(12) **EUROPEAN PATENT APPLICATION**

published in accordance with Art. 158(3) EPC

(71) Applicant: Matsushita Electric Industrial Co., Ltd.
1006, Oaza Kadoma
Kadoma-shi Osaka-fu, 571(JP)

(72) Inventor: UENO, Akihiko
380-1, Oaza Shimomaki Kanmakicho Kitakatsuragigun
Nara-ken 639-02(JP)

(72) Inventor: WATANABE, Kiyoshige
1323, Toriyacho Kashihara-shi
Nara-ken 634(JP)

(72) Inventor: AKIYOSHI, Mitsuo
540-6, Shichijyocho Nara-shi
Nara-ken 630(JP)

(72) Inventor: WATANABE, Kenji
376, Tsutsuicho Yamatokoriyama-shi
Nara-ken 639-11(JP)

(74) Representative: Crawford, Andrew Birkby et al,
A.A. THORNTON & CO. Northumberland House 303-306
High Holborn
London WC1V 7LE(GB)

(54) HIGH FREQUENCY HEATING DEVICE.

(57) A high frequency heating device which automates cooking in combination with a microcomputer and various sensors. A heating element (15) is provided in the vicinity of a suction port (16) of a heater housing (12), and a temperature sensor (20) and a moisture sensor (19) are provided in the vicinity of an exhaust port (17). The heating element (15) is controlled in response to temperature signals from the sensor (20), thereby maintaining the exhaust temperature constant, and vapor from food is detected by the sensor (19) placed in the vapor. The detections are hardly affected by the influence of the conditions in a kitchen, and this heating device can thus cook more types of foods automatically than the conventional type.

Fig. 3
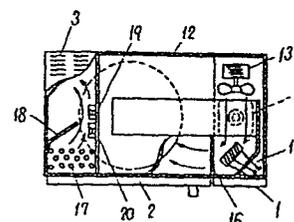
SPECIFICATION

TECHNICAL FIELD

The present invention relates to a high frequency heating apparatus intended for automation of cooking by using a combination of a microcomputer and various sensors.

BACKGROUND ART

With development and cost reduction of micro-computers and with development of various snesors such as temperature sensors and humidity sensors, microwave ovens capable of automatic cooking have made their advent and are in the limelight. Further, there is a proposal to control the finished state of food.

Above all, the humidity sensor used in microwave ovens designed for automatic cooking by detecting vapor from food, as compared with other gas sensors, has a stabilized characteristic hardly responsive to seasonings, alcohols and other impurities different from vapor, but since the temperature of the atmosphere around the humidity sensor varies with the progress of cooking, even if changes in humidity due to vapor from food can be detected, it has been impossible to detect a predetermined amount of change. In the case where

the amount of vapor from food is very small as in thawing, rises in the temperature of the atmosphere around the humidity sensor relatively lower the rate of change of relative humidity, thus making it impossible to detect a predetermined amount of change.

There is a method wherein in an effort to eliminate these drawbacks, a wrap is applied to food or a special lidded container is used to temporarily suppress generation of vapor from food, and at about the time of boiling, the vapor is allowed to emit at a time, and is detected to effect control. With this method, cooking takes much time and labor, and if the operator makes a mistake in handling the wrap, etc., this leads directly to malfunction. Further, since the finished state of cooking is like baking, the drawback is that the external appearance of cooked food is poor particularly in the case of meat and cake. If the humidity of the atmosphere in the room is high, water vapor from the food causes the relative humidity to be saturated and the humidity sensor loses its function, involving the danger of overheating or carbonizing the food or of causing a fire. Further, when frozen food is thawed, it is impossible to detect the vapor, which is very small in amount, from the food, so that this method cannot be applied to thawing. Thus, it has been impossible to effect automatic thawing by heating using a humidity sensor.

0093172

DISCLOSURE OF THE INVENTION

An object of the invention is to provide an arrangement wherein the temperature of the exhaust from the heating chamber is made constant and the humidity is detected, thereby accurately detecting the time required to reach a fixed amount of change in relative humidity due to water vapor from food, so as to effect automatic cooking and automatic thawing without using any wrap or special container for food.

Another object of the invention is to provide an arrangement wherein high frequency oscillation is intermittently controlled to control the output so as to heat a large food uniformly to the interior thereof, while the output of a heater for making constant the exhaust temperature is switched to a low output when the high frequency oscillator is oscillated at the time of intermittent control and to a high output when it is not oscillated, thereby keeping down the maximum consumption current and consumption power to cut down the cost, and wherein the apparatus is adapted to be used with a household plug receptacle and is convenient to use.

A further object of the invention is to provide an arrangement wherein the atmosphere temperature at the start of cooking is detected and one of predetermined exhaust control temperatures is selected according to the size of said atmosphere temperature to avoid

reckless use of high temperature for control, and
wherein rises in the temperatures of electric parts
including a magnetron are used as an auxiliary heat
source to reduce the power cost.

To achieve said objects, a high frequency heating
apparatus of the present invention comprises a heater
installed adjacent the suction port of the heating
chamber, a temperature sensor and a humidity sensor
which are installed adjacent the exhaust port, wherein
said heater is controlled in response to detection
signals from said temperature sensor to keep the
exhaust temperature at a constant value, while the
vapor emitting from the food in the atmosphere adjacent
the exhaust port is detected by the humidity sensor
and the time required for relative humidity to reach a
predetermined amount of change due to said vapor
emitting from the food is calculated by a microcomputer,
and said food is cooked or frozen food is thawed
according to one of heating patterns determined
according to the kind of food with said time used as a
function, enabling automatic cooking of not only foods
in general but also frozen foods.

According to the invention, the following effects
can be obtained.

(1) Because of relative humidity detected with a
constant temperature, the amount of change of relative
humidity due to vapor from food can be accurately

found and therefore by measuring the time required to
reach a predetermined amount of change, it is possible
to know the weight and volume of the food. Thus, with
this time as a function, cooking foods according to
respective heating patterns based on the kind of food
enables automatic cooking which provides satisfactory
finish.

(2) In the case of thawing frozen food, since
the apparatus is responsive to even a very small
amount of vapor emitting from the food, the frozen
food can be satisfactorily thawed without overheating
the same.

(3) Since the exhaust temperature is kept
constant, the operation is hardly influenced by the
environment of the room. Since the suction port is
provided with the heater, the relative humidity in the
heating chamber can be kept low and hence the danger
of malfunction due to condensation of vapor from food
can be eliminated. As a result, the amount of change
of relative humidity due to vapor from food can be set
in a wide range from low to high humidity and it
becomes possible to satisfactorily identify the
characteristic of water vapor generation with respect
to heating time which differs with the kind and weight
of food.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a perspective view of an automatic microwave oven, showing an embodiment of the present invention; Fig. 2 is a front view of the operating section of the same; Fig. 3 is a plan view of the heating chamber of the same; Fig. 4 is a perspective view of the humidity sensor of the same; Fig. 5 is the circuit diagram of the control device of the same; and Figs. 6 and 7 are graphs showing humidity characteristics when the cooking and thawing of beef are effected.

BEST MODE FOR CARRYING OUT THE INVENTION

Fig. 1 shows an automatic microwave oven according to an embodiment of the present invention, having an operating section 1 and a door 2, with an exhaust port 3 formed in a top plate at a corner thereof. Fig. 2 is a front view of the operating section 1. When no cooking program is set, a display section 4 indicates the time. For the setting of the time, the time can be inputted by a clock switch 5 and numeral keys 6. For normal manual cooking, a high frequency output is selected by a power key 7 and then an optional time is inputted by numeral keys 6, and cooking is started by a start key 8. Keys denoted by 9 and 10 are an automatic cooking key and an automatic thawing key based on humidity sensor control which is the point of the present invention. By tapping these

keys, a numeral corresponding to the food, e.g., A1,

is indicated in the display section 4, and then by

pushing the start key 8 it is possible to automatically

effect cooking or thawing. A canceling key denoted by

11 is a key used to interrupt cooking or cancel the

program.

Fig. 3 shows a plan view of a heating chamber 12,

indicating the path of flow of cooling air. The air

from a cooling fan driven by a fan motor 13, after

cooling a magnetron 14, is passed across a heater 15

and then through a suction port 16 in the heating

chamber 12 to enter the latter, and it is exhausted

together with the water vapor emanating from the food

(not shown), through an exhaust port 17 in the heating

chamber 12 and it is concentrated by an exhaust guide

18, passes a humidity sensor 19 and a temperature

sensor 20 and is finally discharged to the outside

through the exhaust port 3 in the top plate of the

body.

Fig. 4 shows the humidity sensor 19 composed of a

refreshing heater 19-a and a detecting element 19-b,

having a refreshing function such that the dirt

sticking to the surface of the detecting element 19-b

is burnt up by elevating the surface temperature to

about 500°C by the refreshing heater 19-a so as to

maintain constant the humidity characteristic of the

detecting element 19-b.

Fig. 5 shows the circuit diagram of the automatic
microwave oven main body showing an embodiment of the
invention. A power source plug 21 is connected to a
low voltage transformer 23 through a fuse 22 to feed
power to a control section 24. The input-output
relation of the control section 24 is such as to
control, by a microcomputer inside the control section
24, the display section 4 for indicating the time when
the microwave oven is not used or for indicating the
contents of cooking and the remaining time for
cooking, a key board 25 for inputting cooking time,
the temperature sensor 20 for detecting the temperature
of exhaust air adjacent to the exhaust port 17, the
humidity detecting element 19-b for detecting the
humidity in the exhaust section, the refreshing heater
19-a for removing dirt from the humidity detecting
element 19-b, a power relay 27 for opening and closing
the power source to the heater 15 and a high voltage
transformer 26, a temperature control relay 28 for
on-off controlling the heater 15 in response to
signals from the temperature sensor 20 so as to
maintain the exhaust temperature at a constant value,
a heater changeover relay 29 for changeover between a
400 W heater 15-a and a 100 W heater 15-b, a high
voltage reed switch 30 for on-off controlling the
oscillation of the magnetron and controlling high
frequency output, and a buzzer (not shown) for reporting

the completion of cooking and the situation of input.

Further, 31, 32 and 33 denote a first latch switch, a second latch switch and a short switch, the role of the short switch 33 being to blow the fuse 22 to cause a fault on the safety side if the door 2 is opened when the first latch switch 31 is in a fused or other abnormal state. The power for the magnetron 14 is supplied by half-wave double-voltage rectification of high voltage on the secondary side of the high voltage transformer 26 and through the high voltage reed switch 30.

For manual cooking, a high frequency output and a cooking time are inputted from the key board 25, whereupon the cooking time is indicated on the display section 4, and pushing the start key 8 causes the cooking time on the display section 4 to be counted down, while closing the power relay 27 to energize the high voltage transformer 26. The high voltage reed switch is closed or intermittently or on-off operated according to the high frequency output which is set. In this case, the temperature control relay 28 remains opened, that is, the heater 15 is not energized. However, in order to prevent dirt from accumulating on the temperature sensor 19, the refreshing action is periodically performed by energizing the refreshing heater 19-a.

The operation of the present automatic microwave

oven will now be described.

Fig. 6 shows a humidity detection characteristic
where automatic cooking is performed. The humidity
detecting element 19-b is responsive to relative
humidity and exhibits a negative resistance charac-
teristic with respect to temperatures above 150°C, so
that it is possible to maintain the refreshing
temperature at a constant value by reading the
resistance value of the humidity detecting element
19-b during refreshing. In the case of automatic
cooking and automatic thawing, the refreshing opera-
tion is performed immediately after start, and then a
humidity detecting state is established. In Fig. 6,
point a at the time of start shows the relative
humidity of the room, and the exhaust section
temperature is read at the same time by the tempera-
ture sensor 20. On the basis of the exhaust section
temperature thus read, the exhaust section temperature
to be controlled is determined. The need for
maintaining the exhaust temperature at a high value
arises from the fact that where the atmosphere
in the room has a high relative humidity, it cannot
further contain the water vapor from the food. That
is, it becomes saturated, making it impossible to know
the amount of change of humidity. For example, if the
atmosphere in the chamber is 20°C, 100%, heating it to
50°C by the heater 15 changes the relative humidity to

about 20%, enabling the atmosphere to further contain
70 g/m³, so that the humidity sensor 19 can detect
water vapor up to 70 g/m³ generated from the food.
However, where the atmosphere temperature in the
chamber is low, elevating the exhaust temperature to,
e.g., 50°C at all times involves a problem concerning
the capacity of the heater 15 and makes it necessary
to keep down the maximum combined power consumption of
the magnetron and heater during oscillation of the
magnetron 14, and since the output of the heater 15 is
reduced to 100 W, it is difficult to maintain its
temperature of 50°C with a low output. Further, from
the standpoint of minimizing the wasteful use of
power, it is desirable to set the exhaust control
temperature to as low a value as possible. In the
present embodiment, exhaust control temperatures are
classified into four temperatures, 35°C, 40°C, 50°C,
and 55°C, and an optimum temperature is selected
therefrom according to the room temperature. Another
reason for keeping the exhaust temperature at a high
value is to give ample room for humidity detection by
keeping the exhaust temperature at a high value in
advance since control becomes impossible if the
exhaust control temperature is exceeded owing to
temperature rises of the food and electric parts from
when the heater 15 starts to control the exhaust
temperature to a constant value and the minimum value

of relative humidity is stored to when a certain fixed
amount of change of relative humidity is obtained to
detect vapor from the food.

At the cooking start point a in the figure, the
400 W heater 15-a of greater output included in the
heater 15, and the refreshing heater 15-b are
energized. Since the refreshing heater 19-a is
integrally installed in close vicinity to the humidity
detecting element 19-b, the relative humidity of the
atmosphere around the humidity detecting element 19-b
sharply decreases, reaching point b near 0%. When the
atmosphere temperature exceeds 150°C, the humidity
detecting element 19-b exhibits a negative resistance
characteristic, so that when it is about 500°C, it
reaches point c. Thereafter, the refreshing heater
19-a is deenergized and hence the temperature lowers.
When the temperature is below 150°C, the atmosphere
around the refreshing heater 19-b becomes dried,
reaching point d. However, the relative humidity from
point b to point d is shown by a characteristic
represented by a straight line connecting points b and
d. Thereafter, the atmosphere around the humidity
detecting element 19-b is cooled. In a state before
the 400 W heater 15-a is continuously energized to
control the exhaust temperature to a constant value,
it once returns to point e, and when the exhaust
temperature starts to be controlled, the oscillation

start point f is reached where the magnetron 14 starts
to oscillate and the counting of the time till vapor
detection is started. From start point a to oscilla-
tion start point f, the continuous energization of the
400 W heater 15-a accelerates arrival at point f.
After point f is reached, in accordance with the
situation of oscillation of the magnetron 14 being
intermittently oscillated, i.e., while switching to
the 100 W heater 15-b at the time of stoppage and to
the 100 W heater 15-b at the time of oscillation, the
exhaust temperature is controlled by the temperature
control relay 28. The reason for using the 400 W
heater 15-b after point f is that the use of the 100 W
heater 15-a alone is insufficient to maintain the
exhaust temperature.

The method of detecting humidity comprises the
steps of storing the lowest value of relative humidity
which takes plce after point f, counting the time
until a predetermined amount of change of relative
humidity is obtained, and progressing automatic
cooking on the basis of it.

The characteristics of humidity change shown in
the figure refer to the cooking of 1 Kg, 2 Kg and 3 Kg
of beef, respectively indicated by characteristic
curves g, h and ι. Further, j indicates an amount of
change of relative humidity for determining a
reference detection time T_1 which is a function of a

heating program, the j changing with the kind of food

and exhaust control temperature. This is because the

amount of saturated water vapor differs with temperature

and because the amount of change which affects relative

humidity varies even if the same weight of water

evaporates from food. Further, as shown in the

figure, the reference detection time T_1 with respect

to the weight of food varies the more clearly and

stabilizes the more, the greater the amount of change

j of relative humidity, so that it is important that

the relative humidity be minimized when cooking is

started. For example, a heating program for cooking

roast beef using the reference detection time T_1

detected in this way is as follows.

High frequency output	Medium output (500 W)	→	Medium output (500 W)	→	Medium low output (350 W)
Cooking time	T_1	→	T_2	→	T_3

The high frequency output is made a medium output

(500 W) until vapor is detected, whereupon the control

of exhaust temperature is stopped and with this output

maintained heating is effected for $T_2 = T_1$ x 2 hours.

Upon the lapse of time T_2, the high frequency output

is made a medium low output (350 W) and heating is

effected for time T_3. The method of calculating time

T_3 differs with the time T_1 which is detected; when

$T_1 \leq 5$ (min.), $T_3 = T_1$ x 2 (min.), and when $T_1 > 5$ (min.),

$T_3 = 10 + T_1$ x 5 (min.). This is a program empirically

found when roast beef is to be medium-finished, but
similar procedures may be applied to various menus,
and heating patterns, such as the one described above,
are stored in the automatic cooking keys 9 according
to the kinds of menues.

Fig. 7 shows a humidity detection characteristic
where thawing of frozen beef is performed. This is
the same as the aforesaid automatic cooking up to
point f where a predetermined control temperature is
reached by using the heater 15, but after point f, in
the case of automatic thawing, the 100 W heater 15-b
is used without employing the 400 W heater 15-a. In
the case of automatic thawing, control is performed
without using so high a temperature setting with
respect to the exhaust temperature detected at the
start of cooking. This is because the temperature of
the food is so low that a natural rise in the exhaust
temperature due to rise in the temperatures of the
electric parts rarely occurs before vapor is detected,
and because it is only necessary to detect a very
small change in relative humidity, so that there is no
need to reduce the humidity at point f to a great
extent. However, in order to shorten the cooking
time; continuous operation is performed up to point f
by using the 400 W heater 15-a to hasten the arrival
time, and after point f control is performed using the
100 W heater 15-b alone. Thus, the humidity once

increases to point k, and thereafter at point f the magnetron 14 starts to oscillate, so that the heat therefrom is also added to contribute to normalization toward point m. Detection of the lowest value of relative humidity is effected after point k, and when the amount of change reaches point j, the reference detection time T_1 is obtained. After detection, as in the case of automatic cooking, the temperature control relay 28 is opened and control of exhaust temperature is not performed. As is clear from Fig. 7, the amount of change j of humidity which is set is much smaller than in the case of automatic cooking, and, since ripples of exhaust temperature must be minimized, the 400 W heater 15-b, which has a large amount of overshoot, cannot be used. That is, in the case of automatic thawing, if exhaust temperature control is performed by intermittently operating the 400 W heater 15-a, the ripples of temperature that occur would affect the humidity detection time; thus, the 100 W heater 15-a alone is used. The heating pattern obtained from the results of experiments of cooking in the case of thawing frozen beef using T_1 thus obtained is as follows.

High frequency output	Low output (180 W)		Low output (180 W)		Warmth retention output (70 W)
Heating time	T_1	→	T_2	→	T_3

Heating is effected with low output (180 W) from point f to vapor detection, and after vapor detection the heating time is changed to T_2 or T_3. If T_1 is less than 15 minutes, the heating time skips T_2 and goes to T_3, and the food is heated with warmth retention output (70 W) for $T_3 = T_1$ (minutes) to complete thawing. In the case where T_1 exceeds 15 minutes, it is heated with low output (180 W) for $T_2 = (T_1 - 15) \times 2$ (minutes), whereupon the heating time output (70 W) for $T_3 = 15 + (T_1 - 15) \times 2$ (minutes) to complete thawing. This procedure can be applied also to the thawing of other frozen foods, and moreover, by combining i with other high frequency outputs as a function of time T_1, it is possible to automate all operation from thawing to cooking.

The aforesaid changeover of the heater capacity could be made by phase control using control rectifier element such as triacs, but considered microscopically it would be impossible to keep down instantaneous maximum consumption power and current; thus, it cannot be said to be a very preferable method. Therefore, an arrangement, as in the present embodiment, wherein two heaters, a large one (400 W) and a small one (100 W), are separately provided for changeover may be said to be most advantageous at present.

INDUSTRIAL APPLICABILITY

As has been described so far, according to the
present invention, the exhaust temperature is made
constant by heaters installed adjacent the suction
port so as to detect relative humidity, so that
accurate amounts of change of humidity can be found,
and by utilizing the humidity detection time it is
possible to attain automation of cooking, thawing, and
from thawing to cooking of a variety of foods.
Further, since there is no need to use wraps or
special containers, there is no danger of spoiling the
external appearance and taste of food, nor is the
danger of failure in cooking or overheating food or
causing a fire. Thus, a high frequency heating
apparatus which is convenient to use can be provided.

WHAT IS CLAIMED IS:

1. A high frequency heating apparatus comprising a heating chamber for receiving food, a high frequency oscillator for feeding high frequency waves into said heating chamber, a control circuit including a microcomputer for controlling said high frequency oscillator, a suction section for suction into the heating chamber and an exhaust section for exhaust from the heating chamber, a heating device for elevating the temperature in said heating chamber to a preset value, and a temperature sensor for detecting the temperature of the atmosphere in said heating chamber or in said exhaust section and a humidity sensor for detecting the humidity, the arrangement being such that said heater is controlled in response to detection signals from said temperature sensor to keep said heating chamber at a constant temperature, while the amount of change of humidity in said atmosphere is detected by said humidity sensor and the time required to reach a predetermined amount of change of humidity is detected, and with said time as a function said control circuit controls said high frequency oscillator.

2. A high frequency heating apparatus as set forth in Claim 1, wherein the heating device is disposed adjacent the suction port and the exhaust temperature is controlled so that it is constant.

3. A high frequency heating apparatus as set forth in Claim 1, wherein the temperature of the atmosphere in the exhaust section at the start of cooking is detected by the temperature sensor and the temperature in the heating chamber to be controlled can be changed in steps.

4. A high frequency heating apparatus as set forth in Claim 2, wherein cooling air which has cooled electric parts including the high frequency oscillator is heated by the heating device and is sucked into the heating chamber through the suction port.

5. A high frequency heating apparatus as set forth in Claim 1 or 2, wherein the temperature sensor and humidity sensor are disposed very close to each other in the exhaust section to detect the temperature and humidity of the exhaust.

6. A high frequency heating apparatus as set forth in Claim 1 or 2, wherein the high frequency oscillator is intermittently controlled to control the output and the output of the heating device is changed at the time of oscillation and non-oscillation of said high frequency oscillator.

7. A high frequency heating apparatus as set forth in Claim 1 or 2, wherein the humidity sensor detects the humidity of the atmosphere subsequently to a refreshing action at the start of cooking.
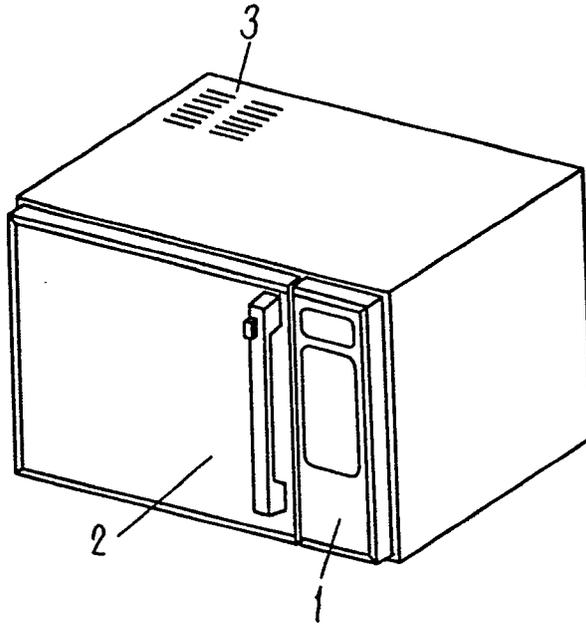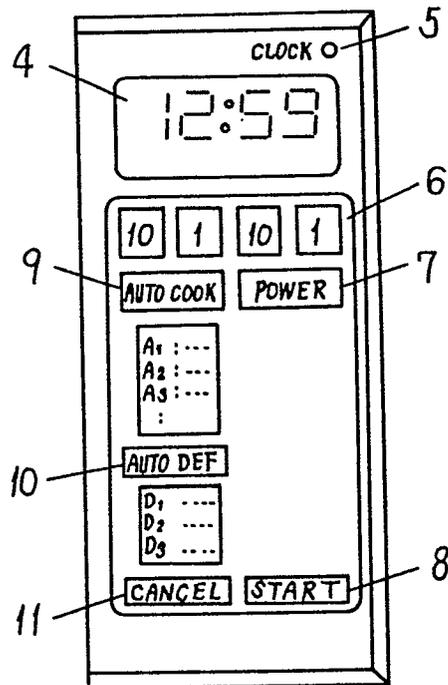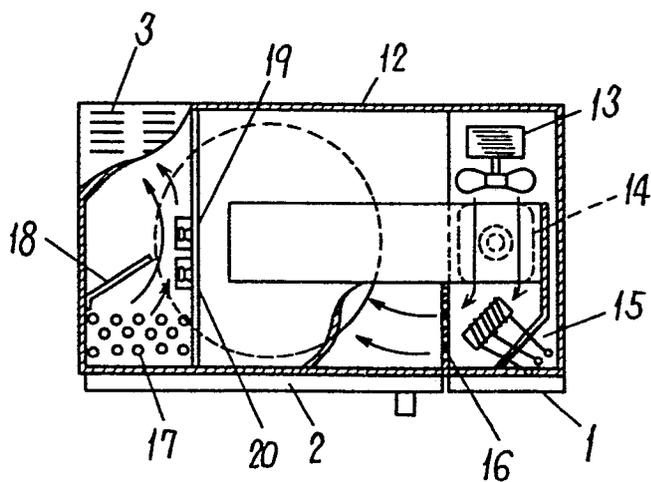
Fig. 1

Fig. 2

Fig. 3

Fig. 4
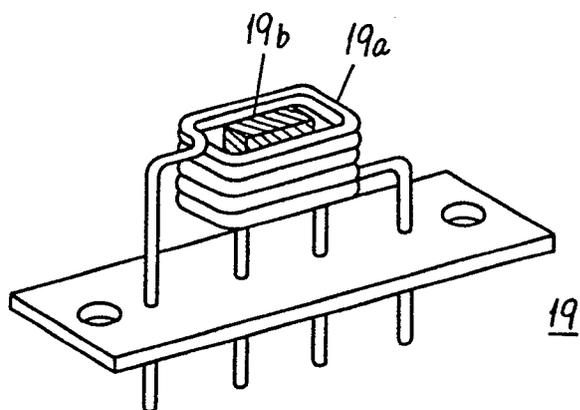
Fig. 5
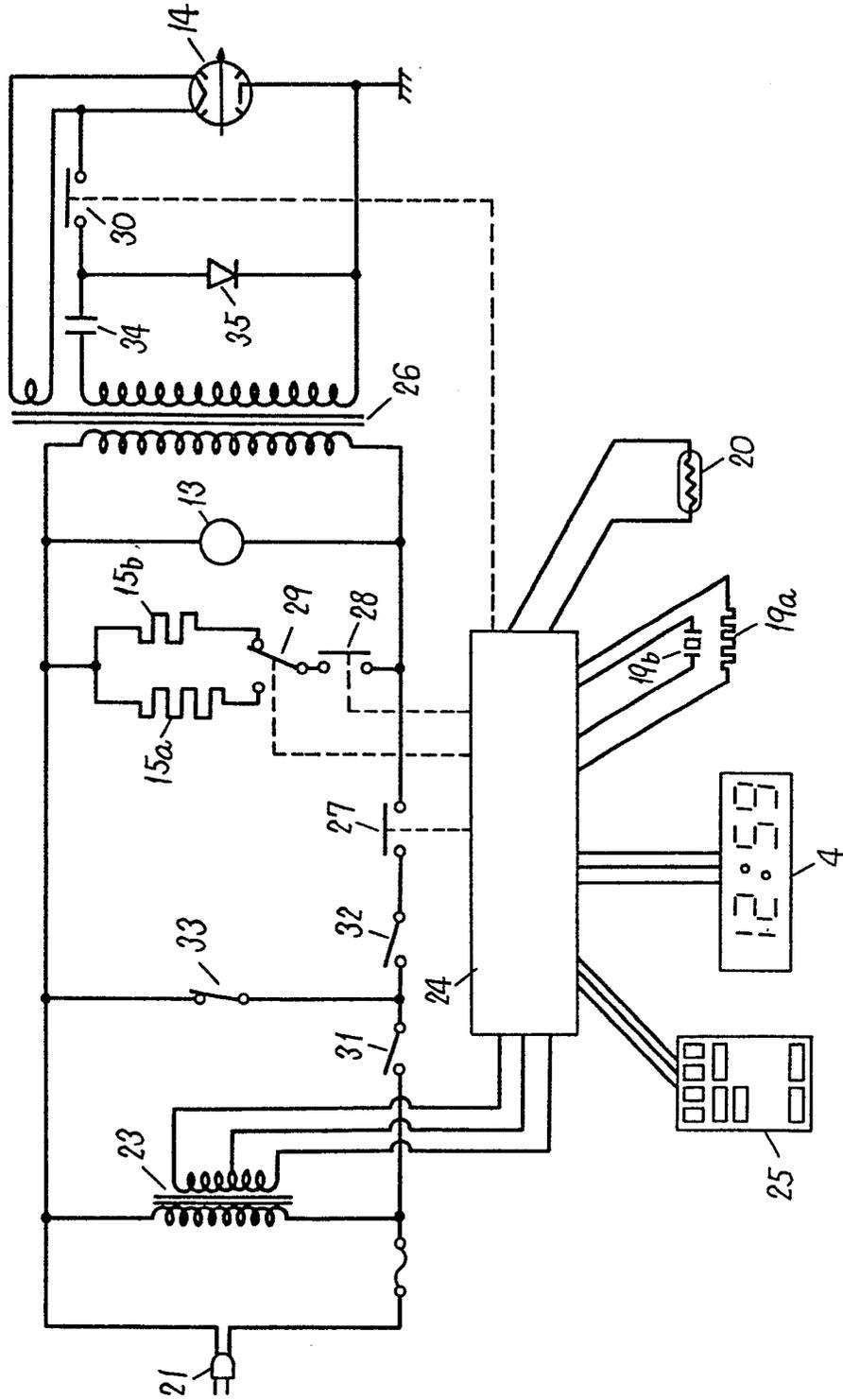
Fig. 6
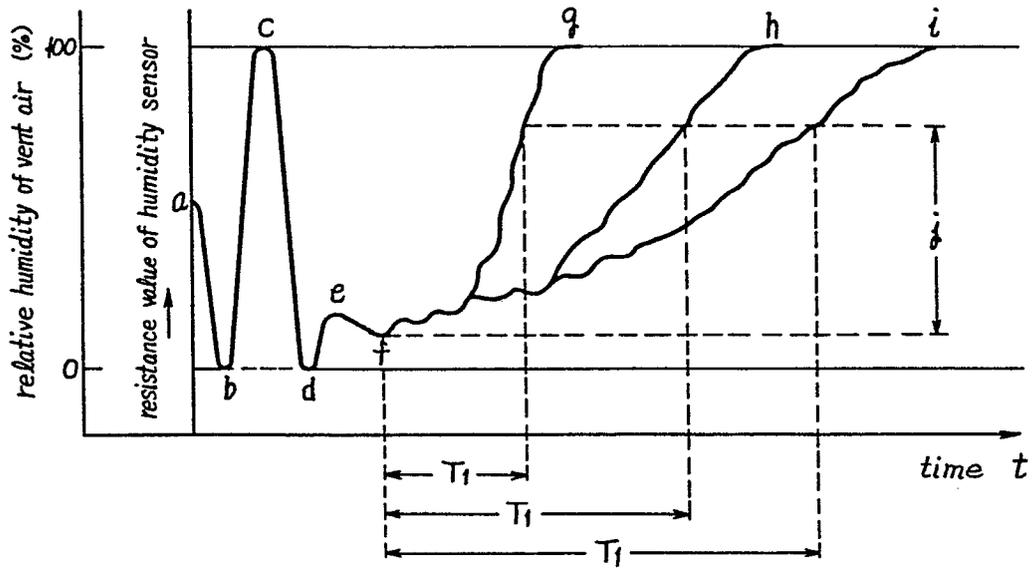

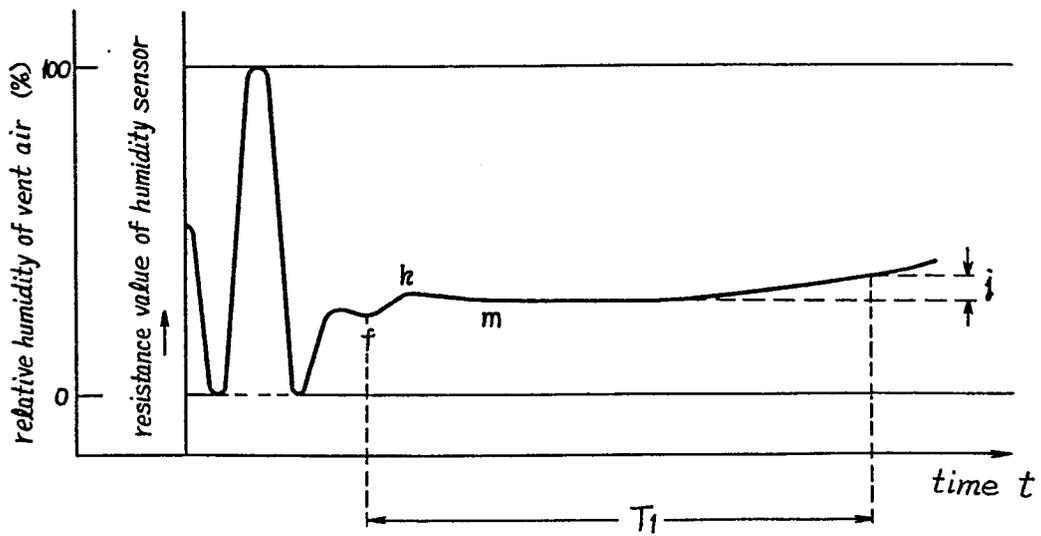
Fig. 7

LIST OF REFERENCE NUMBERS IN THE DRAWINGS

1...operating section

2...door

3...outer air exhaust port

4...display section

5...clock switch

6...numeral keys

7...power key

8...start key

9...automatic cooking key

10...automatic thawing key

11...canceling key

12...heating chamber

13...fan motor

14...magnetron

15-a, 15-b...heaters

16...suction port

17...exhaust port

18...exhaust guide

19...humidity sensor

19-a...refreshing heater

19-b...detecting element

20...temperature sensor

21...power source plug

22. fuse

23...low voltage transformer

24...control section

25...key board

26...high voltage transformer

27...power relay

28...temperature control relay

29...heater changeover relay

30...high voltage reed switch

31, 32...first and second latch switches

33...short switch

34...capacitor

35...diode

T_1...reference detection time

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) *

According to International Patent Classification (IPC) or to both National Classification and IPC

Int. Cl.^{3} F24C 7/08, H05B 6/68

II. FIELDS SEARCHED

Minimum Documentation Searched *

Classification System	Classification Symbols
I P C	F24C 7/08, F24C 1/00, H05B 6/68

Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched *

	Jitsuyo Shinan Koho	1926 — 1981
	Kokai Jitsuyo Shinan Koho	1971 — 1981

III. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of Document, with indication, where appropriate, of the relevant passages	Relevant to Claim No.
A	National Technical Report, Vol. 24, No. 5 (October, 1978) Matsushita Electric Industrial Co., Ltd., Kanazawa Takato and five others "Shitsudo Kenchishiki Jido Denshi Range" P. 876-885	1 - 7
A	JP,A, 53-69940 (Matsushita Electric Industrial Co., Ltd.) 21. June. 1978 (21. 06. 78)	1 - 7

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" earlier document but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

IV. CERTIFICATION

Date of the Actual Completion of the International Search	Date of Mailing of this International Search Report
August 5, 1982 (05.08.82)	August 16, 1982 (16.08.82)

International Searching Authority	Signature of Authorized Officer
Japanese Patent Office	