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(71) Applicant: **Samsung Electronics Co., Ltd.**
Suwon-si, Gyeonggi-Do (KR)

(72) Inventors:
• **Lee, Sang Taek**
Seoul (KR)
• **Shin, Young Shik,**
No.B-1614, Kolon-Tripolis
Gyeonggi-do (KR)
• **Lim, Jung Soo,**
No. 1001-801, Bangjukmaeul-Yeongtong-
Dranche Apt
Gyeonggi-do (KR)
• **Lee, Jae Seung,**
No.210-102, Shinyeongtong-Hyundai Apt.
Gyeonggi-do (KR)
• **Hahm, Kyung Hee,**
No.33-302
Seoul (KR)

- **Lee, Hye Ran,**
No.981-503
Gyeonggi-do (KR)
- **Kim, Jeong Han,**
No.201-605, Hyundai Apt., 1240
Gyeonggi-do (KR)
- **Lim, Chang Hak,**
No.104-802, Daechang Apt., 359,
Gyeonggi-do (KR)
- **Hong, Sook Hyun,**
No.109-706, Neulbutmaeul-Shinchang-1st Apt.
Gyeonggi-do (KR)
- **Ha, Joo Young,**
No.101-302
Seoul (KR)
- **Jin, Hee Won**
Seoul (KR)
- **Son, Bong Su**
Chungnam (KR)

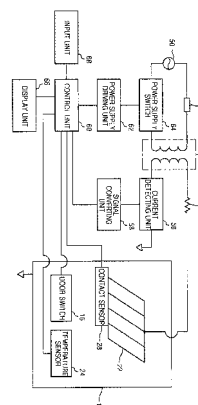
(74) Representative: **Zimmer, Franz-Josef**
Grünecker, Kinkeldey,
Stockmair & Schwanhäusser
Anwaltssozietät
Maximilianstrasse 58
80538 München (DE)

(54) **Refrigerator and safety control method thereof**

(57) A refrigerator and a safety control method thereof, which is capable of ensuring protection from a high voltage applied to a shelf (22) on which food is placed in order to improve food preservation. The safety control method of a refrigerator having a storage chamber (12) which stores food, the method includes sensing a chamber temperature of the storage chamber (12), comparing the sensed chamber temperature with a predetermined setting temperature and generating a high voltage when the chamber temperature is less than the predetermined setting temperature, supplying the generated high voltage to the inside of the storage chamber to preserve the food, determining whether a high voltage cutoff condition occurs while the high voltage is supplied to the inside of the storage chamber, and cutting off the high voltage supplied to the inside of the storage chamber when the

high voltage cutoff condition occurs.

FIG. 3



Description

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0001] The present invention relates to a refrigerator which is capable of improving food preservation by applying a high voltage to a shelf on which food is placed. More particularly, to a refrigerator which can ensure protection from a high voltage applied to a shelf and a safety control method thereof.

2. Description of the Related Art

[0002] In general, a conventional refrigerator employs a general cooling system, which enables refrigerant to circulate in the refrigerator so as to provide a food storage chamber with cooling air generated by absorbing surrounding heat when the liquid refrigerant evaporates, thereby freshly storing food for a long time. Recently, in accordance with various lifestyles of a user or variation of favorite food, a function for storing meat, fish, vegetables or kimchi is differentiated from the existing freezing and cooling functions. In addition, the food is desired to be stored in an original form.

[0003] As a refrigerator for storing food (for example, fresh meat or fish and shellfish) in an original form, there is provided a refrigerator having a high voltage processing function disclosed in Japanese Patent Application No. 06-323721.

[0004] In the refrigerator disclosed in the above publication, an electric field processing chamber is formed in a part or all of a freezing chamber and a high voltage is applied to a shelf on which food is placed, such that the food stored in the electric field processing chamber is prevented from rotting to improve storage quality and thawing quality of meat or fish and shellfish.

[0005] At this time, since the high voltage is applied to the shelf on which the food is placed, an electric shock may occur when a person contacts the shelf applied with the high voltage. Accordingly, in a conventional refrigerator, as a safety device for preventing the electric shock, a door switch is provided, which senses the opening and closing state of a door of the electric field processing chamber such that the high voltage is cut off when the door is opened and the high voltage is applied when the door is closed.

[0006] However, in the conventional safety device of the refrigerator, when a person voluntarily operates the door switch in a state where the door is opened, the person may be exposed to the high voltage. Furthermore, when the door switch fails, the person may be exposed to the high voltage.

SUMMARY OF THE INVENTION

[0007] Accordingly, it is an aspect of the present in-

vention to provide a refrigerator and a safety control method thereof, which is capable of ensuring safety by cutting off a high voltage when a door switch fails or a person contacts with a shelf of the refrigerator.

[0008] It is another aspect of the present invention to provide a refrigerator and a safety control method thereof, which is capable of ensuring safety by sensing an actual chamber temperature as well as an opening and closing state of a door, and applying a high voltage only when the chamber temperature falls to less than or equal to a predetermined temperature.

[0009] It is yet another aspect of the present invention to provide a refrigerator and a safety control method thereof, which is capable of ensuring safety by cutting off a high voltage when insulation between food which is placed on a shelf applied with the high voltage and an inner wall of a storage chamber is broken down, and thus, current having at least a setting value is detected.

[0010] It is yet another aspect of the invention to provide a refrigerator and a safety control method thereof, which is capable of displaying an operation state of the refrigerator due to cutoff of a high voltage.

[0011] Additional aspects and/or advantages of the invention 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 invention.

[0012] These and/or other aspects of the present invention are achieved by providing a safety control method of a refrigerator which preserves food by supplying a high voltage to an inside of a storage chamber storing the food, the method including detecting a value of current supplied to the inside of the storage chamber, and comparing the detected current value with a predetermined setting value and cutting off the high voltage supplied to the inside of the storage chamber when the current value is greater than or equal to the setting value.

[0013] It is another aspect of the present invention to provide a safety control method of a refrigerator which preserves food by supplying a high voltage to an inside of a storage chamber storing the food, the method including detecting whether a door of the storage chamber is opened; and cutting off the high voltage supplied to the inside of the storage chamber when the door of the storage chamber is opened.

[0014] It is another aspect of the present invention to provide a safety control method of a refrigerator which preserves food by supplying a high voltage to an inside of a storage chamber storing the food, the method including sensing a chamber temperature of the storage chamber, and comparing the sensed chamber temperature with a predetermined setting temperature and cutting off the high voltage supplied to the inside of the storage chamber when the chamber temperature is greater than or equal to a total sum of the predetermined setting temperature and a predetermined temperature.

[0015] It is another aspect of the present invention to provide a safety control method of a refrigerator which preserves food by supplying a high voltage to an inside

of a storage chamber storing the food, the method including determining whether a person approaches the inside of the storage chamber, and cutting off the high voltage supplied to the inside of the storage chamber when the person approaches the inside of the storage chamber.

[0016] The method further includes displaying an operation state of the refrigerator due to the cutoff of the high voltage supplied to the inside of the storage chamber.

[0017] According to an aspect of the present invention, the inside of the storage chamber is a shelf on which the food is placed.

[0018] It is another aspect of the present invention to provide a safety control method of a refrigerator having a storage chamber which stores food, the method including sensing a chamber temperature of the storage chamber, comparing the sensed chamber temperature with a predetermined setting temperature and generating a high voltage when the chamber temperature is less than the predetermined setting temperature, supplying the generated high voltage to an inside of the storage chamber to preserve the food, determining whether a high voltage cutoff condition occurs while the high voltage is supplied to the inside of the storage chamber, and cutting off the high voltage supplied to the inside of the storage chamber when the high voltage cutoff condition occurs.

[0019] The high voltage cutoff condition includes at least one of a condition that a value of current supplied to the inside of the storage chamber is greater than or equal to a predetermined setting value, a condition that a door of the storage chamber is opened, a condition that a chamber temperature is greater than or equal to a total sum of the predetermined setting temperature and a predetermined temperature, and a condition that a person approaches the inside of the storage chamber.

[0020] It is another aspect of the present invention to provide a refrigerator including a storage which stores food, a high voltage generator generating a high voltage supplied to an inside of the storage chamber, a power supply switch switching a power supply to drive the high voltage generator, a temperature sensor sensing a chamber temperature of the storage chamber, and a control unit comparing the sensed chamber temperature with a predetermined setting temperature, controlling the power supply switch to supply the high voltage generated at the high voltage generator to the inside of the storage chamber when the chamber temperature is less than the predetermined setting temperature.

[0021] The control unit controls the power supply switch to turn off the power supply to drive the high voltage generator, when the chamber temperature rises to greater than or equal to a total sum of the predetermined setting temperature and a predetermined temperature while the high voltage is supplied to the inside of the storage chamber.

[0022] The refrigerator further includes a current detecting unit detecting a value of current supplied to the

inside of the storage chamber, wherein the control unit compares the detected current value with a predetermined setting value and controls the power supply switch to turn off the power supply to drive the high voltage generator, when the detected current value is greater than or equal to the predetermined setting value.

[0023] The refrigerator further includes a door switch detecting whether a door of the storage chamber is opened or closed, and the control unit controls the power supply switch to turn off the power supply to drive the high voltage generator when the door switch detects that the door is opened.

[0024] The refrigerator further includes a sensor sensing whether a person approaches the inside of the storage chamber, and the control unit controls the power supply switch to turn off the power supply to drive the high voltage generator when the sensor senses that the person approaches the inside of the storage chamber.

[0025] According to an aspect of the present invention, the sensor includes at least one of a contact sensor, a proximity sensor, an infrared ray sensor and a touch sensor.

[0026] The refrigerator further includes a display unit displaying an operation state of the refrigerator due to the turn-off of the power supply for driving the high voltage generator.

[0027] The control unit determines whether a high voltage cutoff condition occurs while the high voltage is supplied to the inside of the storage chamber and cut off the high voltage supplied to the inside of the storage chamber when the high voltage cutoff condition occurs.

[0028] The high voltage cutoff condition includes at least one of a condition that a value of current supplied to the inside of the storage chamber is greater than or equal to a predetermined setting value, a condition that a door of the storage chamber is opened, a condition that a chamber temperature is greater than or equal to a total sum of the predetermined setting temperature and a predetermined temperature, and a condition that a person approaches the inside of the storage chamber.

BRIEF DESCRIPTION OF THE DRAWINGS

[0029] These and/or other aspects and advantages of the invention will become apparent and more readily appreciated from the following description of the embodiments, taken in conjunction with the accompanying drawings of which:

FIG. 1 is a front view of a refrigerator according to an embodiment of the present invention;
FIG. 2 is a partial perspective view of FIG. 1;
FIG. 3 is a block diagram illustrating a safety control device of the refrigerator according to a first embodiment of the present invention;
FIG. 4 is a block diagram illustrating a safety control device of the refrigerator according to a second embodiment of the present invention; and

FIGS. 5A and 5B are flowcharts illustrating a safety control method of a refrigerator according to an embodiment of the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0030] Reference will now be made in detail to the embodiments of the present invention, examples of which are illustrated in the accompanying drawings, wherein like reference numerals refer to the like elements throughout. The embodiments are described below to explain the present invention by referring to the figures.

[0031] FIG. 1 is a front view illustrating a refrigerator according to an embodiment of the present invention and FIG. 2 is a partial perspective view of FIG. 1.

[0032] In FIG. 1, the refrigerator according to this embodiment of the present invention comprises a main body 10 having a storage chamber 12 capable of improving food preservation using a high voltage and a door 14 which opens and closes a front surface of the storage chamber 12. A door switch 16, which detects the opening and closing state of the door, is provided at an inside of the storage chamber 12 which is in contact with the door 14.

[0033] A mechanical chamber 18, which forms a separate space, is provided above the main body 10, and a high voltage generator 20, which generates a high voltage, is provided in the mechanical chamber 18.

[0034] The storage chamber 12 is divided by a plurality of shelves 22 such that food is placed on each shelf 22, and a temperature sensor 24 to sense a chamber temperature is provided on a wall surface of the storage chamber 12.

[0035] The shelf 22 is in contact with a power supply line 26 provided on the rear side of the storage chamber 12 and connected to the high voltage generator 20. The high voltage generated at the high voltage generator 20 is applied to the shelf 22. The shelf 22 is made of a conductive material to which the high voltage is easily applied. A cover made of an insulating material is provided on an outer surface of the power supply line 26, to prevent the power supply line 26 from directly contacting the main body 10.

[0036] Since the high voltage is applied to the shelf 22, a contact sensor 28 is provided so as to prevent an accident from occurring due to the contact of a person. Accordingly, even when the door switch 16 fails or a person voluntarily operates the door switch 16, that is, the person contacts the shelf 22, it is possible to ensure the safety of the person from the high voltage applied to the shelf 22.

[0037] Although the contact sensor 28, which senses whether a person contacts the shelf 22, is provided according to an embodiment of the present invention, the present invention is not limited thereto. That is, it may be sensed whether the person contacts or approaches the shelf 22 using a proximity sensor, an infrared ray sensor or a touch sensor, for example. According to an embodi-

ment of the present invention, the contact sensor 28 is integrally combined with the shelf 22, as shown in FIG. 2, however, the contact sensor 28 is not limited thereto, the position thereof may vary, as necessary.

[0038] In addition, as shown in FIG. 2, the shelf 22 is received in the storage chamber 12 to be spaced apart from the inner wall 12a of the storage chamber 12. Supporting members 30, which support four corners of the shelf 22, are provided on the main body 10 at the inner wall 12a of the storage chamber 12, and an insulating member 32 which prevents the high voltage generated at the high voltage generator 20 from being applied to the main body 10 through the supporting member 30, is provided between the supporting member 30 and the shelf 22 supported by the supporting member 30.

[0039] Although not shown in figure, a compressor, a condenser, an expansion valve and an evaporator are provided in a general cooling system which enables refrigerant to circulate in the refrigerator so as to provide the storage chamber 12 with cooling air generated by absorbing surrounding heat when the liquid refrigerant evaporates, thereby freshly storing food for a long time.

[0040] FIG. 3 is a block diagram illustrating a safety control device of the refrigerator according to a first embodiment of the present invention. The safety control device comprises a fuse 52 connected with a commercial power supply 50, the high voltage generator 20, a current detecting unit 56, a signal converting unit 58, a control unit 60, a power supply driving unit 62, a power supply switch 64, a display unit 66, and an input unit 68, in addition to the components of FIGS. 1 and 2.

[0041] The fuse 52 is an overload protection circuit which blows to prevent abnormal current from flowing in an electric circuit when current having at least a predetermined value flows in the power supply line through the commercial power supply 50.

[0042] The high voltage generator 20 is a high voltage transformer which boosts an alternating current voltage supplied through the commercial power supply 50 to generate the high voltage (approximately 1 to 10 kV). The generated high voltage is supplied to the shelf 22 in the storage chamber 12 through the power supply line 26, and a resistor 54 is connected with a secondary side of the high voltage generator 20 to restrict a current component of the high voltage supplied to the shelf 22.

[0043] The current detecting unit 56 is a CT sensor, for example, which is connected with a secondary side of the high voltage generator 20 and detects the current inputted to the shelf 22. When the value of the detected current is greater than or equal to the setting value due to insulation breakdown between the food put on the shelf 22 applied with the high voltage and the inner wall 12a of the storage chamber 12, the high voltage generator 20 is prevented from generating the high voltage.

[0044] The signal converting unit 58 is a circuit which converts an AC component of input current detected by the current detecting unit 56 into direct current (DC) and inputs the direct current to the control unit 60.

[0045] The control unit 60 is a microcomputer which controls an entire operation of the refrigerator, receives signals of the door switch 16, the temperature sensor 24, the contact sensor 34 and the current detecting unit 56, and controls the power supplied to the high voltage generator 20.

[0046] More specifically, the control unit 60 controls the power supply connected with the high voltage generator 20 according to the opening-and-closing sensing signal of the door switch 16, such that the high voltage is cut off when the door 14 is opened and the high voltage is applied to the shelf 22 when the door 14 is closed.

[0047] The control unit 60 also enables the temperature sensor 23 to sense an actual chamber temperature, in addition to the sensing of the opening and closing state of the door 14, and controls the power supply connected to the high voltage generator 20 such that the high voltage is applied only when the chamber temperature falls to less than or equal to a user setting temperature.

[0048] The control unit 60 controls the power supply connected with the high voltage generator 20 such that the high voltage is cut off when the contact sensor 34 detects that a person contacts the shelf 22, for example, when the door switch 16 fails or the person voluntarily operates the door switch 16.

[0049] The control unit 60 controls the power supply connected with the high voltage generator 20 such that the high voltage is cut off when the food, which is placed on the shelf 22 applied with the high voltage, is in contact with the inner wall 12a of the storage chamber 12 to break down insulation and the value of the current detected by the current detecting unit 56 is greater than or equal to the setting value.

[0050] The power supply driving unit 62 is a driving circuit which applies the power to a primary side of the high voltage generator 20 according to a control signal of the control unit 60 and the power supply switch 64 turns on/off the commercial power source 50 connected with the high voltage generator 20 according to the drive of the power supply driving unit 62 and is formed of a semiconductor device i.e., a power relay or a TRIAC, for example.

[0051] The display unit 66 displays an operation state of the high voltage generator 20 due to the voltage cutoff to a user, by the control signal of the control unit 60.

[0052] The input unit 69 inputs a user control instruction to the control unit 60 and comprises a start button which starts temperature control and preservation control after the food is placed on the storage chamber 12 and a plurality of buttons, for example, a temperature setting button to set the temperature of the food.

[0053] FIG. 4 is a block diagram illustrating a safety control device of the refrigerator according to a second embodiment of the present invention. The safety control device shown in FIG. 4 is similar to that shown in FIG. 3, except that a ground line connected with the secondary side of the high voltage generator 20 connected with the current detecting unit 56 is inserted into a module of the

high voltage generator 20, independent of a ground line of the storage chamber 12. Even when the ground line connected with the secondary side of the high voltage generator 20 is inserted into the module, the same object and effect as those of FIG. 3 can be accomplished.

[0054] Hereinafter, the operation and the effect of the refrigerator and the safety control method thereof will be described.

[0055] FIGS. 5A and 5B are flowcharts of the safety control method of the refrigerator according to an embodiment of the present invention.

[0056] First, in operation 100, a user places food, which is desired to be stored, on the shelf 22 of the storage chamber 12, and from operation 100, the process moves to operation 102, where the user operates the temperature setting button provided in the input unit 68 to input a setting temperature T_s of the food.

[0057] When the setting temperature T_s is input in operation 102, the process moves to operation 104, where the control unit 60 determines whether a cooling start signal is input through a start button provided in the input unit 68. When the start button is pressed in operation 104, the process moves to operation 106 where the control unit 60 starts the temperature control which allows the food placed on the shelf 22, to be stored at the setting temperature T_s by operating the cooling system which enables refrigerant to circulate in the refrigerator so as to provide the storage chamber 12 with cooling air.

[0058] Next, under the control of the control unit 60, in operation 108, the temperature sensor 24 senses the chamber temperature T_c of the storage chamber 12 which varies depending on the drive of the cooling system and from operation 108, the process moves to operation 110, where the control unit 60 compares the sensed chamber temperature T_c with the setting temperature T_s .

[0059] As the result of comparison, when the chamber temperature T_c is greater than the setting temperature T_s in operation 110, the process returns to operation 106, where the temperature control is continuously performed until the chamber temperature T_c falls to less than or equal to the setting temperature T_s and, when the chamber temperature T_c is less than or equal to the setting temperature T_s in operation 110, high voltage control for storing the food for a long time (experimental result: about a month) in an original state starts in operation 112.

[0060] In operation 112, under the control of the control unit 60, the power supply switch 64 is turned on by the power supply driving unit 62, and the commercial power supply 50 supplies the power to the primary side of the high voltage generator 20.

[0061] When the commercial power supply 50 supplies the power to the primary side of the high voltage generator 20, the high voltage of approximately 1 to 10 kV is generated at the secondary side of the high voltage generator 20 and from operation 112, the process moves to operation 114, where the high voltage generated at the secondary side of the high voltage generator 20 is applied to the shelf 22 through the power supply line 26 provided

on the rear side of the storage chamber 12 to perform the high voltage control of the food.

[0062] The preservation of the food using the high voltage is described in a refrigerator having a high voltage processing function, which is disclosed in Japanese Patent Application Publication No. 06-323721, and thus their detailed description will be omitted. Hereinafter, the technical characteristics of the present invention which ensures protection from the high voltage applied to the shelf 22 will be described in detail.

[0063] First, from operation 114, the process moves to operation 116, where when the high voltage is applied to the shelf 22, the current I_c inputted to the shelf 22 is detected by the current detecting unit 56. The AC component of the detected input current I_c is converted into the direct current (DC) by the signal converting unit 58 and inputted to the control unit 60.

[0064] Now, referring to FIG. 5B, from operation 116, the process moves to operation 118, where the control unit 60 determines whether the value of the detected current I_c is greater than or equal to a setting value I_s . When the value of the detected current I_c is less than the setting value I_s in operation 118, the process moves to operation 120 where the control unit 60 determines that the insulation between the shelf 22 applied with the high voltage and the inner wall 12a of the storage chamber 12 has not broken down. Accordingly, the high voltage is continuously generated.

[0065] Meanwhile, when the value of the detected current I_c is greater than or equal to the setting value I_s in operation 118, the process moves to operation 126, where the control unit 60 determines that the food placed on the shelf 22 applied with the high voltage, contacts the inner wall 12a of the storage chamber 12 to break down the insulation and controls the power supply driving unit 62 to turn off the power supply switch 64, and accordingly the commercial power supply 50 does not supply the power to the high voltage generator 20 to prevent the high voltage from being generated. Therefore, when the insulation between the shelf 22 and the inner wall 12a of the storage chamber 12 has broken down and thus the value of the current I_c detected by the current detecting unit 56 is greater than or equal to the setting value I_s , it is possible to ensure protection from the high voltage applied to the shelf 22.

[0066] In operation 120, the control unit 60 determines whether the door 14 is opened, using the door switch 16. When it is determined that the door 14 is not opened in operation 120, the high voltage is continuously generated and, when it is determined that the door 14 is opened in operation 120, the process moves to operation 126, where the control unit 60 controls the power supply driving unit 62 to turn off the power supply switch 64, and accordingly the commercial power supply 50 does not supply the power to the high voltage generator 20 to prevent the high voltage from being generated. Therefore, when the door 14 is opened, it is possible to ensure protection from the high voltage applied to the shelf 22 by

preventing the high voltage from being generated.

[0067] In addition to the current detection due to insulation breakdown and the sensing of the opening and closing state of the door 14, when it is determined in operation 120 that the door is opened, the process moves to operation 122, where the control unit 60 determines whether the actual chamber temperature T_c detected by the temperature sensor 24 is greater than or equal to a total sum of the setting temperature T_s and a predetermined temperature R (approximately 2 to 3 °C). When the chamber temperature T_c is less than the total sum of the setting temperature T_s and the predetermined temperature R in operation 122, the high voltage is continuously generated.

[0068] Meanwhile, when the chamber temperature T_c is greater than or equal to the total sum of the setting temperature T_s and the predetermined temperature R , the process moves to operation 126, where the control unit 60 controls the power supply driving unit 62 to turn off the power supply switch 64, and accordingly the commercial power supply 50 does not supply the power to the high voltage generator 20 to prevent the high voltage from being generated. Therefore, in consideration that the door switch 16 fails or the user voluntarily operates the door switch 16, it is possible to check the variation of the chamber temperature T_c to ensure the safety.

[0069] When it is determined in operation 122 that the chamber temperature T_c is less than the total sum of the setting temperature T_s and the predetermined temperature R , the process moves to operation 124, where the control unit 60 determines whether a person contacts the shelf, using the contact sensor 28. When the person does not contact the shelf, the process returns to operation 114 shown in FIG. 5A.

[0070] Meanwhile, when it is determined that the person contacts the shelf in operation 124, the process moves to operation 126, where the control unit 60 controls the power supply driving unit 62 to turn off the power supply switch 64, and accordingly the commercial power supply 50 does not supply the power to the high voltage generator 20 to prevent the high voltage from being generated. Therefore, in addition to the case where the door switch 16 fails or the user voluntarily operates the door switch 16, even when the variation of the actual chamber temperature T_c is too minute to be checked, it is possible to ensure the safety.

[0071] When at least one of the condition that the value of the current I_c detected by the current detecting unit 56 is greater than or equal to the setting value I_s due to the insulation breakdown between the shelf 22 and the inner wall 12a of the storage chamber 12, the condition that the door 14 is opened, the condition that the actual chamber temperature T_c is greater than or equal to the setting temperature T_s plus the predetermined temperature, and the condition that the person contacts the shelf 22 is satisfied, the control unit 60 prevents the commercial power supply 50 from supplying the power to the high voltage generator 20 in order to ensure protection from the high

voltage applied to the shelf 22.

[0072] Subsequently, under the control of the control unit 60, the display unit 68 displays the operation state of the refrigerator due to the cutoff of the high voltage in operation 128.

[0073] As described above, in a refrigerator and a safety control method thereof according to the present invention, it is possible to ensure protection from a high voltage when a door switch fails or a person contacts a shelf.

[0074] According to the present invention, the opening and closing state of a door is detected and an actual chamber temperature is sensed. Only when the actual chamber temperature is less than a predetermined temperature, the high voltage is applied. When the value of the detected current is greater than or equal to the setting value due to the insulation breakdown between food, which is put on a shelf applied with the high voltage, and an inner wall of a storage chamber, it is possible to cut off the high voltage to ensure safety.

[0075] According to the present invention, it is possible to display the operation state due to the cutoff of the high voltage to a user.

[0076] Although a few embodiments of the present invention have been shown and described, it would be appreciated by those skilled in the art that changes may be made in these embodiments without departing from the principles and spirit of the invention, the scope of which is defined in the claims and their equivalents.

Claims

1. A safety control method of a refrigerator which preserves food by supplying a high voltage to an inside of a storage chamber storing the food, the method comprising:

detecting a value of current supplied to the inside of the storage chamber; and
comparing the detected current value with a predetermined setting value and cutting off the high voltage supplied to the inside of the storage chamber when the current value is greater than or equal to the predetermined setting value.

2. A safety control method of a refrigerator which preserves food by supplying a high voltage to an inside of a storage chamber storing the food, the method comprising:

detecting whether a door of the storage chamber is opened; and
cutting off the high voltage supplied to the inside of the storage chamber when the door of the storage chamber is opened.

3. A safety control method of a refrigerator which preserves food by supplying a high voltage to an inside

of a storage chamber for storing the food, the method comprising:

sensing a chamber temperature of the storage chamber; and
comparing the sensed chamber temperature with a predetermined setting temperature and cutting off the high voltage supplied to the inside of the storage chamber when the chamber temperature is greater than or equal to a total sum of the predetermined setting temperature set by a user and a predetermined temperature.

4. A safety control method of a refrigerator which preserves food by supplying a high voltage to an inside of a storage chamber storing the food, the method comprising:

determining whether a person approaches the inside of the storage chamber; and
cutting off the high voltage supplied to the inside of the storage chamber when the person approaches the inside of the storage chamber.

5. The method according to claim 1, further comprising displaying an operation state of the refrigerator due to the cut off of the high voltage supplied to the inside of the storage chamber.

6. The method according to claim 1, wherein the inside of the storage chamber is a shelf on which the food placed.

7. A safety control method of a refrigerator having a storage chamber which stores food, the method comprising:

sensing a chamber temperature of the storage chamber;
comparing the sensed chamber temperature with a predetermined setting temperature and generating a high voltage when the chamber temperature is less than the predetermined setting temperature;
supplying the generated high voltage to an inside of the storage chamber to preserve the food;
determining whether a high voltage cutoff condition occurs while the high voltage is supplied to the inside of the storage chamber; and
cutting off the high voltage supplied to the inside of the storage chamber when the high voltage cutoff condition occurs.

8. The method according to claim 7, wherein the high voltage cutoff condition is at least one of a condition that a value of current supplied to the inside of the storage chamber is greater than or equal to a pre-

determined setting value, a condition that a door of the storage chamber is opened, a condition that a chamber temperature is greater than or equal to a total sum of the predetermined setting temperature and a predetermined temperature, and a condition that a person approaches the inside of the storage chamber.

9. A refrigerator having a storage chamber which stores food, the refrigerator comprising:

a high voltage generator to generate a high voltage supplied to an inside of the storage chamber;
a power supply switch to switch a power supply driving the high voltage generator;
a temperature sensor to sense a chamber temperature of the storage chamber; and
a control unit to compare the sensed chamber temperature with a predetermined setting temperature set by a user, to control the power supply switch to supply the high voltage generated at the high voltage generator to the inside of the storage chamber when the chamber temperature is less than the predetermined setting temperature.

10. The refrigerator according to claim 9, wherein the control unit controls the power supply switch to turn off the power supply driving the high voltage generator, when the chamber temperature rises to greater than or equal to the total sum of the predetermined setting temperature a predetermined temperature while the high voltage is supplied to the inside of the storage chamber.

11. The refrigerator according to claim 10, wherein the predetermined temperature is approximately 2 to 3 °C.

12. The refrigerator according to claim 9, further comprising:

a current detecting unit to detect a value of current supplied to the inside of the storage chamber, wherein the control unit compares the detected current value with a predetermined setting value and controls the power supply switch to turn off the power supply driving the high voltage generator when the detected current value is greater than or equal to the predetermined setting value.

13. The refrigerator according to claim 9, further comprising:

a door switch to detect whether a door of the storage chamber is opened or closed,

wherein the control unit controls the power supply switch to turn off the power supply driving the high voltage generator when the door switch detects that the door is opened.

14. The refrigerator according to claim 9, further comprising:

a sensor sensing whether a person approaches the inside of the storage chamber, wherein the control unit controls the power supply switch to turn off the power supply driving the high voltage generator when the sensor senses that the person approaches the inside of the storage chamber.

15. The refrigerator according to claim 14, wherein the sensor comprises at least one of a contact sensor, a proximity sensor, an infrared ray sensor and a touch sensor.

16. The refrigerator according to claim 9, further comprising:

a shelf provided inside the storage chamber to place food thereon and to receive the high voltage generated from the high voltage generator, and comprising a sensor integrally combined therewith, to sense whether a person contacts with the shelf, wherein the power supply driving the high voltage generator is turned off when it is sensed that the person contacts with the shelf.

17. The refrigerator according to claim 16, further comprising:

supporting members attached to an inner wall of the storage chamber to support the shelf; and insulating members corresponding to each supporting member, wherein the shelf rests on the insulating member, to prevent the high voltage from being applied to the inner wall of storage chamber through the supporting member.

18. The refrigerator according to claim 10, further comprising:

a display unit displaying an operation state of the refrigerator due to the turn-off of the power supply driving the high voltage generator.

19. The refrigerator according to claim 9, wherein the control unit determines whether a high voltage cutoff condition occurs while the high voltage is supplied to the inside of the storage chamber, and cuts off the high voltage supplied to the inside of the storage chamber if the high voltage cutoff condition occurs.

20. The refrigerator according to claim 19, wherein the high voltage cutoff condition is at least one of a condition that a value of current supplied to the inside of the storage chamber is greater than or equal to a predetermined setting value, a condition that a door of the storage chamber is opened, a condition that a chamber temperature is greater than or equal to a total sum of the predetermined setting temperature and a predetermined temperature, and a condition that a person approaches the inside of the storage chamber.

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FIG. 1

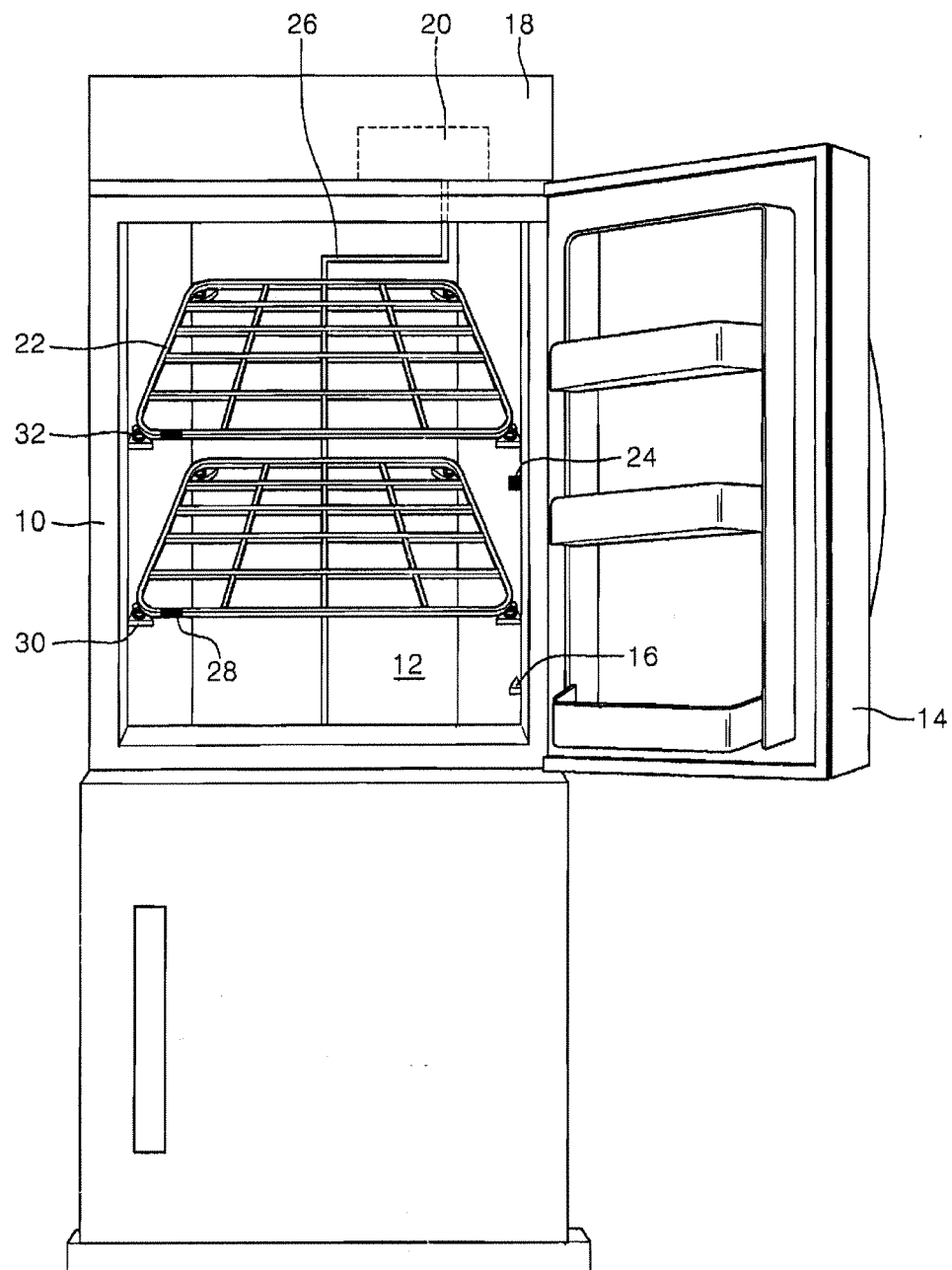


FIG. 2

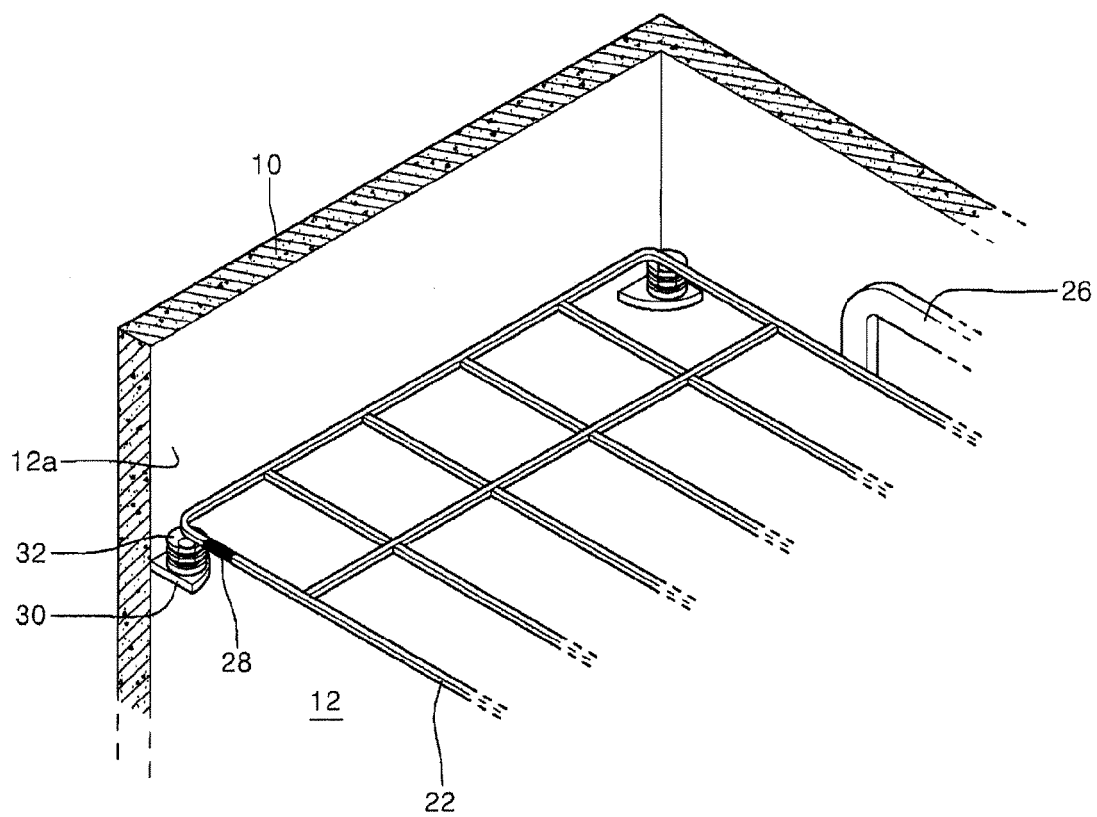


FIG. 3

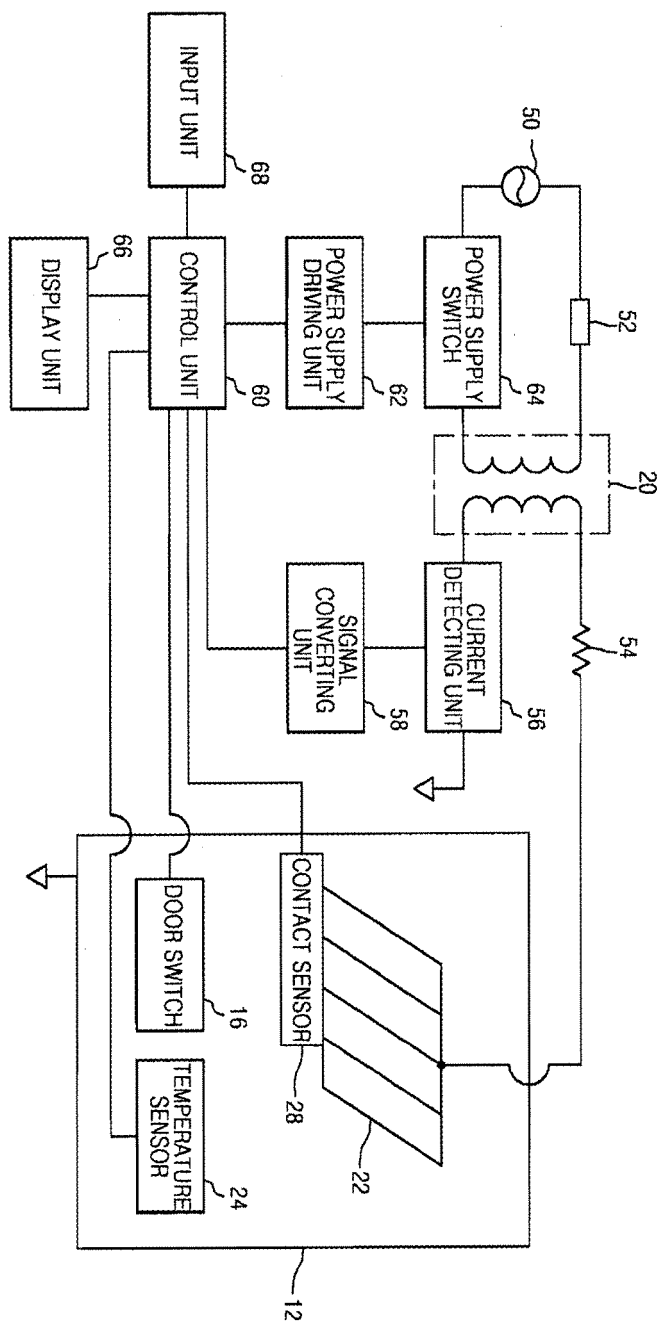


FIG. 4

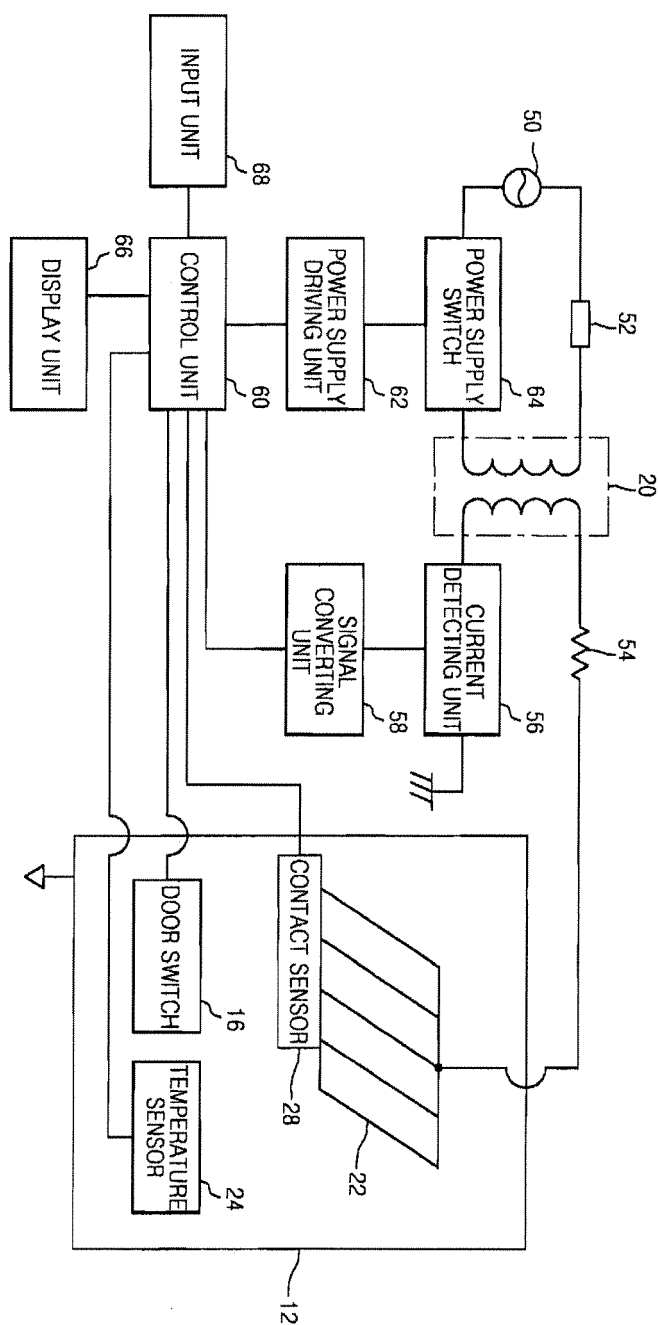


FIG. 5A

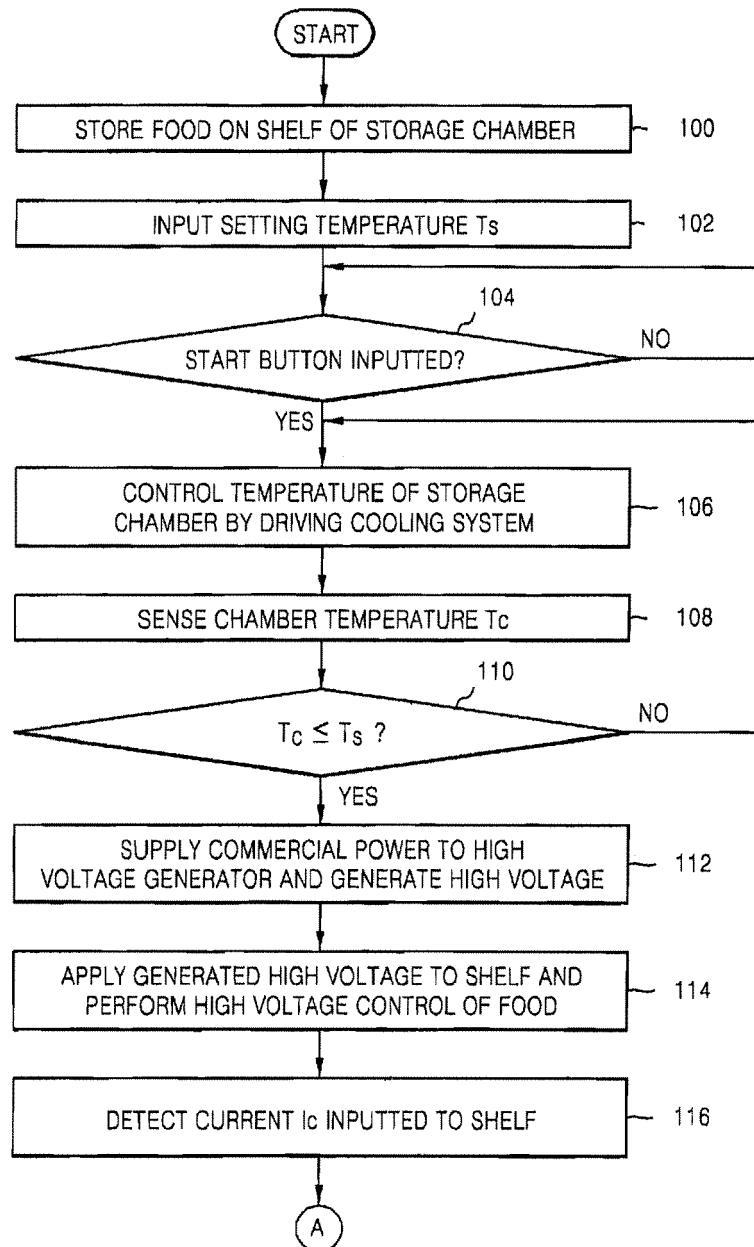
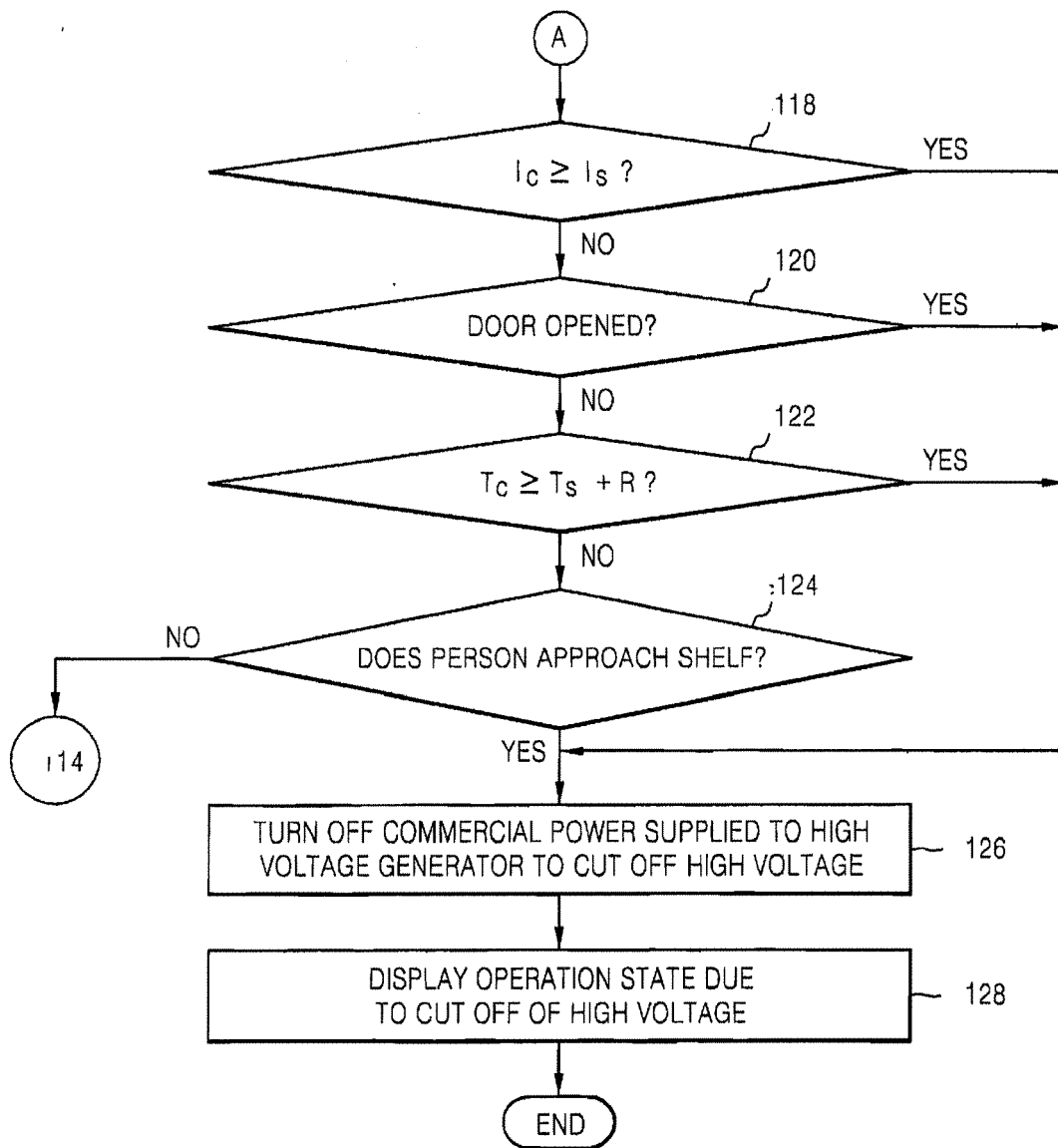


FIG. 5B



REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- JP 6323721 A [0003] [0062]