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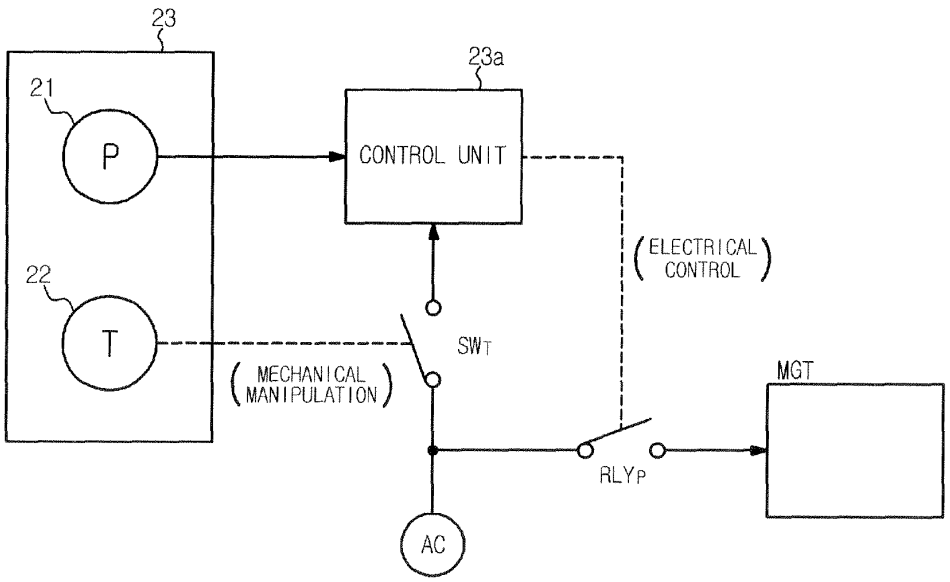
(54) Microwave oven and method of controlling the same

(57) A microwave oven and a method of controlling the same are disclosed. The microwave oven includes a mechanical timer serving to set desired cooking time and to supply power, and a control unit to automatically perform electrical control for cooking operation by receiving power by operation of the mechanical timer. The microwave oven has a relatively low price through proper application of electrical control to the mechanical timer, and can be precisely controlled. The microwave oven also can solve a problem of inrush current at a power-on point through electrical control without an additional device for preventing inrush current.

FIG. 4



EP 2 109 342 A1

Description

CROSS-REFERENCE TO RELATED APPLICATION

[0001] This application claims the benefit of Korean Patent Application No. 2008-0032675, filed on April 8, 2008 in the Korean Intellectual Property Office, the disclosure of which is incorporated herein by reference.

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0002] The present invention relates to a microwave oven and a method of controlling the same, and more particularly, to a microwave oven equipped with a mechanical timer as a device for setting a cooking time, and a method of controlling such a microwave oven.

2. Description of the Related Art

[0003] Control of operation of a microwave oven may be generally divided into control of output of a magnetron and control of a cooking time. To achieve such control, a microwave oven is provided with an output adjusting device and a timer, so that a user can adjust output of a magnetron and a cooking time.

[0004] According to the kinds of an output adjusting device and a timer, a microwave oven may be generally classified as a mechanical microwave oven and an electronic microwave oven. In other words, a mechanical microwave oven comprises a mechanical output adjusting device and a mechanical timer, and an electronic microwave oven comprises an electronic output adjusting device and an electronic timer.

[0005] A mechanical microwave oven employs a mechanical timer. A mechanical timer is operated such that if a knob is rotated to a scale corresponding to a desired time, a switch is turned on/off at the desired time by unwinding of a spring or rotation of a motor. In a case of such a mechanical microwave oven, a timer employs a manner of reducing the number of rotations of a motor by using a plurality of gears. Specifically, because the rotation of a motor of a timer and the speed reduction by gears are also used in an output adjusting device, the timer and the output adjusting device mechanically interlock with each other. Therefore, it is difficult to precisely control a conventional mechanical microwave oven.

[0006] An electronic microwave oven employs an electronic timer which counts time by using electronic circuits. An electronic timer has an advantage of being easily handled. However, an electronic timer cannot be easily employed in a microwave oven due to relatively high cost.

SUMMARY OF THE INVENTION

[0007] Therefore, it is an aspect of the invention to provide a mechanical microwave oven using a mechanical timer, which has a relatively low price through proper application of electrical control to the mechanical timer and can be precisely controlled.

[0008] It is another aspect of the invention to provide a method of controlling a microwave oven, which can solve a problem of inrush current at a power-on point through electrical control without an additional device for preventing inrush current.

[0009] Additional aspects and/or advantages of the invention will be set forth in part in the description which follows and, in part, will be obvious from the description, or may be learned by practice of the invention.

[0010] In accordance with an aspect of the invention, there is provided a microwave oven comprising: a mechanical timer serving to set desired cooking time and to supply power; and a control unit to automatically perform electrical control for cooking operation by receiving power by operation of the mechanical timer.

[0011] The mechanical timer may include a rotatable timer knob.

[0012] The microwave oven may further comprise a first switch to be turned ON by rotation of the timer knob. The first switch may serve to supply power to the control unit.

[0013] The rotation of the timer knob may be performed by a user.

[0014] The microwave oven may further comprise a magnetron, and a second switch to be turned ON/OFF by electrical control of the control unit. The second switch may serve to intermit power supply to the magnetron.

[0015] The control unit may electrically control the second switch so as to prevent inflow of inrush current to the magnetron at an initial stage of power supply to the magnetron.

[0016] The control unit may control the second switch to be turned ON at a point when inrush current is minimum, so as to start power supply to the magnetron.

[0017] The point when the inrush current is minimum may be when voltage determined through a phase of the supplied power is maximum and current is minimum.

[0018] In accordance with another aspect of the invention, there is provided a microwave oven comprising: a magnetron; a mechanical timer serving to set desired cooking time and to supply power; and a control unit to automatically perform electrical control for cooking operation by receiving power by operation of the mechanical timer. When controlling power supply to the magnetron, the control unit prevents inflow of inrush current to the magnetron.

[0019] The mechanical timer may include a rotatable timer knob.

[0020] The microwave oven may further comprise a first switch to be turned ON by rotation of the timer knob. The first switch may serve to supply power to the control unit.

[0021] The microwave oven may further comprise a second switch to be turned ON/OFF by electrical control of the control unit, so as to intermit power supply to the

magnetron. The control unit may control the second switch to be turned ON at a point when the inrush current is minimum, so as to start power supply to the magnetron.

[0022] The point when the inrush current is minimum may be when voltage determined through a phase of the supplied power is maximum and current is minimum.

[0023] In accordance with a further aspect of the invention, there is provided a method of controlling a microwave oven including a mechanical timer having a rotatable timer knob, the mechanical timer serving to set desired cooking time and to supply power, a first switch to be turned ON by rotation of the timer knob, and a magnetron, the method comprising: automatically performing electrical control for cooking operation by receiving power through the first switch turned ON by the rotation of the timer knob.

[0024] The microwave oven may further include a second switch to be turned ON/OFF by the electrical control, so as to intermit power supply to the magnetron. The method may further comprise electrically controlling the second switch so as to prevent inflow of inrush current to the magnetron at an initial stage of power supply to the magnetron.

[0025] The method may further comprise controlling the second switch to be turned ON at a point when the inrush current is minimum, so as to start power supply to the magnetron.

[0026] The point when the inrush current is minimum may be when voltage determined through a phase of the supplied power is maximum and current is minimum.

BRIEF DESCRIPTION OF THE DRAWINGS

[0027] These and/or other aspects and advantages of the exemplary embodiments 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 view showing constitution of a microwave oven according to an exemplary embodiment of the present invention;

FIG. 2 is a view showing an external shape of a cooking setting part of the microwave oven shown in FIG. 1;

FIG. 3 is a control circuit diagram of the microwave oven shown in FIG. 1;

FIG. 4 is a view showing a connecting relation between the cooking setting part shown in FIG. 2 and the control circuit shown in FIG. 3; and

FIG. 5 is a flow chart showing a method of controlling the microwave oven according to an exemplary embodiment of the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0028] Reference will now be made in detail to exemplary embodiments of the present invention, examples of which are illustrated in the accompanying drawings, wherein like reference numerals refer to like elements throughout. The embodiments are described below to explain the present invention by referring to the figures.

[0029] FIG. 1 is a constitutional view of a microwave oven according to an exemplary embodiment of the present invention. As shown in FIG. 1, a microwave oven 10 according to an exemplary embodiment of the present invention comprises a case 20, an electrical component chamber 30 and a cooking chamber 41.

[0030] A case 20 is provided with an output adjusting knob 21 to set output of the microwave oven, and a timer knob 22 to set cooking time. The output adjusting knob 21 and the timer knob 22 are coupled to a cooking setting part 23, which is disposed in the rear of the output adjusting knob 21 and the timer knob 22. The cooking setting part 23 serves to drive a magnetron according to output of the magnetron and a cooking mode selected through the output adjusting knob 21 and cooking time set through the timer knob 22. The case 20 is further provided with a door lever 25 to open or close a door 43.

[0031] The electrical component chamber 30 contains a magnetron MGT to generate high frequency waves, high voltage elements HVT, HVC and HVD, a cooling fan 3 and a lamp 2. A conduit 24 is provided at a side surface portion of the magnetron MGT, in order to guide high frequency waves generated from the magnetron MGT to the cooking chamber 41. The high voltage elements HVT, HVC and HVD serve to generate high voltage necessary for operation of the magnetron MGT. The high voltage elements include a high voltage transformer HVT, a high voltage condenser HVC and a high voltage diode HVD. The cooling fan 3 serves to cool down the magnetron MGT and the high voltage elements HVT, HVC and HVD. The lamp 2 serves to light the cooking chamber 41 when the door 43 is opened.

[0032] The door 43 is mounted to the front of the cooking chamber 41 so as to selectively open or close the cooking chamber 41. A tray 42 is provided inside the cooking chamber 41, so as to rotate food accommodated in the cooking chamber 41. By the rotation of the tray 42, the high frequency waves are evenly radiated to a surface of the food placed on the tray 42 inside the cooking chamber 41.

[0033] Although not illustrated in FIG. 1, a grill heater is mounted in the cooking chamber 41 to perform a grill cooking mode.

[0034] FIG. 2 is a view illustrating an external shape of the cooking setting part of the microwave oven shown in FIG. 1. As shown in FIG. 2, the output adjusting knob 21 enables a user to select the output (200 - 400 - 600 - max (maximum output), unit : watt (W)) of the magnetron MGT. The output adjusting knob 21 is connected to a variable resistance (not shown) provided in the cooking setting part 23. Therefore, if a user rotates the output adjusting knob 21, a resistance value of the variable resistance is changed according to a rotational angle of the

knob 21, and output corresponding to the resistance value is set. The output adjusting knob 21 also enables a user to select a cooking mode using a grill. In other words, if a user places the output adjusting knob 21 to a position marked with a "Grill", a grill cooking mode using the grill heater (not the magnetron MGT) can be selected.

[0035] The timer knob 22 enables a user to set cooking time from 0 to 60 minutes. A user can set cooking time by 1 minute from 0 to 10 minutes, and can set cooking time by 10 minutes from 10 to 60 minutes. The timer knob 22 is coupled to a mechanical timer module provided in the cooking setting part 23. The timer knob 22 and the timer module constitute a whole timer. The timer module includes a motor, which starts rotation immediately when the timer knob 22 is manipulated. The rotation of the motor is reduced via a plurality of gears, thereby generating a time delay effect proportional to the rotational angle of the timer knob 22.

[0036] FIG. 3 is a control circuit diagram of the microwave oven shown in FIG. 1. As shown in FIG. 3, a first power line L1 and a second power line L2, to which alternating current power (AC 220V) is applied, are connected to both ends of a primary coil 7a of the high voltage transformer HVT via a noise filter 1. The noise filter 1 includes a main fuse FUSE1, condensers C1 to C3, an inductor L and a resistance R1. The noise filter serves to prevent the high frequency waves generated from the magnetron MGT from leaking outside through the first power line L1 and the second power line L2.

[0037] The first power line L1 is connected in series with a magnetron protecting element TCO1 to be turned ON/OFF according to a temperature of the magnetron MGT in order to prevent overheating of the magnetron MGT, a door switch SWD to be turned ON/OFF according to an opened/closed state of the door, and a monitor switch SWMT to monitor an opened/closed state of the door 43.

[0038] The second power line L2 is connected in series with a cooking chamber protecting element TCO2 to be turned ON/OFF according to a temperature of the cooking chamber 41 in order to prevent overheating of the cooking chamber 41, and a magnetron relay (second switch) RLYP to adjust output of the magnetron MGT.

[0039] A grill heater H, a lamp 2, a fan motor 3, a driving motor 4 and a control unit 23a are connected between the first power line L1 and the second power line L2. The lamp 2 and the fan motor 3 are driven by supply voltage (AC 220V), and the driving motor 4 and the control unit 23a are driven by low voltage (AC 21V) supplied from a portion of a coil of the fan motor 3.

[0040] The control unit 23a is configured as a MICOM (microcomputer). An expensive high-performance MICOM may be used, or a relatively cheap MICOM to perform simple functions may be used. The control unit 23a receives power from a timer switch SWT (first switch), which is turned ON by user's mechanical manipulation (rotation) of the timer knob 21, and drives the magnetron relay RLYP for the set cooking time. While the cooking operation is performed, the magnetron relay RLYP is repeatedly turned ON/OFF by the control of the control unit 23a. The magnitude of output of the magnetron MGT is determined according to a ratio of turn-on time to turn-off time of the magnetron relay RLYP. If a user selects a cooking mode using the grill heater H, not the magnetron MGT, the control unit 23a turns ON a grill relay RLYG, thereby achieving the cooking using the grill heater H.

[0041] Also, the control unit 23a takes a measure to prevent inrush current by controlling the magnetron relay RLYP, to thereby protect the microwave oven from inrush current. In a case of a general mechanical microwave oven without a MICOM type control unit, in order to prevent inflow of inrush current to a magnetron, a method of making the supplied power bypass through a coil for a predetermined time immediately after power-on was used. For this, a coil and a switch was additionally used to achieve the bypass of the supplied power. However, in this embodiment of the present invention, because the control unit 23a controls an initial turn-on point of the magnetron relay RLYP in consideration of a phase of the supplied power, inflow of inrush current can be prevented. That is, the alternating current power has features such that a phase of the current is opposite to a phase of the voltage. Therefore, when the current is minimum, the voltage becomes maximum. In order to prevent inflow of inrush current, the control unit 23a initially turns ON the magnetron relay RLYP when the current is minimum and the voltage is maximum. Accordingly, power is supplied to the high voltage transformer HVT, thereby protecting the high voltage elements from inrush current.

[0042] FIG. 4 is a view schematically showing a connecting relation between the cooking setting part shown in FIG. 2 and the control circuit shown in FIG. 3. As shown in FIG. 4, the user's desired output value of the magnetron MGT, which is set by the manipulation of the output adjusting knob 21 of the cooking setting part 23, is transferred to the control unit 23a. However, the control unit 23a does not drive the magnetron MGT until the timer switch SWT is turned ON and power is supplied to the control unit 23a. After manipulating the output adjusting knob 21, if a user additionally manipulates the timer knob 22, the cooking time corresponding to the manipulation amount (rotational angle) of the timer knob 22 is set. At the same time, the timer switch SWT is turned ON, and direct current voltage of 21V is supplied to the control unit 23a. In other words, the process until direct current voltage is supplied to the control unit 23a is carried out by the mechanical manipulation of the output adjusting knob 21 and the timer knob 22.

[0043] The control unit 23a receiving the direct current voltage repeatedly turns ON/OFF the magnetron relay RLYP so as to generate output having a magnitude proportional to the user's desired output value of the magnetron MGT set by manipulating the output adjusting knob 21. When initially turning ON the magnetron relay RLYP, as described above with reference to FIG. 3, the control unit 23a performs the inrush current prevention

control. If a user selects a cooking mode using the grill heater H, not the magnetron MGT, the control unit 23a turns ON the grill relay RLYG shown in FIG. 2, instead of the magnetron relay RLYP, to drive the grill heater H. As described above, after direct current voltage is supplied to the control unit 23a, the magnetron MGT or the grill heater H is controlled by the electrical control of the control unit 23a. Accordingly, a user's desired cooking operation is realized.

[0044] FIG. 5 is a flow chart showing a method of controlling the microwave oven according to an exemplary embodiment of the present invention. As shown in FIG. 5, if a user manipulates (rotates) the output adjusting knob 21, the output of the magnetron MGT is set in proportion to the rotational angle of the knob 21 at operation 501. After the output setting is completed, if a user manipulates (rotates) the timer knob 22, the cooking time of the microwave oven 10 is set in proportion to the rotational angle of the knob 22 at operation 502. And, the timer switch SWT is turned ON, and power is supplied to the control unit 23a at operation 504.

[0045] In order to prevent inflow of inrush current to the high voltage transformer HVT, the control unit 23a receiving the power first performs the inrush current prevention control, which controls an initial turn-on point of the magnetron relay RLYP at operation 506. Thereafter, the control unit 23a controls the cooking operation of the microwave oven 10, corresponding to the cooking conditions selected by a user (selection of the magnetron MGT and the grill heater H, a magnitude of the output of the magnetron MGT, cooking time, etc.), at operation 508.

[0046] If the cooking time set by the mechanical manipulation (rotation) of the timer knob 22 elapses at operation 510, the timer switch SWT is turned OFF, and the power supply to the control unit 23a is interrupted at operation 512. By the interruption of the power supply to the control unit 23a, the magnetron relay RLYP is also turned OFF. Therefore, the power supply to the magnetron MGT is interrupted, and the cooking operation is terminated at operation 514. In a case where the grill cooking mode is selected, the grill relay RLYG is turned OFF, and the power supply to the grill heater H is interrupted.

[0047] As apparent from the above description, the mechanical microwave oven using the mechanical timer according to the present invention has a relatively low price through proper application of electrical control to the mechanical timer, and also can be precisely controlled, thereby meeting high consumer satisfaction.

[0048] Further, the microwave oven according to the present invention can solve a problem of inrush current at a power-on point through electrical control without an additional device for preventing inrush current, thereby having a more competitive price.

[0049] Although 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 this embodiment 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 microwave oven comprising:

a mechanical timer serving to set desired cooking time and to supply power; and
a control unit to automatically perform electrical control for cooking operation by receiving power by operation of the mechanical timer.

2. The microwave oven according to claim 1, wherein the mechanical timer includes a rotatable timer knob.

3. The microwave oven according to claim 2, further comprising:

a first switch to be turned ON by rotation of the timer knob,
whereby the first switch serves to supply power to the control unit.

4. The microwave oven according to claim 2, wherein the rotation of the timer knob is performed by a user.

5. The microwave oven according to claim 4, further comprising:

a magnetron; and
a second switch to be turned ON/OFF by electrical control of the control unit,
whereby the second switch serves to intermit power supply to the magnetron.

6. The microwave oven according to claim 5, wherein the control unit electrically controls the second switch so as to prevent inflow of inrush current to the magnetron at an initial stage of power supply to the magnetron.

7. The microwave oven according to claim 5, wherein the control unit controls the second switch to be turned ON at a point when inrush current is minimum, so as to start power supply to the magnetron.

8. The microwave oven according to claim 7, wherein the point when the inrush current is minimum is when voltage determined through a phase of the supplied power is maximum and current is minimum.

9. A microwave oven comprising:

a magnetron;
a mechanical timer serving to set desired cook-

ing time and to supply power; and
a control unit to automatically perform electrical control for cooking operation by receiving power by operation of the mechanical timer,
wherein when controlling power supply to the magnetron, the control unit prevents inflow of inrush current to the magnetron.

10. The microwave oven according to claim 9, wherein the mechanical timer includes a rotatable timer knob.

11. The microwave oven according to claim 9, further comprising:

a first switch to be turned ON by rotation of the timer knob,
whereby the first switch serves to supply power to the control unit.

12. The microwave oven according to claim 9, further comprising:

a second switch to be turned ON/OFF by electrical control of the control unit, so as to intermit power supply to the magnetron,
wherein the control unit controls the second switch to be turned ON at a point when the inrush current is minimum, so as to start power supply to the magnetron.

13. The microwave oven according to claim 12, wherein the point when the inrush current is minimum is when voltage determined through a phase of the supplied power is maximum and current is minimum.

14. A method of controlling a microwave oven including a mechanical timer having a rotatable timer knob, the mechanical timer serving to set desired cooking time and to supply power, a first switch to be turned ON by rotation of the timer knob, and a magnetron, the method comprising:

automatically performing electrical control for cooking operation by receiving power through the first switch turned ON by the rotation of the timer knob.

15. The method according to claim 14, wherein the microwave oven further includes a second switch to be turned ON/OFF by the electrical control, so as to intermit power supply to the magnetron,
and wherein the method further comprises electrically controlling the second switch so as to prevent inflow of inrush current to the magnetron at an initial stage of power supply to the magnetron.

16. The method according to claim 15, further comprising:

controlling the second switch to be turned ON at a point when the inrush current is minimum, so as to start power supply to the magnetron.

17. The method according to claim 16, wherein the point when the inrush current is minimum is when voltage determined through a phase of the supplied power is maximum and current is minimum.

FIG. 1

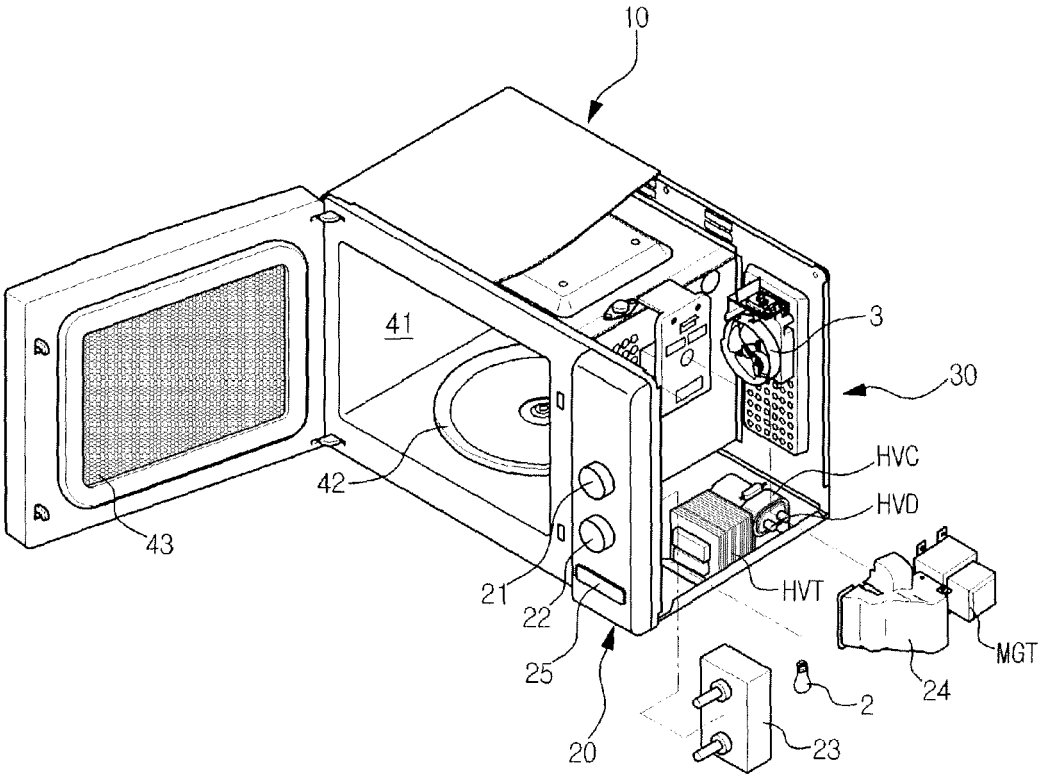
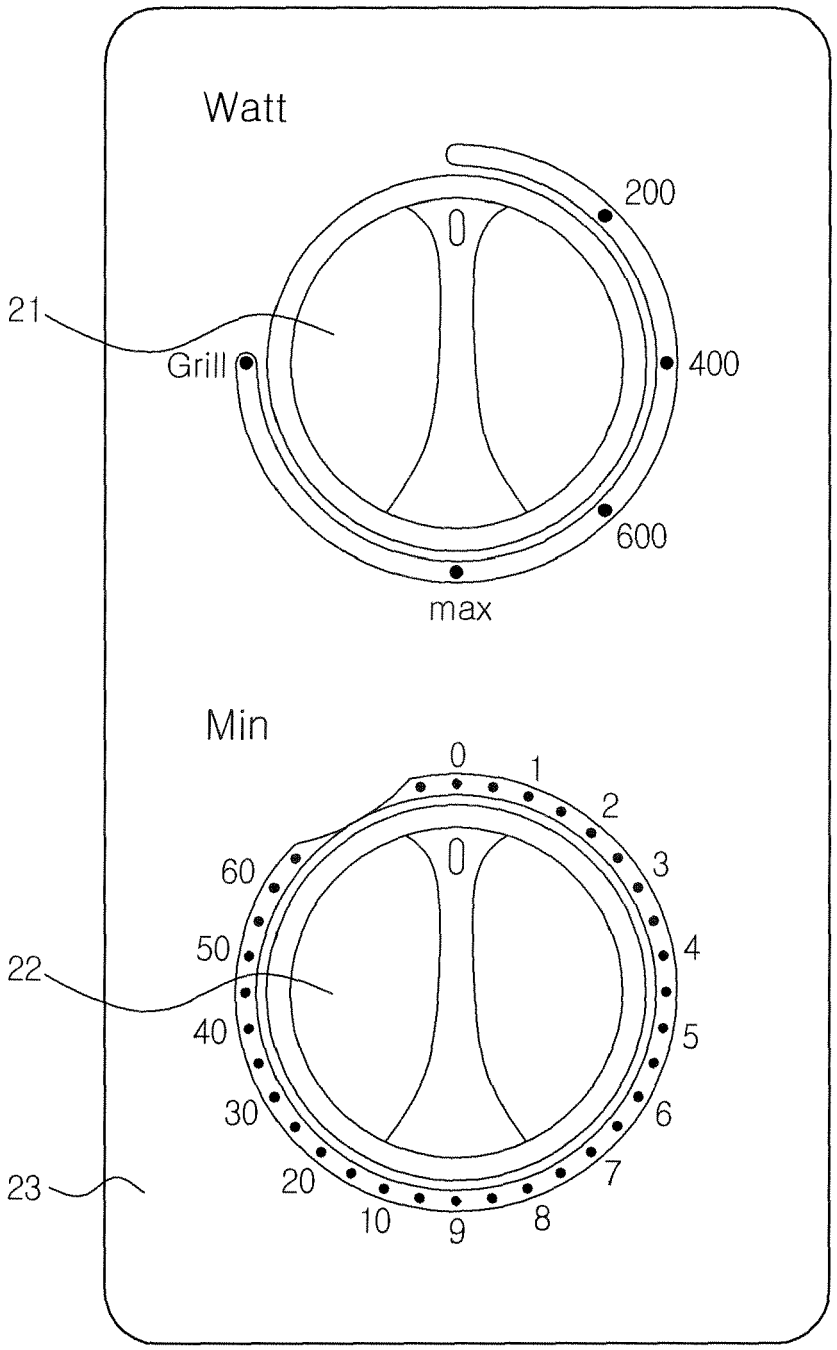


FIG. 2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600
max
Grill
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Min
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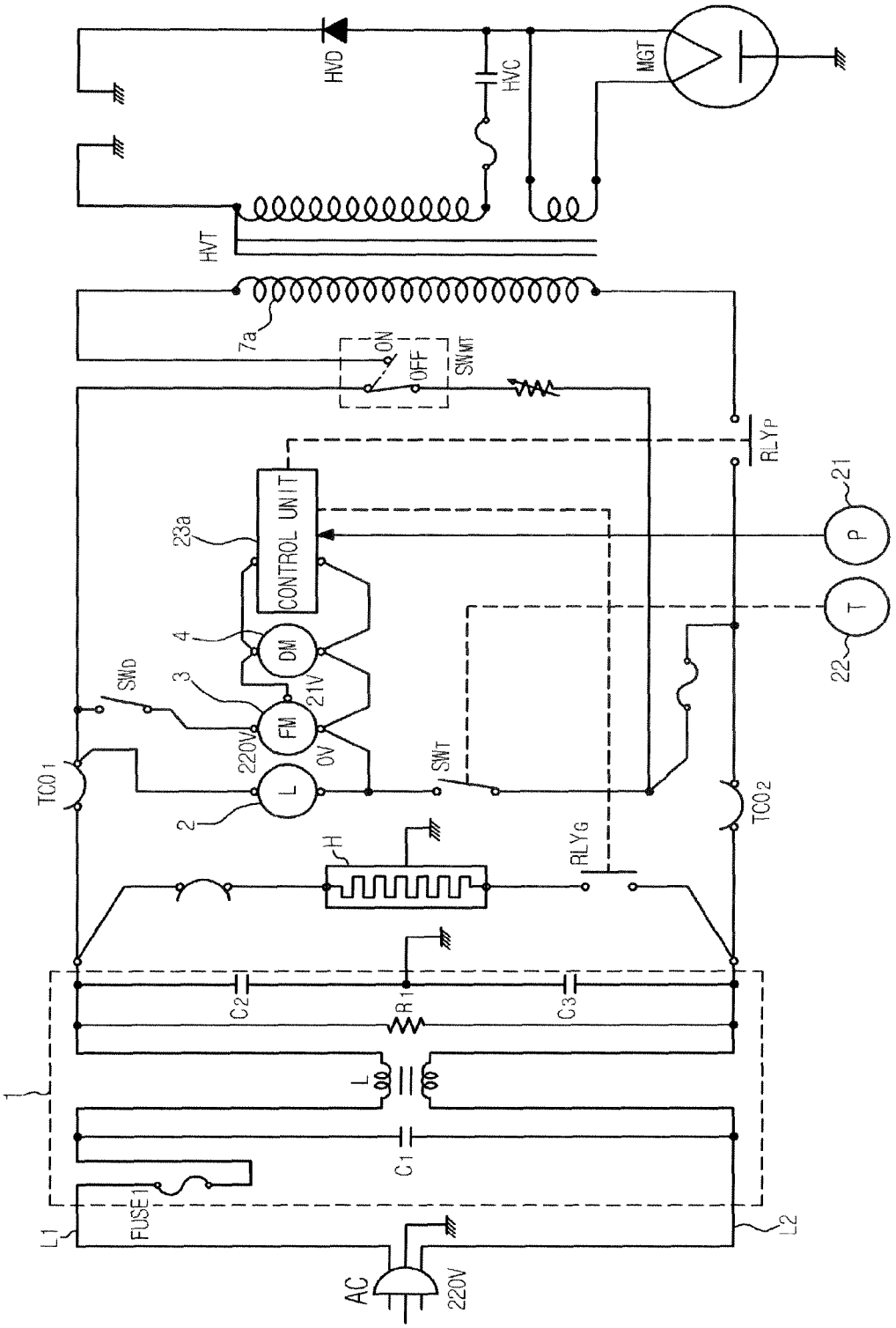
30
40
50
60
22
23

FIG. 3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TCO2
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L1
L2
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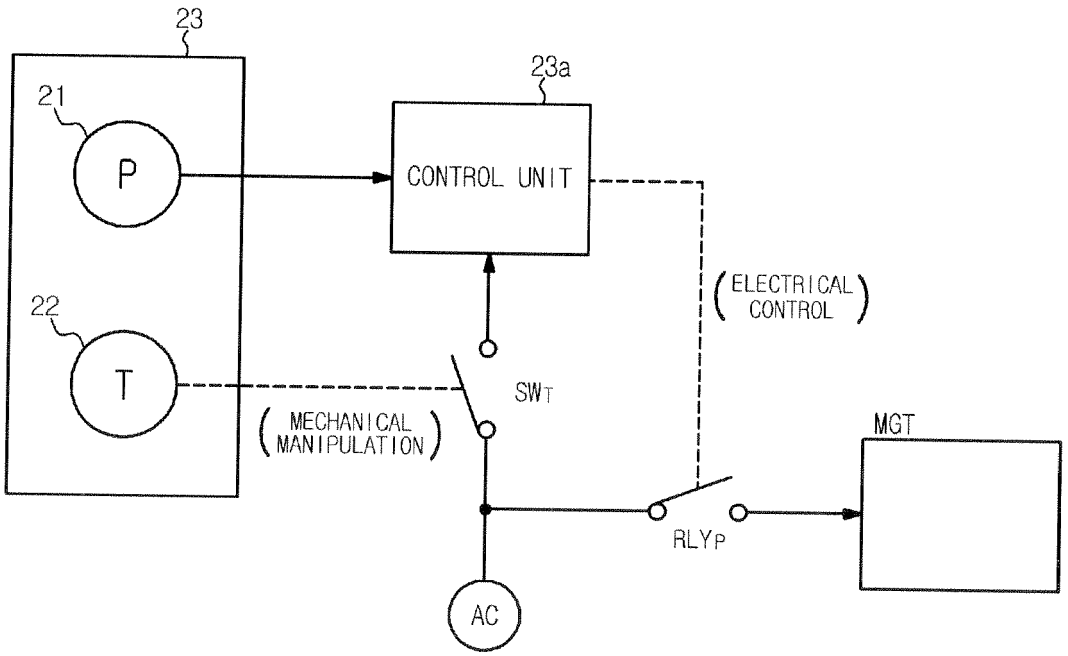
FIG. 4


23
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(MECHANICAL MANIPULATION)
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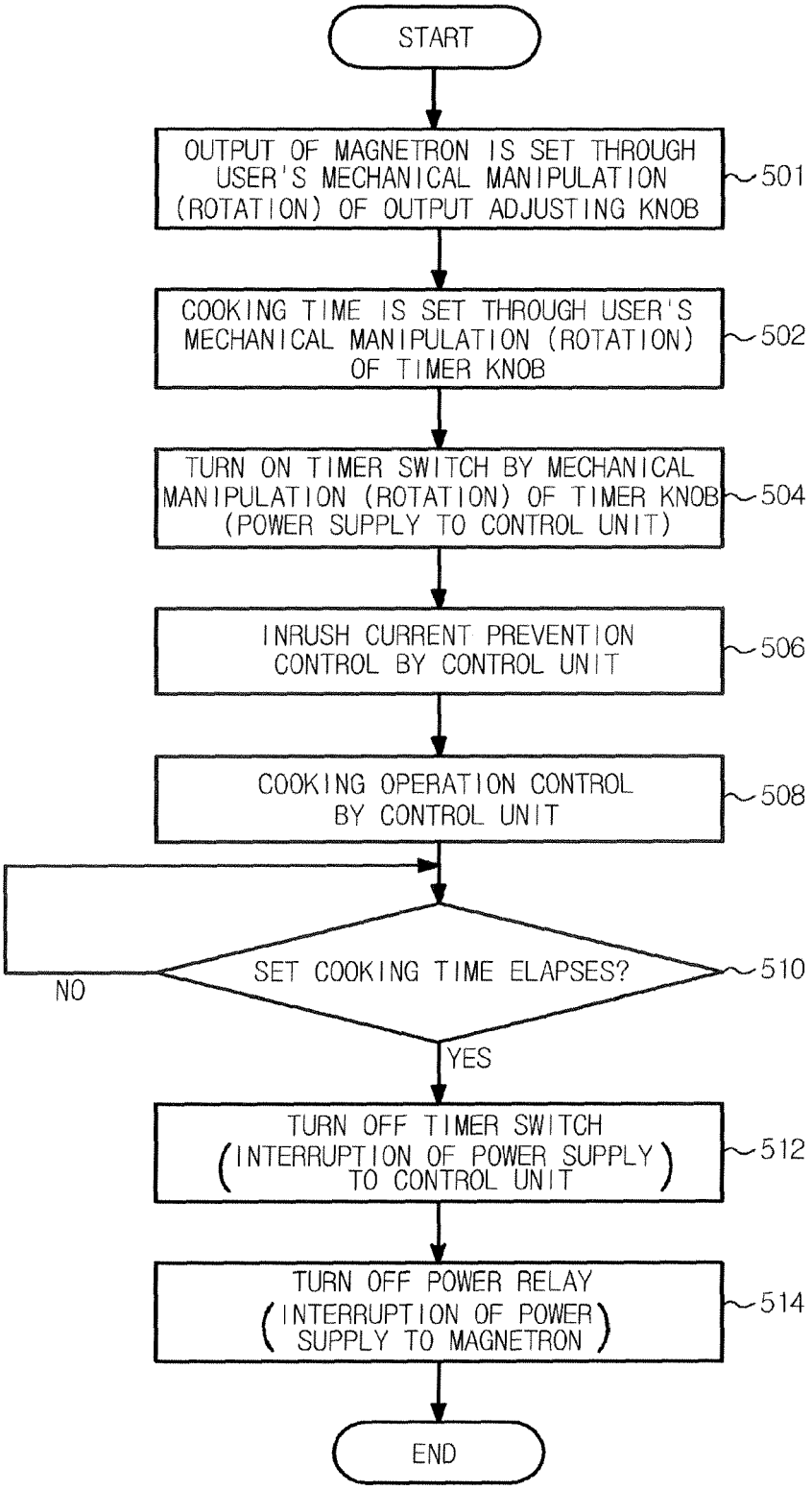
FIG. 5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OUTPUT OF MAGNETRON IS SET THROUGH USER'S MECHANICAL MANIPULATION (ROTATION) OF OUTPUT ADJUSTING KNOB
501
COOKING TIME IS SET THROUGH USER'S MECHANICAL MANIPULATION (ROTATION) OF TIMER KNOB
502
TURN ON TIMER SWITCH BY MECHANICAL MANIPULATION (ROTATION) OF TIMER KNOB (POWER SUPPLY TO CONTROL UNIT)
504
INRUSH CURRENT PREVENTION CONTROL BY CONTROL UNIT
506
COOKING OPERATION CONTROL BY CONTROL UNIT
508
SET COOKING TIME ELAPSES?
510
NO
YES
TURN OFF TIMER SWITCH (INTERRUPTION OF POWER SUPPLY TO CONTROL UNIT)
512
TURN OFF POWER RELAY (INTERRUPTION OF POWER SUPPLY TO MAGNETRON)
514
END

Europäisches Patentamt
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EUROPEAN SEARCH REPORT

Application Number
EP 08 16 7072

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	EP 1 482 766 A (SHARP KK [JP]) 1 December 2004 (2004-12-01) * the whole document *	1-17	INV. H05B1/02 H05B6/80 H05B6/66
X	US 3 780 252 A (WYTHE CRAPUCHETTES P) 18 December 1973 (1973-12-18) * abstract *	1,9,14	
X	EP 1 565 039 A (SAMSUNG ELECTRONICS CO LTD [KR]) 17 August 2005 (2005-08-17) * abstract *	1,9,14	
A	EP 1 058 482 A (SAMSUNG ELECTRONICS CO LTD [KR]) 6 December 2000 (2000-12-06) * abstract *	1	
A	GB 2 330 958 A (SAMSUNG ELECTRONICS CO LTD [KR]) 5 May 1999 (1999-05-05) * abstract *	1	
			TECHNICAL FIELDS SEARCHED (IPC) H05B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	23 June 2009	Garcia, Jesus

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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E : earlier patent document, but published on, or after the filing date
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L : document cited for other reasons

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ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 08 16 7072

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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23-06-2009

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 1482766 A	01-12-2004	AU 2003221310 A1	16-09-2003
		CN 1640198 A	13-07-2005
		WO 03075614 A1	12-09-2003
		JP 2003332039 A	21-11-2003
		US 2005121441 A1	09-06-2005
US 3780252 A	18-12-1973	NONE	
EP 1565039 A	17-08-2005	CN 1644999 A	27-07-2005
		KR 20050076210 A	26-07-2005
		US 2005173423 A1	11-08-2005
EP 1058482 A	06-12-2000	CA 2283012 A1	29-11-2000
		JP 2000348857 A	15-12-2000
		US 6218652 B1	17-04-2001
GB 2330958 A	05-05-1999	CN 1216360 A	12-05-1999
		DE 19803746 A1	20-05-1999
		JP 2865657 B2	08-03-1999
		JP 11167984 A	22-06-1999
		US 5928552 A	27-07-1999

EPO FORM P0459

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REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- KR 20080032675 **[0001]**