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(54) Cooking hob provided with electronically controlled multiple electric plates.

(57) A cooking hob provided with two or more electric plates (1) and including an electronic control unit (8) which detects both the instant overall power input and possible input variations requested by the user, and controls the supply to the electric plates (1) according thereto so that the overall electric power input of the cooking hob does not exceed a preset maximum value.

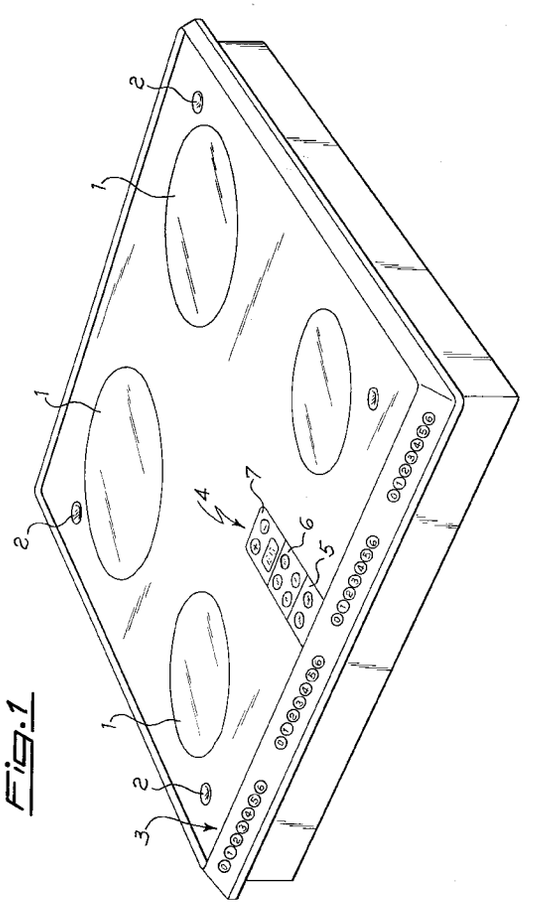


Fig.1

EP 0 576 408 A1

The present invention concerns the cooking hobs provided with electric plates and particularly refers to a cooking hob with electronically controlled multiple electric plates.

The cooking hobs provided with two or more electric plates presently have limited diffusion owing to the high power input required when several cooking points are activated. In fact, this need is in contrast with the limited input available for the domestic electric installations.

In the cooking hobs of known type each activated plate is inserted at line voltage and works therefore with the maximum power input. Owing to this, assuming a normal power input to the other domestic appliances or the like connected to the installation, the activation of even two electric plates only of the cooking hob causes an overall power input which often exceeds the maximum allowed input.

The object of the present invention is therefore to provide a cooking hob with multiple electric plates having a varying power input adjusted so that the overall input does not exceed a prearrangeable level.

This object is achieved by means of a cooking hob provided with two or more electric plates and including an electronic control unit which detects both the overall instant power input and possible variations of input demanded by the user, and controls the supply to the electric plates according thereto so that the overall electric power input of the cooking hob does not exceed a maximum predetermined value.

The advantages of the cooking hob according to the present invention will be apparent from the following detailed description of a preferred embodiment thereof with reference to the annexed drawings wherein:

Fig.1 is a perspective view of a cooking hob according to the present invention;

Fig.2 is a block diagram of the cooking hob of fig.1;

Fig.3 is a flowchart relative to a first method of electronic control of the cooking hob of fig.1 and

Fig.4 is a flowchart relative to a second method of electronic control of the cooking hob.

Referring to fig.1, there is seen that a cooking hob according to the present invention includes four electric plates 1 each one provided with an adjacent pilot light 2 and a respective power regulator 3. Each one of said regulators consists of seven push-buttons and is arranged on the front side of the cooking hob, while a main board 4 is arranged in the frontal area of the cooking hob itself. The board 4 includes in turn a main switch 5, a commutator 6 to select, from time to time, one of the plates 1, and a programmable timer 7 with which the desired operating period for the selected plate can be possibly preset.

The push-buttons of each regulator 3 preferably include a circular ring-shaped pilot light to clearly display their status. The push-button "0", when continuously lit, shows that the corresponding plate is switched off, while its intermittent lighting shows an operating condition of the corresponding plate which will be made clear later on. The remaining push-buttons of each regulator 3 are needed to control the switching on of the corresponding plate 1 at different power levels, with the push-button "6" only corresponding to the maximum power level and therefore to the supply of the plate with the whole line voltage. The switching on of a plate 1 at any power level will preferably involve, for a better and faster understanding of the operating status of the plate itself, the lighting of the corresponding push-button and of all those corresponding to a lower power level, as well as the switching off of the push-button "0". This preferably has a colour different from the others and by pushing it, of course, the deactivation of the corresponding plate is obtained.

Each pilot light 2 is controlled by a temperature sensor not shown which controls the lighting of said light when the corresponding plate 1 reaches a temperature higher than a level above which the contact with the plate would be dangerous for the user.

Referring now to fig.2, there is seen that the main board 4 is connected via a bus 4a to an electronic control unit 8, preferably of the microprocessor type. Through the bus 4a the unit 8 receives the data relative to the selection of the plates 1 to activate and to the determination of the respective operating periods. It should be noted that for the activation of a plate it is not indispensable the use of the commutator 6 and the timer 7.

In fact, the unit 8 is connected also to each power regulator 3 via a respective bidirectional bus 3a. The unit 8 therefore is able to receive the commands given by the user through the push-buttons of the regulator 3, as well as to control the switching on and off of the push-buttons themselves to inform the user on the operating conditions of each plate.

Moreover, the unit 8 is connected, via a respective bidirectional bus 9a, to a voltage reducing circuit 9 for each plate 1. Said circuits receive as an input the line voltage and produce as an output a voltage lower or equal to the input. More specifically, each voltage reducer 9 can produce, according to the control signals from the unit 8, six different values of output voltage with which to supply the corresponding plate 1, and it is obvious that the electronic control unit 8 can completely prevent the supply to one or more plates 1.

It should be noted that the power level demanded by the user through a regulator 3 does not necessarily correspond to the power actually supplied to the corresponding plate 1 since the corresponding voltage reducer 9 is controlled by the control unit 8 according to the overall power input that the unit 8 is able to calculate continuously by controlling all the reducing circuits 9.

Referring to fig.3, there is seen that on switching on the cooking hob, by means of the main switch, the electronic control unit automatically acquires the stored value of the maximum allowed power input. Said value is preferably set by the manufacturer of the control unit but one could think of making it adjustable by the installer, for example through suitable controls to be added to the main board, and this in order to adapt the cooking hob to the user's requirements as far as the power consumption is concerned.

When the user, in case after having selected a plate and programmed the length of its period of activation, demands the activation of the plate at a certain power level by acting on the corresponding regulator, the control unit first of all checks, through the test 11, if said activation would imply exceeding the maximum allowed limit of power input. In this case the control unit further checks (test 12) if it is possible to keep the input in said limit by switching on the required plate at a lower power level. In this case the control unit controls the switching on of the plate at the highest power level compatible with the allowed limit. If, on the contrary, the activation of the required plate does not result possible anyway, the control unit waits to detect a sufficient lowering of the power input of the plates already activated, and if said lowering does not take place within a predetermined time Tmax (test 13) the control unit considers the request of activation of the selected plate as canceled. If, instead, a sufficient limitation of the instant power input takes place within said period, the control unit controls the activation of the selected plate at the highest power level which keeps anyway the overall input not above the allowed limit.

Both the forced limitation of the requested power, and the suspension and possible cancellation of the request of activation of a plate are preferably reported to the user by means of, respectively, e.g. the intermittent lighting of the push-button corresponding to the actual power level activated for the selected plate and the intermittent lighting of the push-button "0".

Instead, when the test 11 has a positive result the control unit controls the switching on of the selected plate at the power level demanded by the user. It is clear that this is what happens whenever the user demands the switching on of a plate while no other plate results to be activated.

When the control unit detects the running out of the preset period of activation of a plate or the deactivation of the same by the user through the pushbutton "0", the control unit switches off the plate.

Finally referring to fig.4, there is seen how the electronic control unit can handle, differently from the preceding case, the cooking hob so as to allow anyway the activation of a plate selected by the user, whichever is the amount of the instant input.

In fact, the control unit carries out a single test 11' to check if the activation of a plate at the requested power level implies an overall input not higher than the maximum allowed, in which case the switching on of the selected plate with the requested power takes place.

Otherwise, instead, the control unit provides to calculate lower input values, among the allowed ones, for all the plates switched on as well as for the new selected plate, so that the new overall input does not exceed the maximum limit. On completion of this processing, the control unit controls the lowering of the input levels of the plates switched on to the values calculated in this way, and then the switching on of the selected plate, also with an actual input lower than that originally demanded by the user.

Obviously, the methods of deactivation of a plate remain unchanged compared to the preceding case, while it is apparent that the same above-described control methods for the activation of a plate can be carried out for the adjustment of the power level of a plate already activated, in particular when the user demands an increase in the power input.

It is clear that for both the control methods of the cooking hob according to the present invention modifications can be provided which permit to assign a priority to one or more plates compared to the remaining ones, while within the electronic control method described in fig.4 it is possible to adopt any rule for the calculation of the limited input values carried out in the block 14.

A different embodiment of the cooking hob according to the present invention can provide for eliminating the voltage reducers 9 and therefore activating each electric plate 1 at the respective maximum power level.

In this case, in order to prevent the power input from exceeding the maximum allowed value, the electronic control unit must handle the periodical activation of each plate while achieving the continuity of heating anyway, thanks to the thermal inertia of the plate. Clearly, the higher is the power level demanded by the user for a plate, the longer must be the activation period of said plate. It is clear that in this embodiment, according to the number of activated electric plates and to the power demanded by the user for each of them, the electronic control unit devises a switching on sequence so as to avoid any way the exceeding of the maximum allowed input level. It is apparent that also in this case it is possible to account for predetermined priorities in the activation of the electric plates.

Obviously, a cooking hob according to the present invention can include a different number of electric plates and therefore of the respective power regulators, while the latter may be of any type suitable for the purpose and in particular such as to allow the activation of the corresponding plate at different power levels.

It is also clear that both the main board and all the

signals, particularly the optical ones, may be of any kind suitable for this use.

It is finally obvious that the above-described components of this cooking hob may be differently arranged.

Therefore, these and other.changes may be produced by those skilled in the art to the cooking hob provided with electronically controlled multiple electric plates as above described without exceeding the limits of the present invention.

Claims

1. A cooking hob provided with two or more electric plates (1), characterized in that it includes an electronic control unit (8) which detects both the instant overall power input and possible input variations requested by the user, and controls the supply to the electric plates according thereto so that the overall electric power input of the cooking hob does not exceed a preset maximum value.

2. A cooking hob according to claim 1, characterized in that the electronic control unit (8) controls voltage reducing circuits (9) which receive the line voltage as an input and produce a voltage not higher than that as an output which they supply to the respective electric plates (1).

3. A cooking hob according to claim 2, characterized in that the electronic control unit (8) enables the supply to an electric plate (1) with the power input demanded by the user if the consequent overall power input calculated by the control unit results not higher than the preset maximum value.

4. A cooking hob according to claim 3, characterized in that the electronic control unit (8) enables the supply to an electric plate (1) even if the overall power input consequent to the demand by the user, calculated by the control unit, results higher than the preset maximum value and the control unit checks the possibility of keeping the overall input in said limit by activating the said plate (1) at a power level lower than the demanded one.

5. A cooking hob according to claim 4, characterized in that the electronic control unit (8) enables the supply to an electric plate (1) even if the overall power input consequent to the demand by the user, calculated by the control unit, results to be higher than the preset maximum value and the control unit detects, within a predetermined time from the user's request, a lowering of the instant overall input sufficient for the activation of the said plate (1) at one of the power levels available for it.

6. A cooking hob according to claim 3, characterized in that the electronic control unit (8) enables the supply to an electric plate (1) even if the overall power input consequent to the demand by the user, calculated by the control unit, results to be higher than the preset maximum value, upon calculation of lower input values both for the plate (1) of which the activation was demanded and for the plates (1) already activated so that the overall input does not exceed the allowed limit, and adjustment of the instant power input to said values.

7. A cooking hob according to claim 1, characterized in that the electronic control unit (8) controls the periodical and combined activation of the plates (1) supplied with the line voltage.

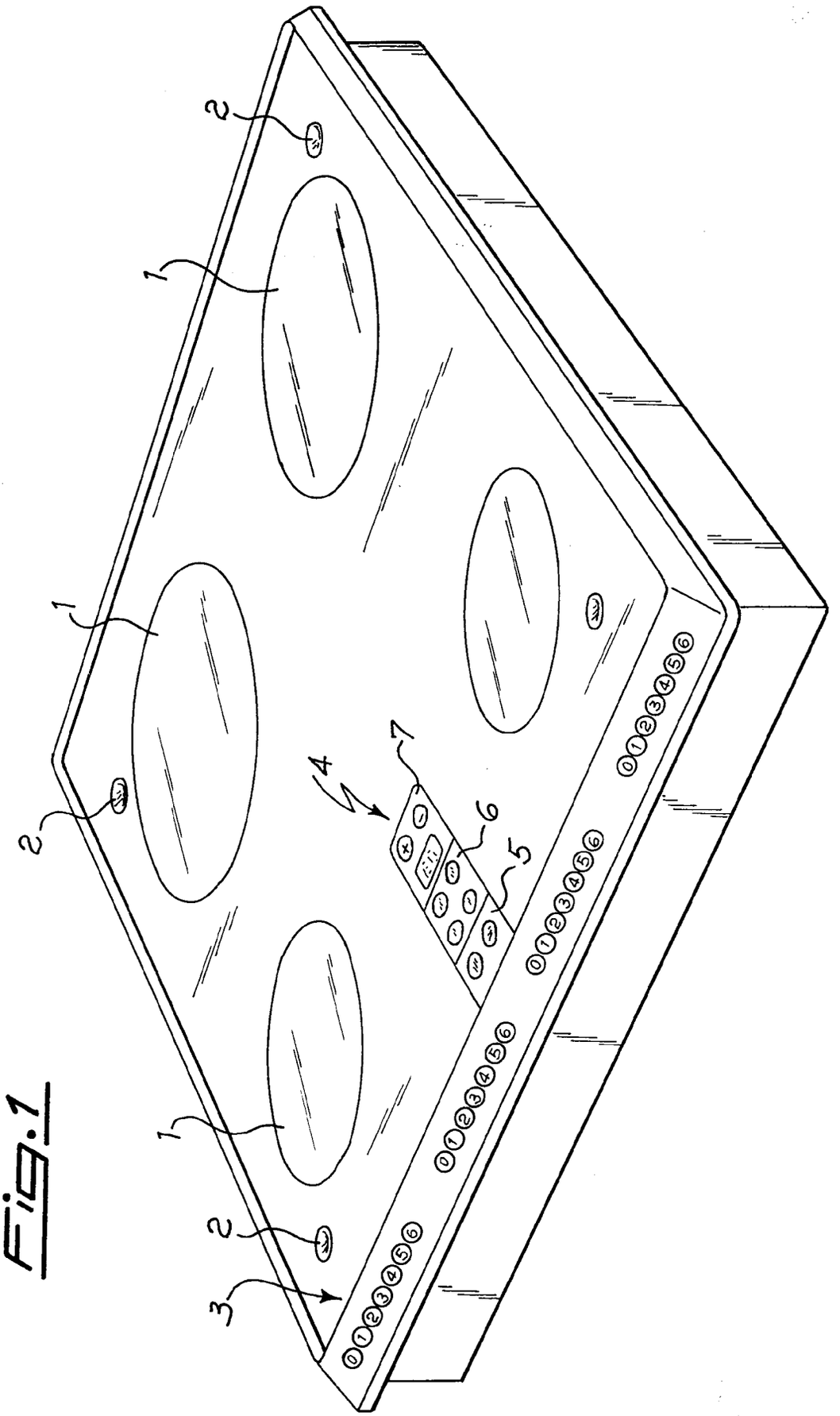


Fig.1

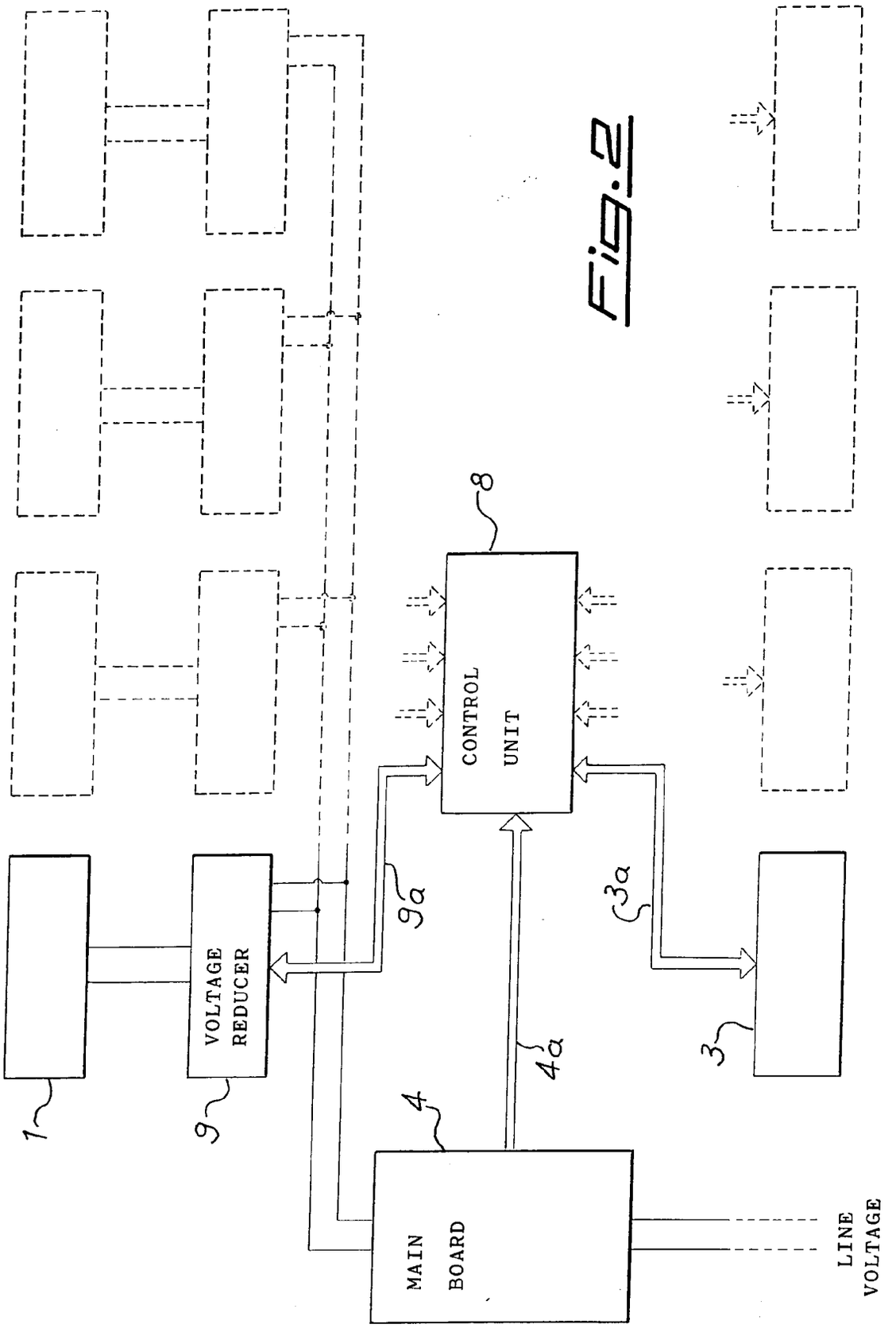

CONTROL UNIT
8
VOLTAGE REDUCER
9
9a
1
3
3a
4
4a
MAIN BOARD
LINE VOLTAGE

Fig.2

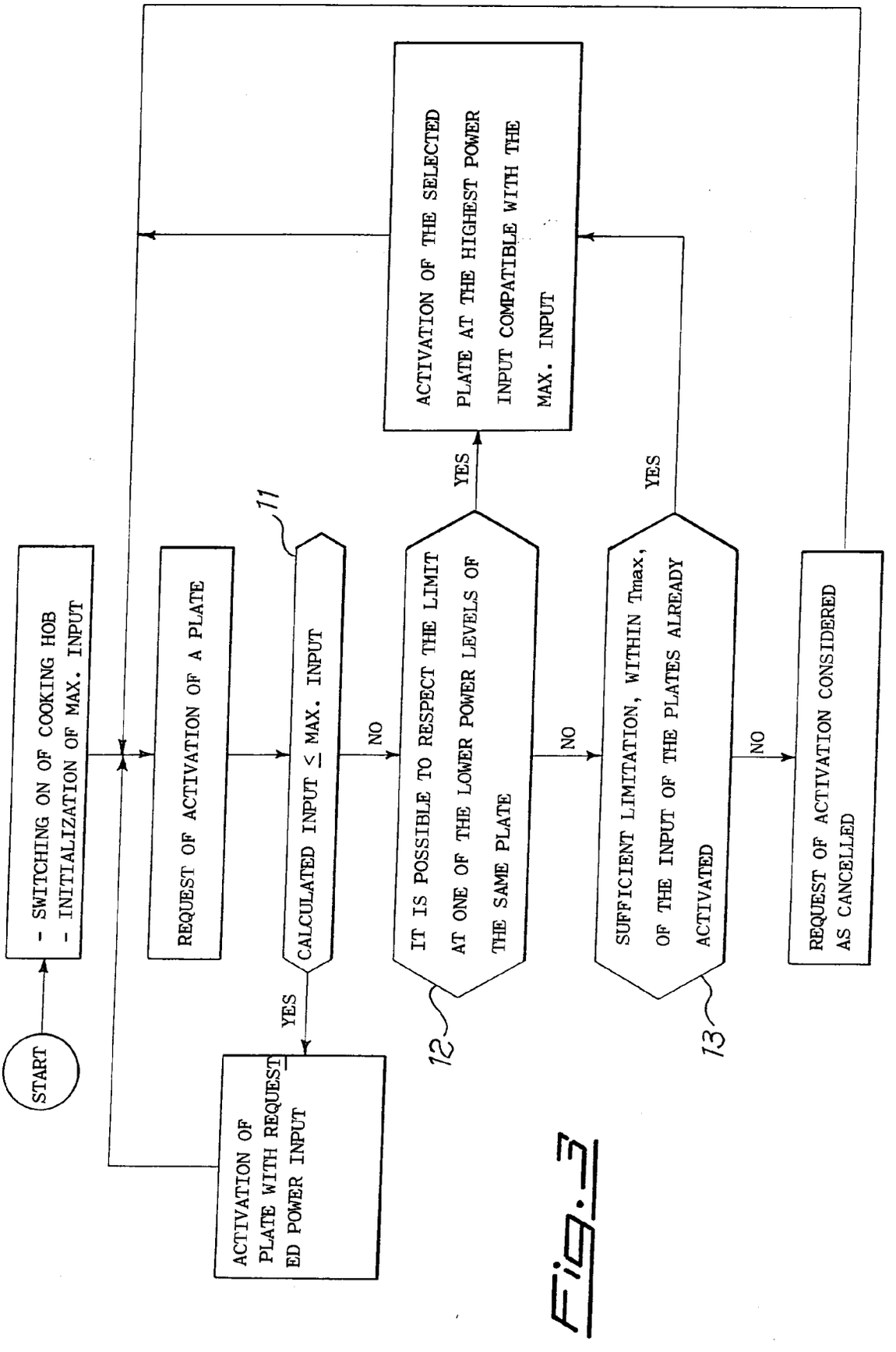
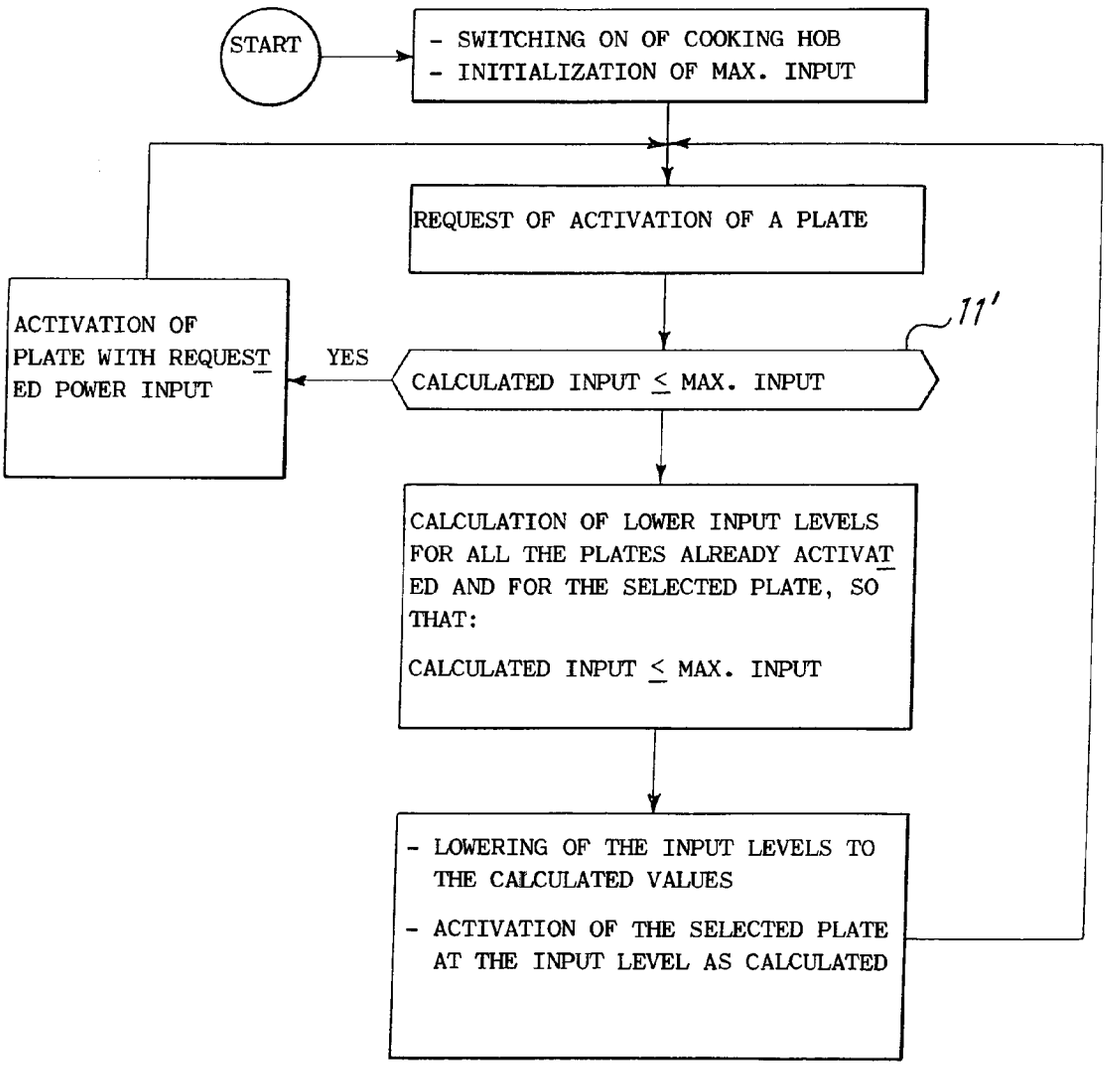

START
- SWITCHING ON OF COOKING HOB
- INITIALIZATION OF MAX. INPUT
REQUEST OF ACTIVATION OF A PLATE
CALCULATED INPUT ≤ MAX. INPUT
11
YES
NO
ACTIVATION OF PLATE WITH REQUESTED POWER INPUT
IT IS POSSIBLE TO RESPECT THE LIMIT AT ONE OF THE LOWER POWER LEVELS OF THE SAME PLATE
12
YES
NO
ACTIVATION OF THE SELECTED PLATE AT THE HIGHEST POWER INPUT COMPATIBLE WITH THE MAX. INPUT
SUFFICIENT LIMITATION, WITHIN Tmax, OF THE INPUT OF THE PLATES ALREADY ACTIVATED
13
YES
NO
REQUEST OF ACTIVATION CONSIDERED AS CANCELLED

Fig.3

Fig.4


START
- SWITCHING ON OF COOKING HOB
- INITIALIZATION OF MAX. INPUT
REQUEST OF ACTIVATION OF A PLATE
11'
CALCULATED INPUT ≤ MAX. INPUT
YES
ACTIVATION OF PLATE WITH REQUESTED POWER INPUT
CALCULATION OF LOWER INPUT LEVELS FOR ALL THE PLATES ALREADY ACTIVATED AND FOR THE SELECTED PLATE, SO THAT:
CALCULATED INPUT ≤ MAX. INPUT
- LOWERING OF THE INPUT LEVELS TO THE CALCULATED VALUES
- ACTIVATION OF THE SELECTED PLATE AT THE INPUT LEVEL AS CALCULATED

European Patent Office

EUROPEAN SEARCH REPORT

Application Number EP 93830268.4

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
A	US - A - 4 237 368 (WELCH) * Abstract; column 13, lines 20-38; fig. 5,6 *	1,2	H 05 B 1/02 F 24 C 7/08 H 05 B 3/74
A	DE - A - 3 837 096 (GENERAL ELECTRIC) * Abstract; fig. 1 *	1	

TECHNICAL FIELDS SEARCHED (Int. Cl.5)

F 24 C 7/00
H 05 B 1/00
H 05 B 3/00

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
VIENNA	30-09-1993	TSILIDIS

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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