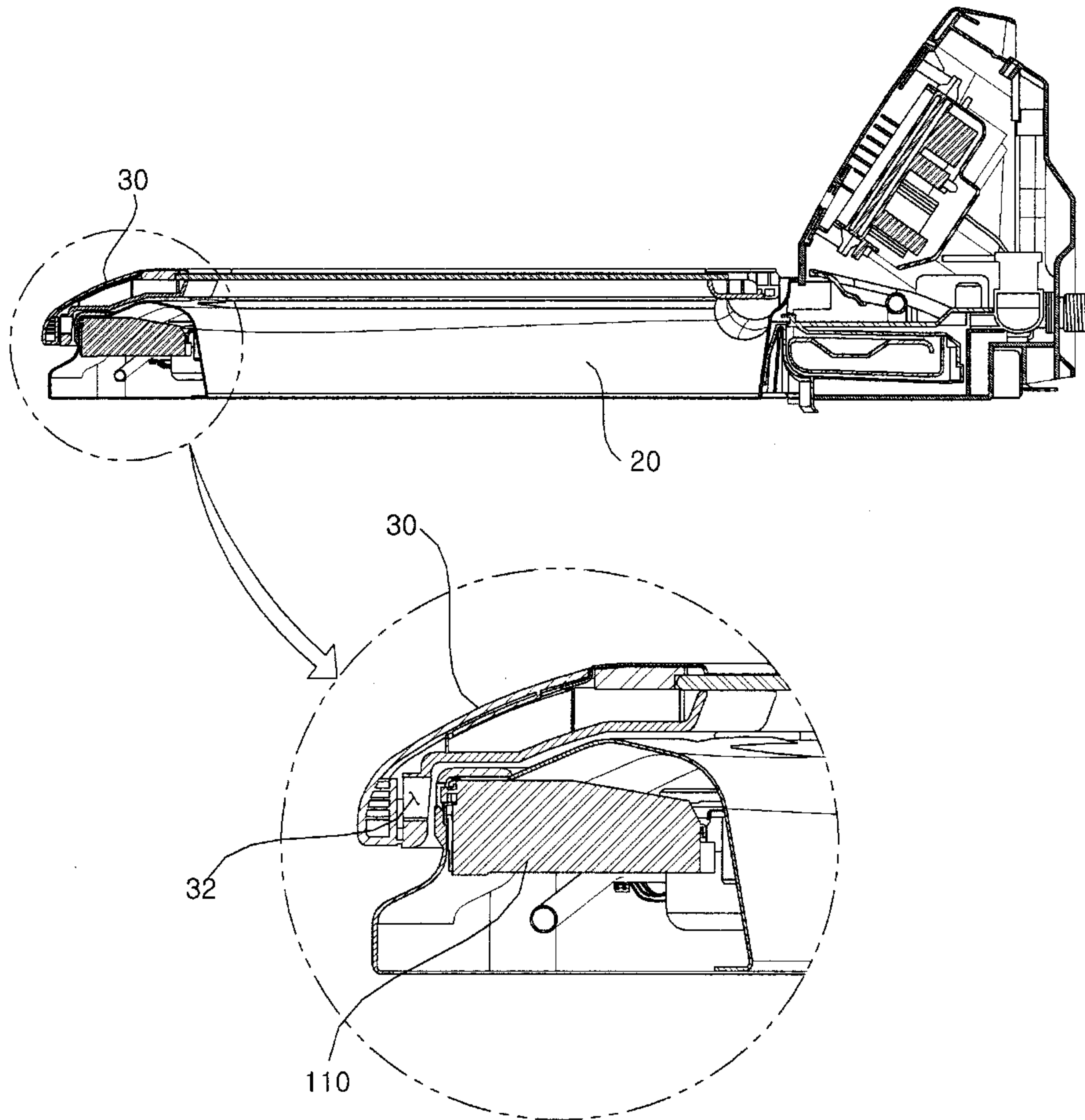
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FIG. 2



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FIG. 3



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FIG. 4

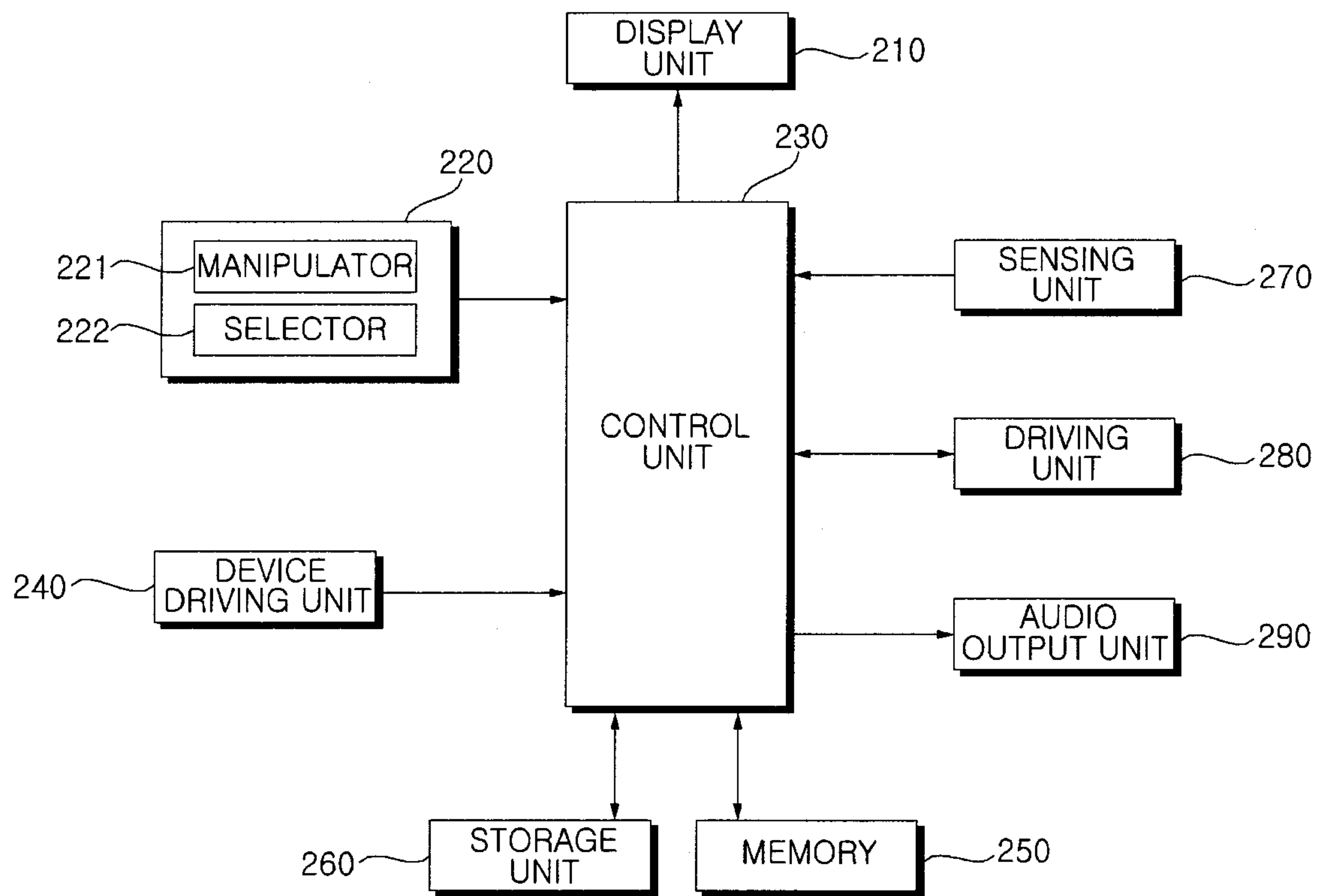
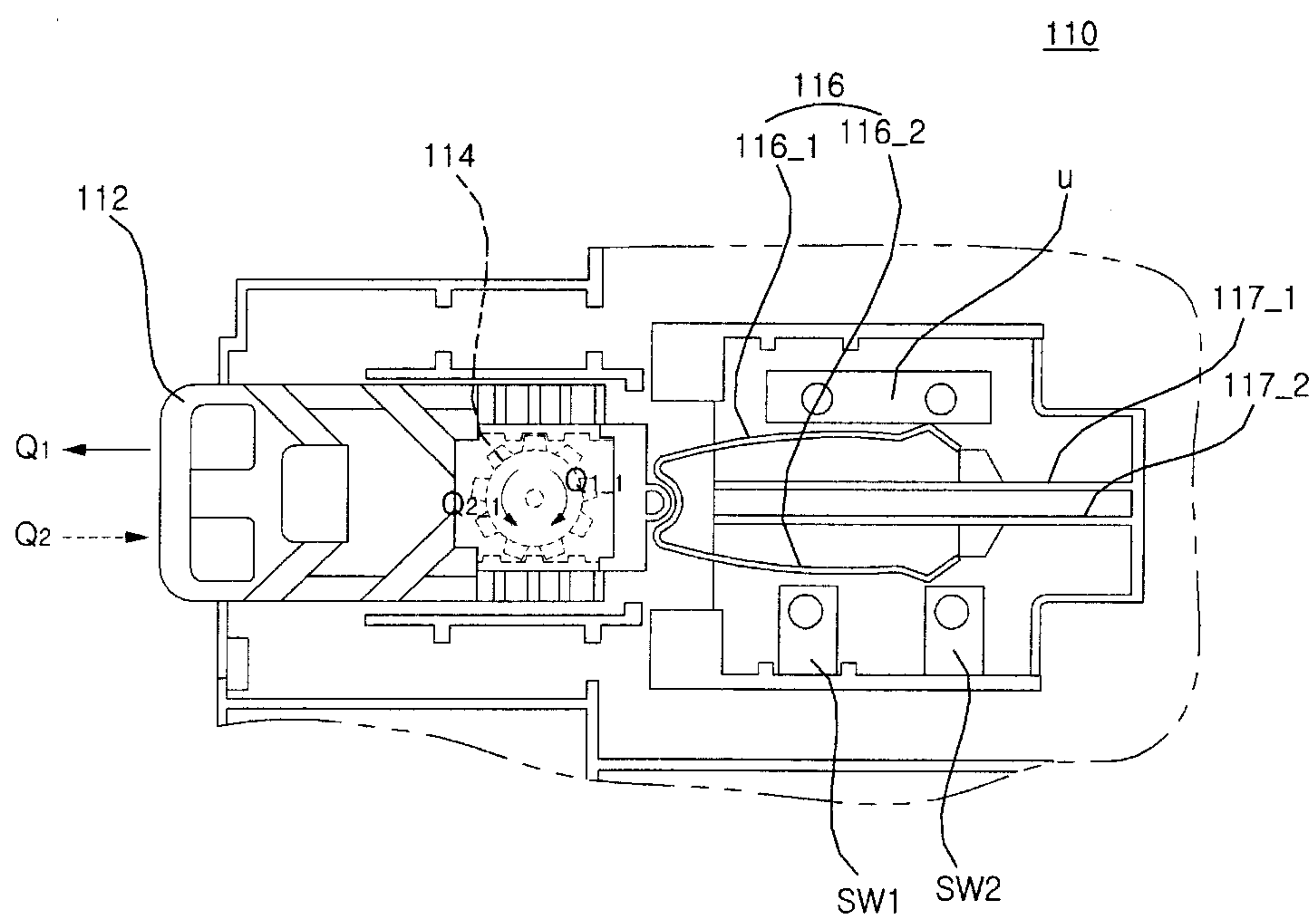
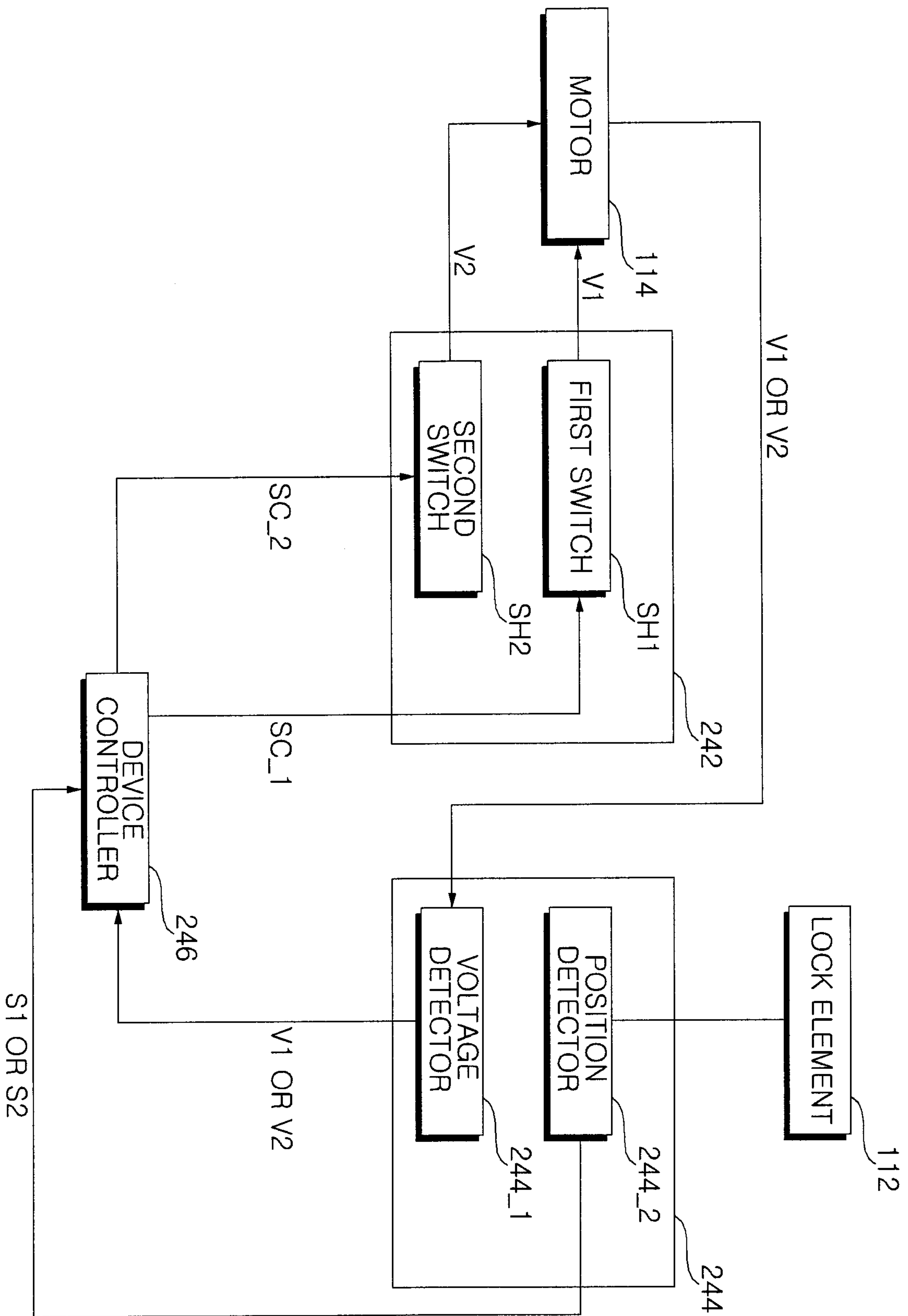


FIG. 5



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FIG. 6



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FIG. 7

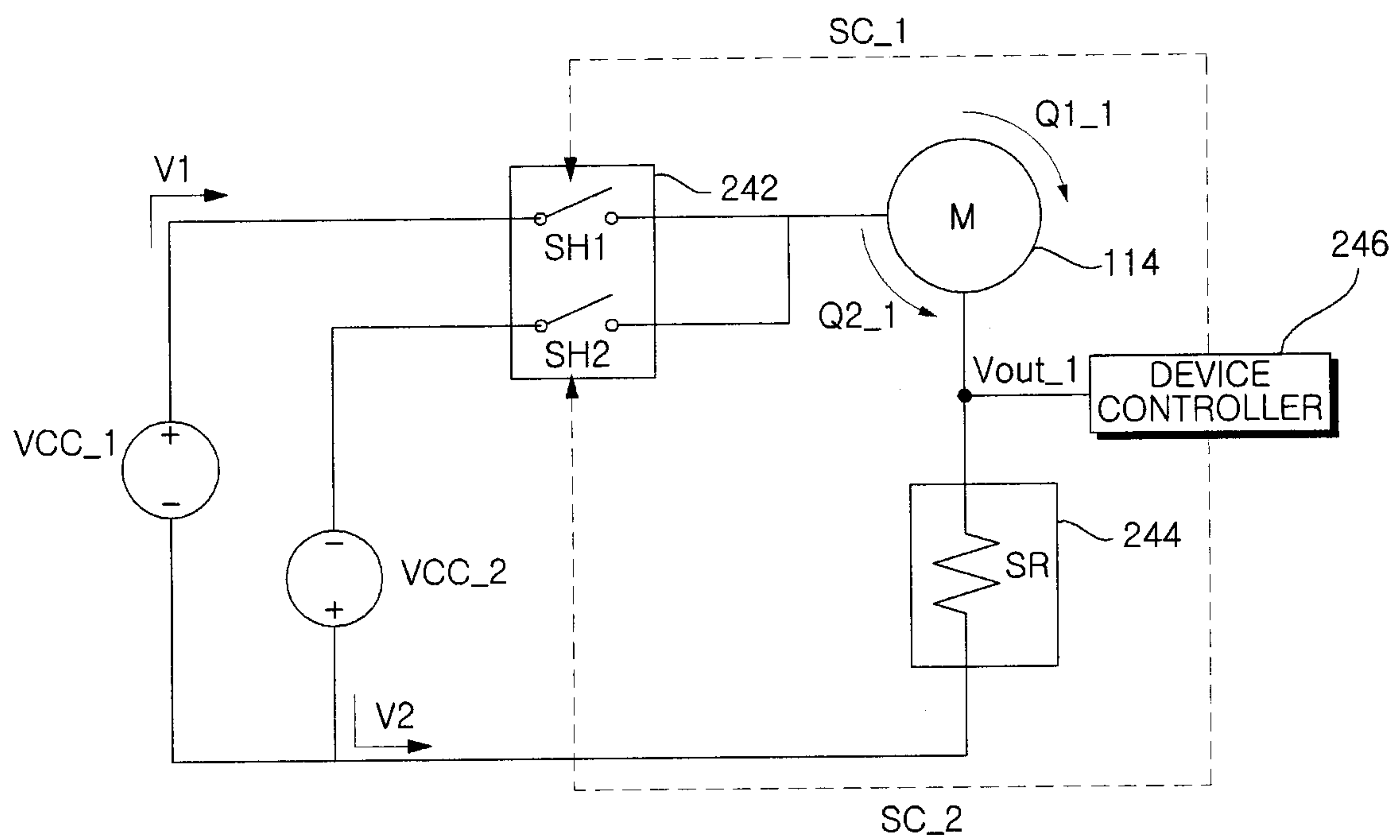
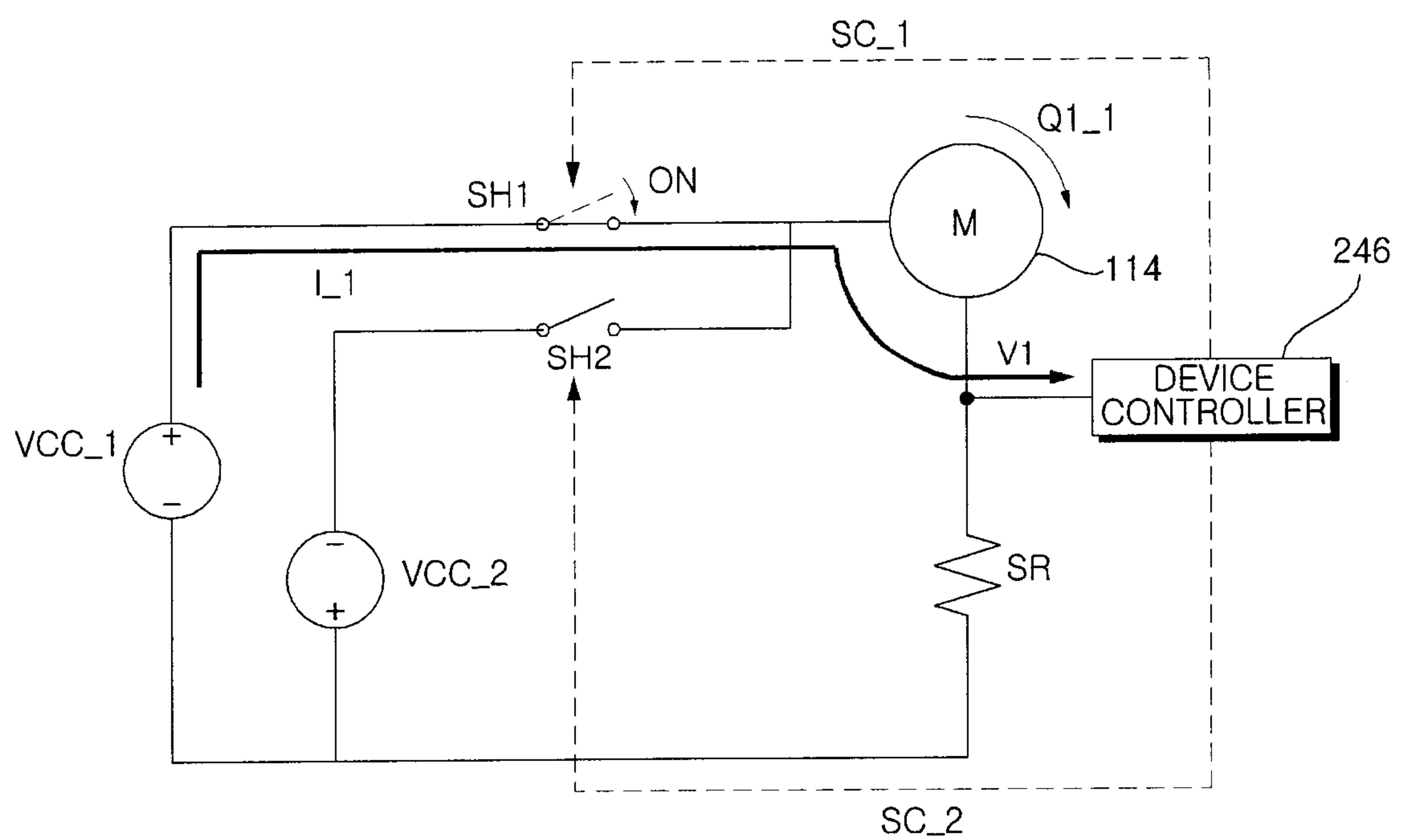
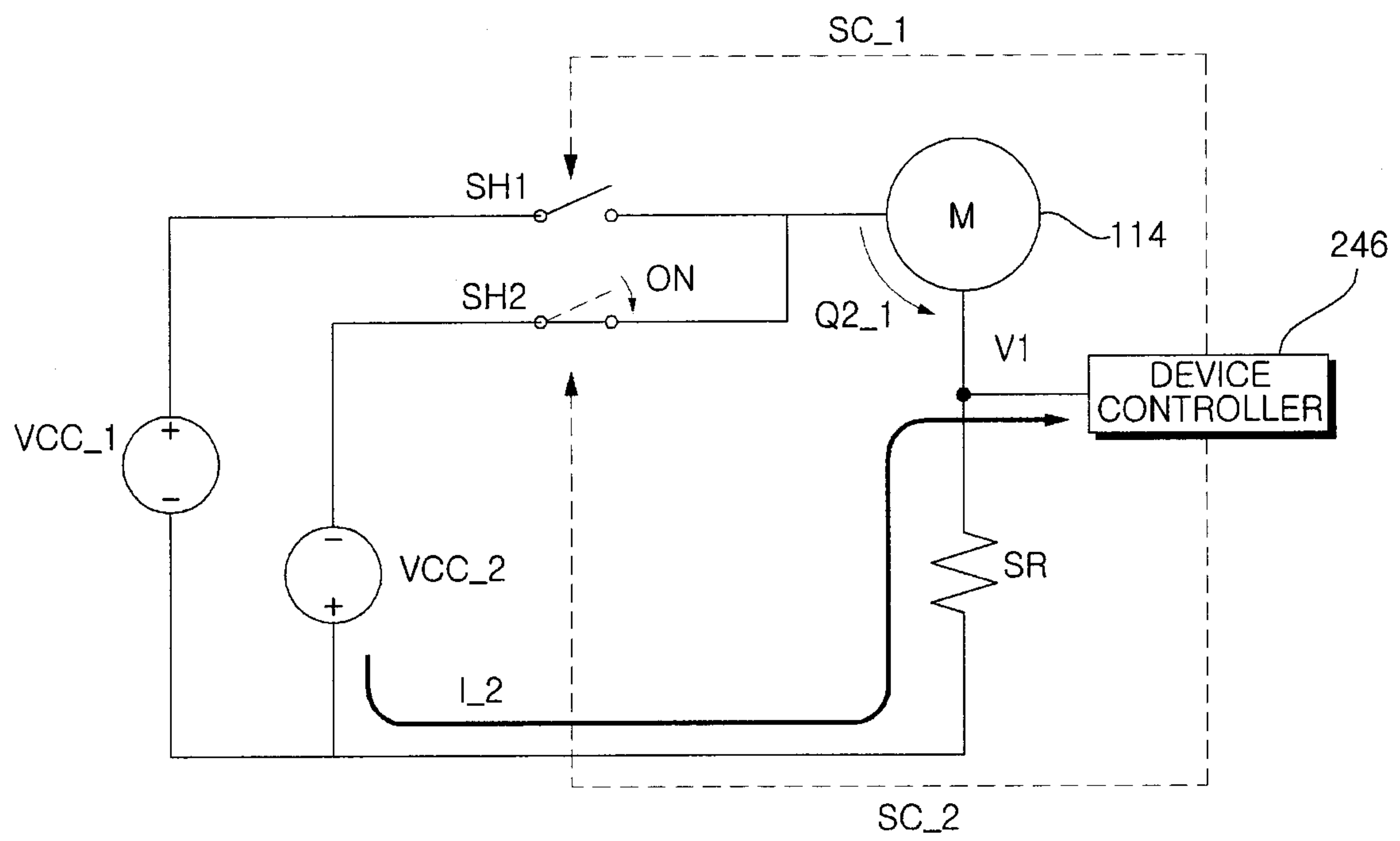


FIG. 8



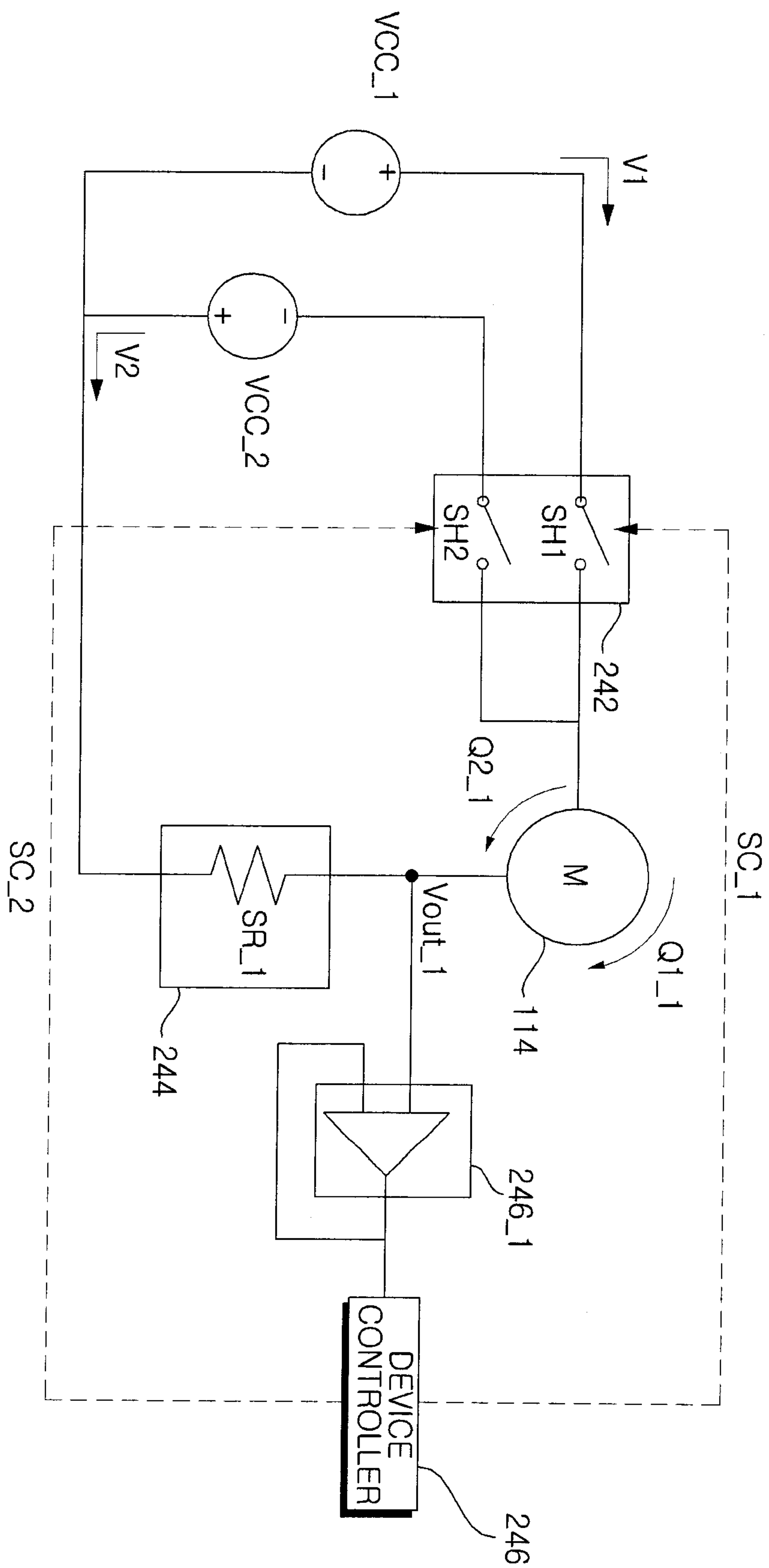
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FIG. 9



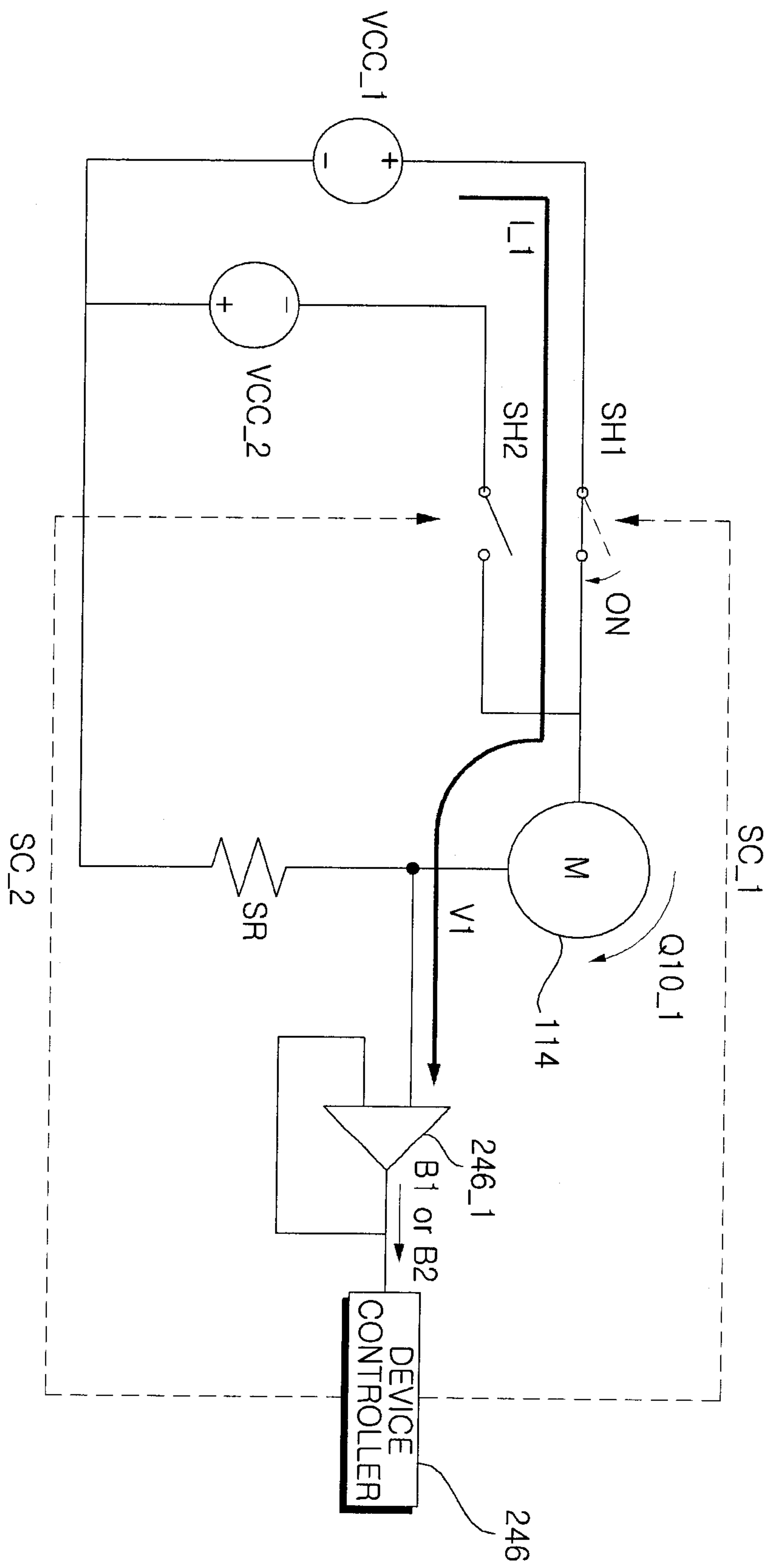
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FIG. 10



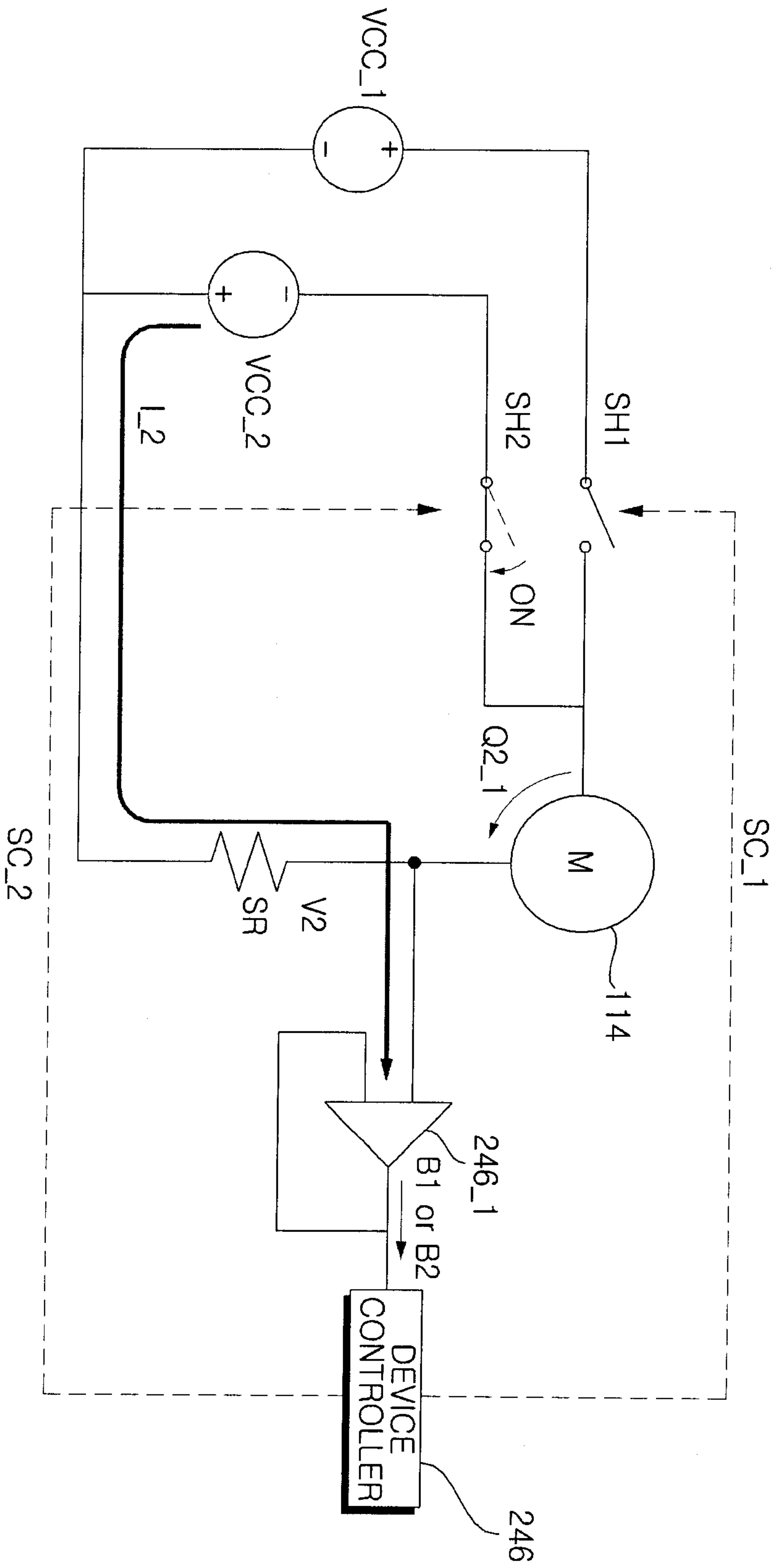
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FIG. 11



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FIG. 12



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FIG. 13

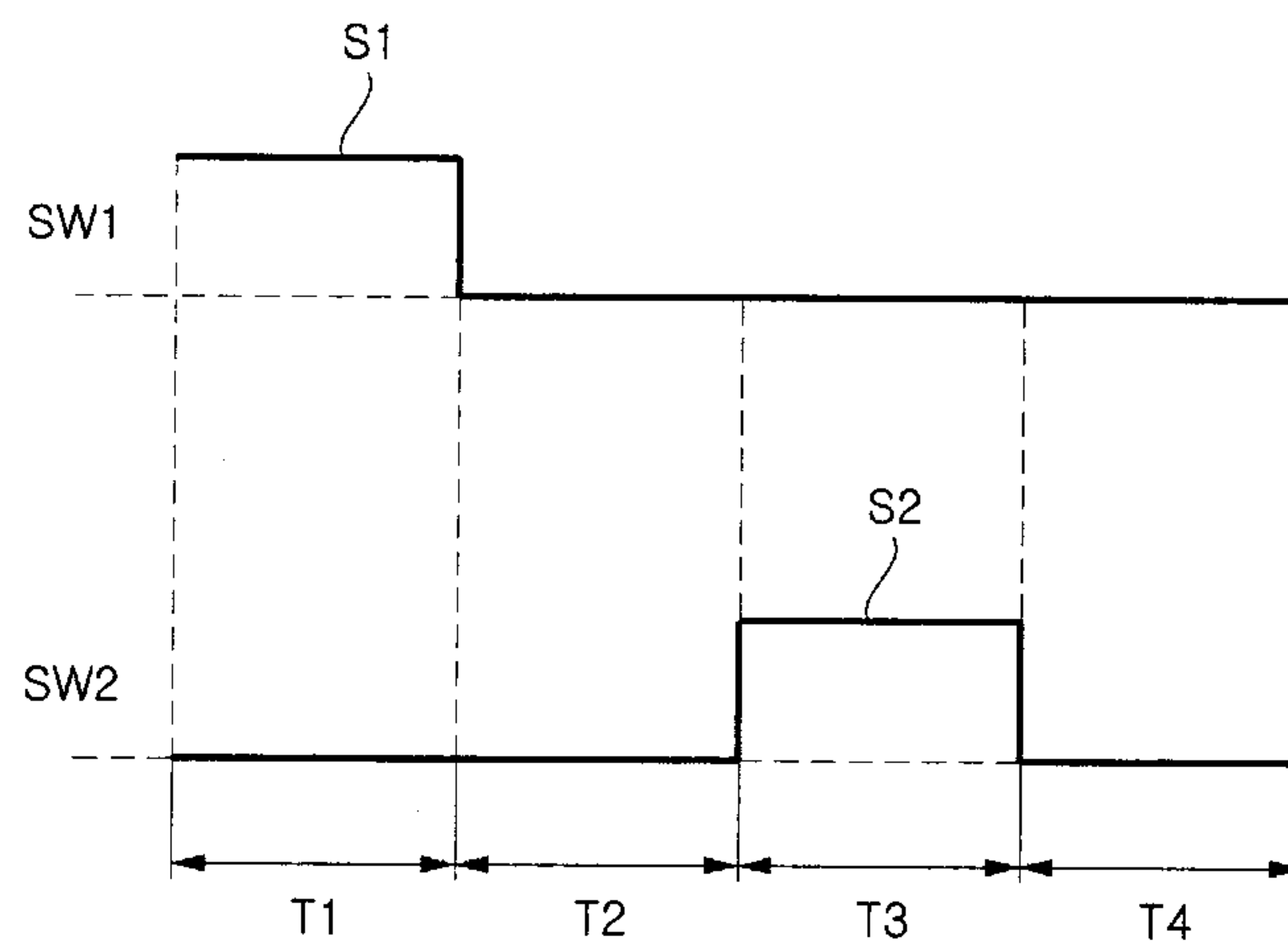
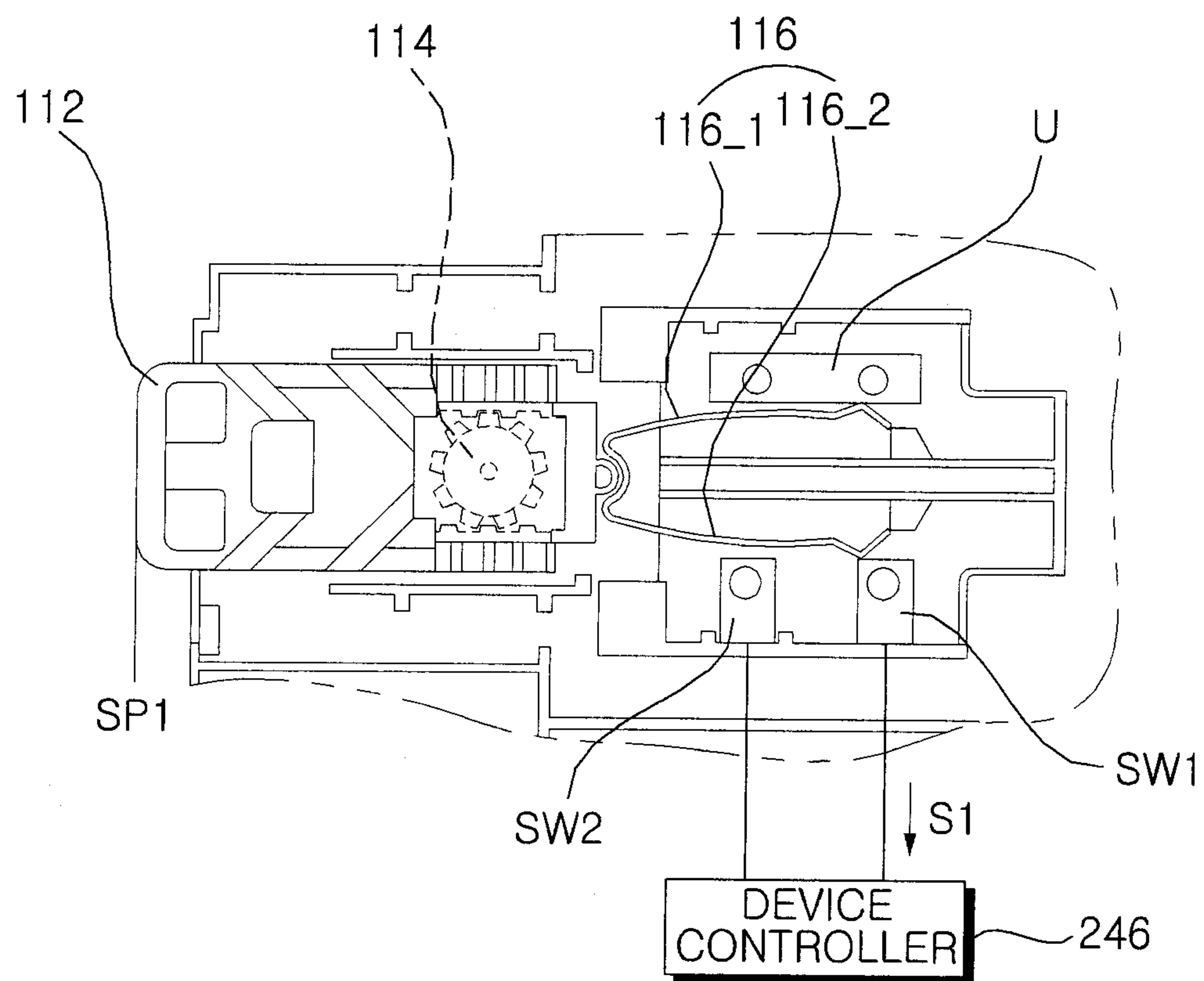
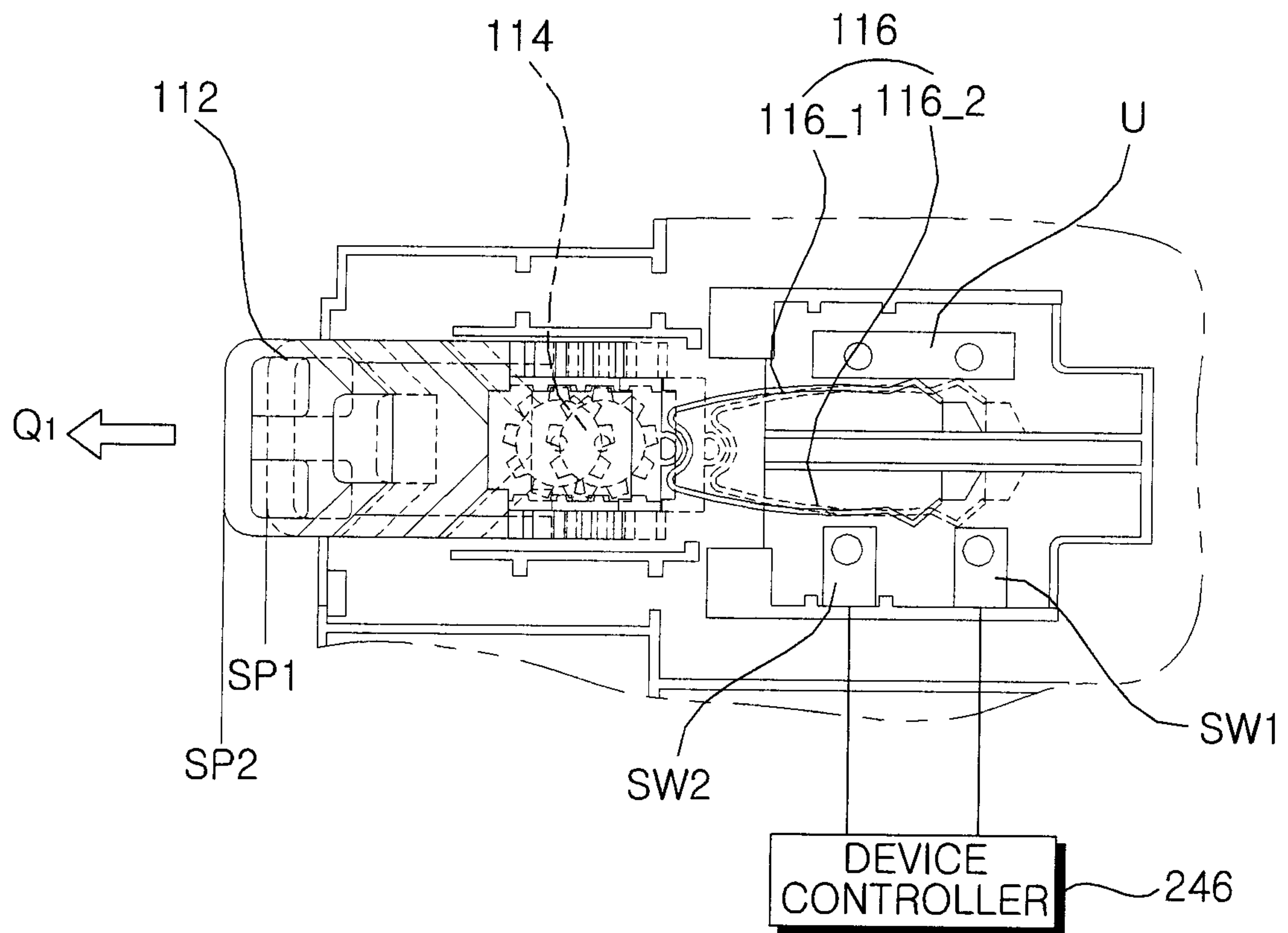


FIG. 14



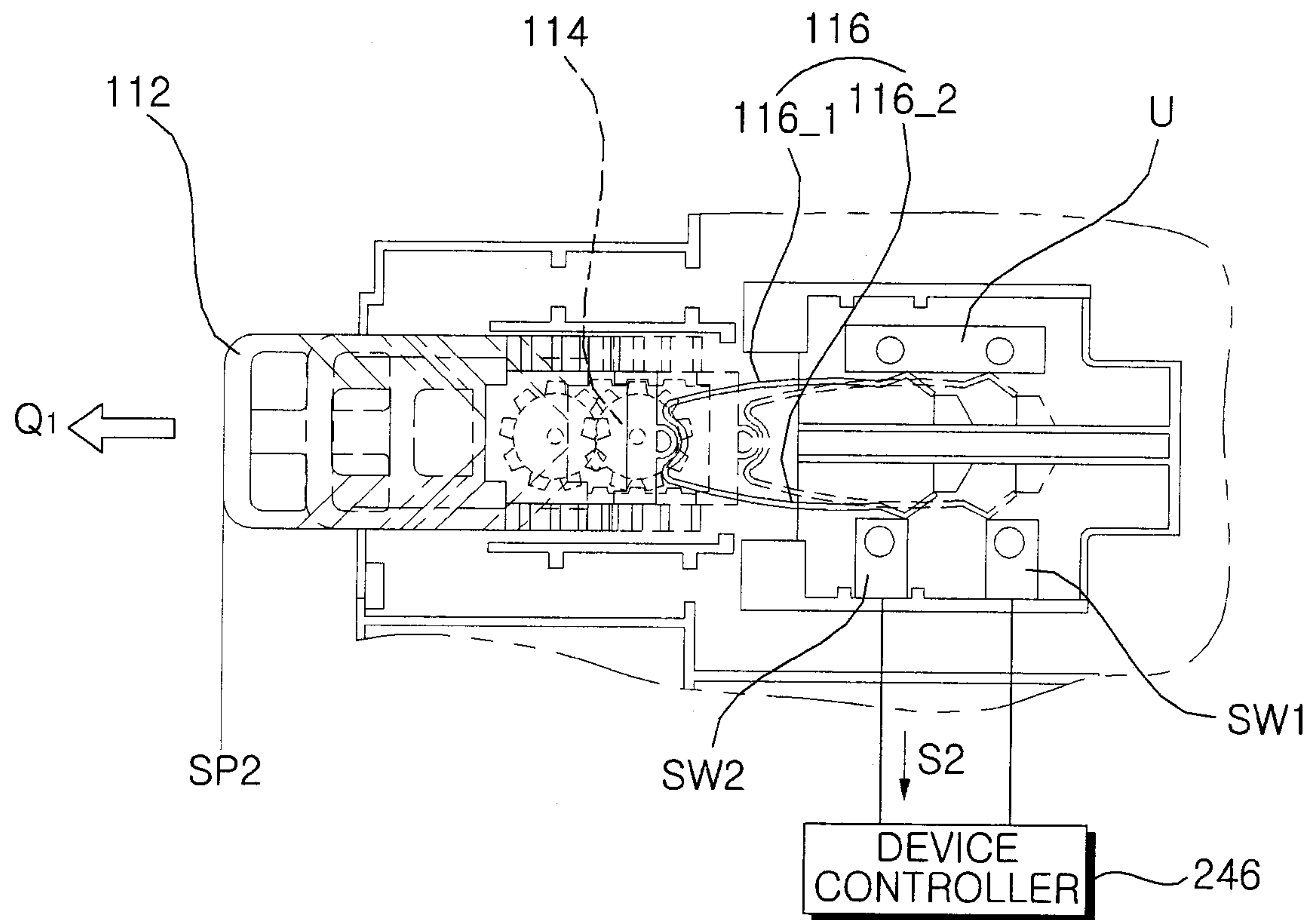
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FIG. 15



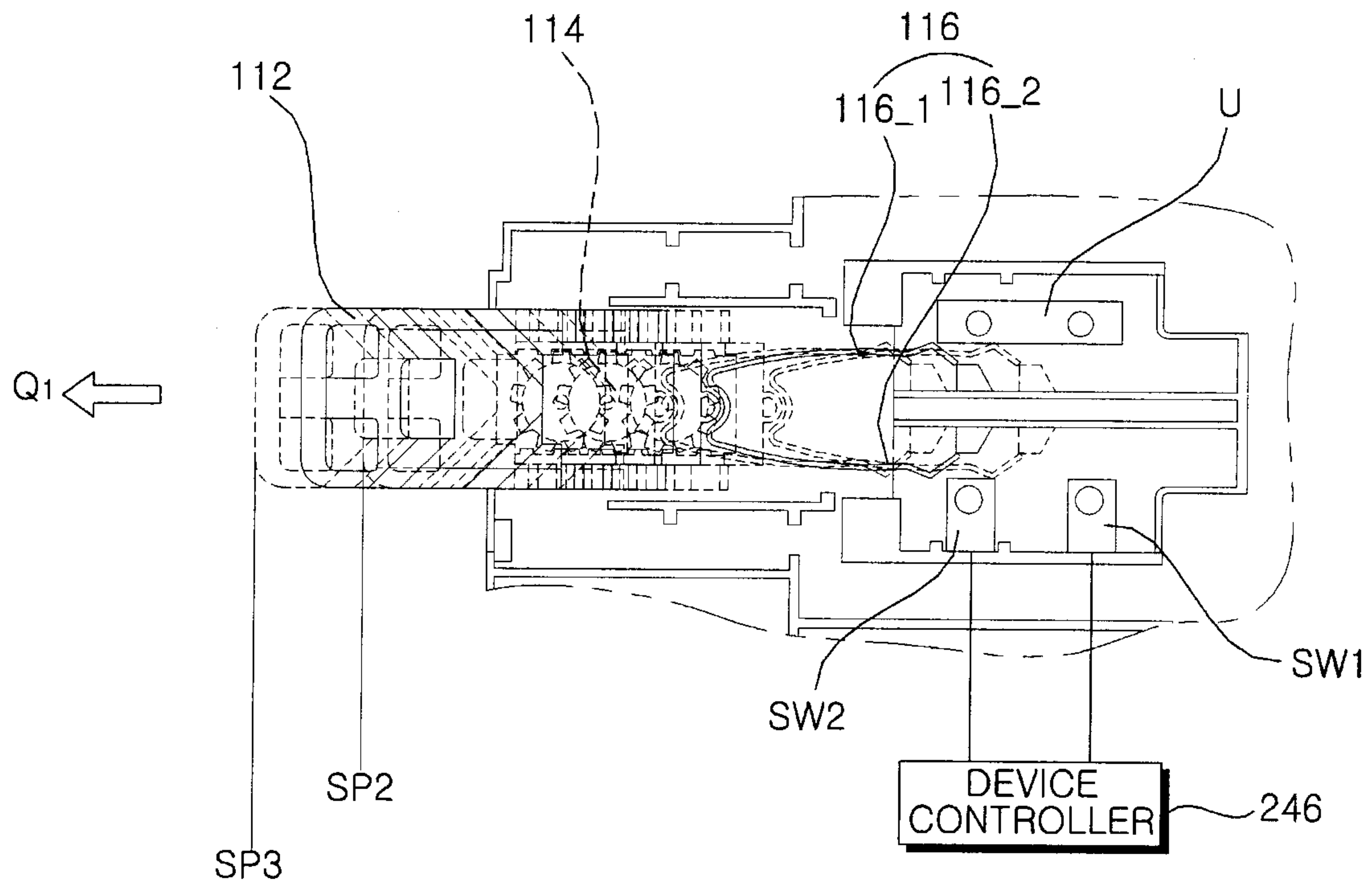
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FIG. 16



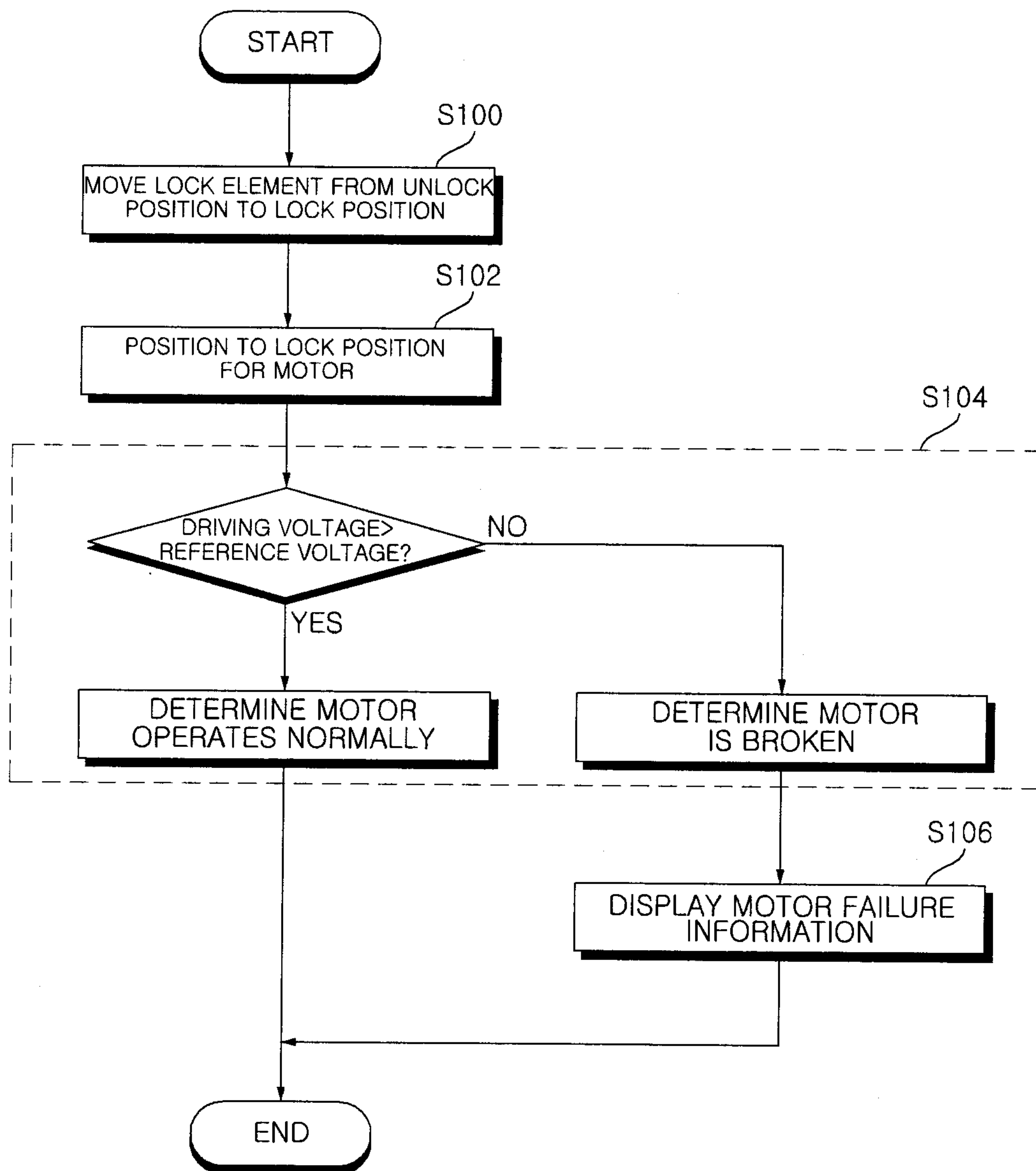
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FIG. 17



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FIG. 18



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FIG. 19

