

(19)



(11)

EP 4 495 486 A1

(12)

EUROPEAN PATENT APPLICATION

(43) Date of publication:
22.01.2025 Bulletin 2025/04

(51) International Patent Classification (IPC):
F24C 7/08^(2006.01) F24C 15/20^(2006.01)

(21) Application number: **23382741.9**

(52) Cooperative Patent Classification (CPC):
F24C 7/083; F24C 15/2021

(22) Date of filing: **19.07.2023**

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC ME MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA
Designated Validation States:
KH MA MD TN

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(54) **SAFETY KIT TO BE INTEGRATED INTO A COOKING APPLIANCE TO PROVIDE THE COOKING APPLIANCE WITH A SAFE OPERATION MODE, AND METHOD OF OPERATION IN SAFE MODE**

(57) Safety kit configured to be integrated into a cooking appliance (2) to provide the cooking appliance (2) with a safe operation mode, the safety kit (1) comprising a control module (10) comprising an algorithm of operating in safe mode, with the control module (10) being configured to exchange information with the control unit (21) of the cooking appliance (2), alarm means (11), and presence confirmation means (12), such that the

control module (10) sends an operating instruction to the control unit (21) of the cooking appliance (2) in the event that the user does not confirm his/her presence after the alarm signal, said operating instruction being determined depending on the algorithm of operating in safe mode. The invention also relates to a method of operation in safe mode of a heating element (20a, 20b, 20c).

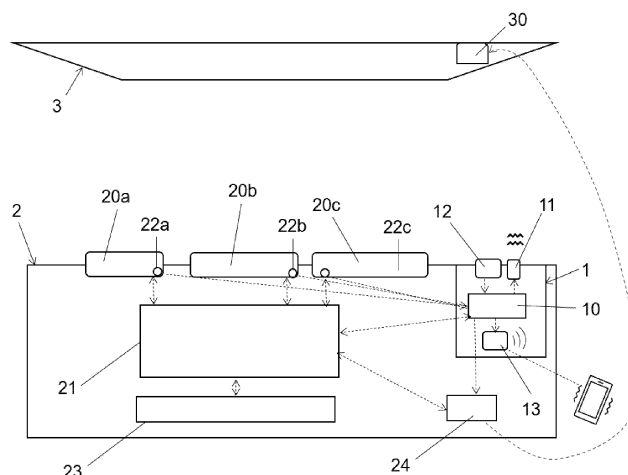


FIG. 2

Description

TECHNICAL FIELD

[0001] The present invention relates to a safety kit to be integrated into a cooking appliance to provide the cooking appliance with a safe operation mode, to a safety apparatus incorporating said safety kit, and to a method of operation in safe mode of a heating element of a cooking appliance.

PRIOR ART

[0002] It is known that most household fires in the world start in the kitchen, and specifically in the cooking appliance, due to oversights or distractions of the people in charge.

[0003] Safety devices outside the cooking appliance arranged in the proximity thereof to avoid dangerous situations are known. Safety devices of this type usually comprise different sensors to be able to detect dangerous situations as well as the presence of the user and are configured to cut off the power supply of the cooking appliance in the event that it is considered that a dangerous situation may occur.

DISCLOSURE OF THE INVENTION

[0004] The object of the invention is to provide a safety kit to be integrated into a cooking appliance to provide the cooking appliance with a safe operation mode, a safety apparatus incorporating said safety kit, and a method of operation in safe mode of a heating element of a cooking appliance, as defined in the claims.

[0005] A first aspect of the invention relates to a safety kit to be integrated into a cooking appliance. The safety kit is configured to provide the cooking appliance with a safe operation mode to avoid dangerous situations due to unattended heating elements.

[0006] The safety kit comprises a control module comprising an algorithm of operating in safe mode, with the control module being configured to exchange information with the control unit of the cooking appliance into which it is integrated.

[0007] The safety kit also comprises alarm means configured to emit an alarm signal when the algorithm of operating in safe mode requires user presence confirmation, and confirmation means configured so that the user can confirm his/her presence.

[0008] The control module is configured to send an operating instruction to the control unit of the cooking appliance in the event that the user does not confirm his/her presence after the alarm signal, said operating instruction being determined depending on the algorithm of operating in safe mode.

[0009] Therefore, the safety kit of the invention is configured to be integrated, i.e., to be incorporated into a cooking appliance, which allows converting a conven-

tional cooking appliance configured to operate in normal mode, into a cooking appliance that can also be operated in a safe operation mode to avoid dangerous situations due to unattended heating elements.

[0010] The safety kit comprises all the hardware and software elements needed to be able to provide a conventional cooking appliance with a safe operation mode, and it therefore allows obtaining cooking appliances with a safe operation mode in a simple, compact manner and without having to modify the structure of the conventional cooking appliance, simply requiring a gap where the safety kit can be placed, as well as making the necessary connections of the safety kit with the components already existing in the conventional cooking appliance.

[0011] Furthermore, since the safety kit is integrated into the cooking appliance itself, it does not require any operation in addition to that required in the installation of a conventional cooking appliance.

[0012] The fact that the safety kit is integrated into the cooking appliance itself allows having access in a simple and direct manner to different operating and control parameters of the cooking appliance to which access would not be allowed in the case of being a safety device outside the cooking appliance, and therefore said parameters can be used without having to duplicate, for example, temperature sensors already comprised in conventional cooking appliances.

[0013] Furthermore, since the control module of the safety kit is communicated directly with the control unit of the cooking appliance, in the event that the user does not confirm his/her presence after the alarm signal, said control module can send an operating instruction to the control unit of the cooking appliance, said instruction being, for example, to modify the power instruction or to shut off the heating element considered to be unattended. However, since external safety devices of the prior art do not have direct access to the control unit of the cooking appliance, they are usually limited to cutting off the power supply of the cooking appliance in the event that it is considered that the user is using the cooking appliance in an unsafe manner.

[0014] A second aspect of the invention relates to a cooking appliance comprising an integrated safety kit as described in the first aspect of the invention.

[0015] A third aspect of the invention relates to a method of operation in safe mode of a heating element of a cooking appliance to avoid dangerous situations due to unattended heating elements.

[0016] The method of operation in safe mode comprises

- a supervised cooking step which is started every time the user sets power instruction for said heating element,
- an alarm and presence check step which is started when the supervised cooking step exceeds a preset safe cooking time and which can be prolonged during a preset alarm time, in which an alarm signal is

emitted and in which in the event that the presence of user is confirmed, the alarm signal emission is interrupted and the supervised cooking step is restarted, and

- an actuation step in which at least one operating instruction for the heating element is modified in the event that the no presence of the user is confirmed at the end of the alarm and presence check step.

[0017] These and other advantages and features of the invention will become apparent in view of the figures and detailed description of the invention.

DESCRIPTION OF THE DRAWINGS

[0018]

Figure 1 shows a first embodiment of a cooking appliance 2 comprising a safety kit 1 according to a preferred embodiment of the invention.

Figure 2 schematically shows the main elements of the cooking appliance and of the safety kit of Figure 1.

Figure 3 shows a flowchart of a preferred embodiment of the method of operation in safe mode of a heating element of the invention.

Figure 4 shows a graph in which each power is related to the safe cooking time and the corresponding alarm time for the preferred embodiment of the method of operation in safe mode.

DETAILED DISCLOSURE OF THE INVENTION

[0019] The safety kit 1 of the invention is configured to be integrated into a cooking appliance 2, i.e., the safety kit 1 is configured to be incorporated in a cooking appliance 2. The cooking appliance 2 integrating the safety kit 1 can be, for example, an induction cooktop, a ceramic cooktop, a gas cooker or a barbecue grill.

[0020] The safety kit 1 of the invention allows converting a conventional cooking appliance into a cooking appliance 2 that can be operated in a safe operation mode to avoid dangerous situations due to unattended heating elements.

[0021] In the context of the invention, safe operation mode (also referred to as safe mode) will be considered a mode of operating the cooking appliance 2 in which both the state of the cooking appliance and the presence of the user are monitored to avoid dangerous situations due to unattended heating elements, and thereby prevent the personal and material damage that may arise, and furthermore prevent deterioration of the cooking equipment, of the cooking appliance itself, and of air extraction means. In the safe operation mode the safety kit monitors the progression of cooking by means of parameters such

as the temperature of the heating elements, and/or the power instruction set by the user, and in the event that the algorithm of operating in safe mode determines that it is necessary to check for the user, it will emit an alarm signal requiring the user to confirm his/her presence.

[0022] In the context of the invention, a cooking appliance which comprises a control unit, at least one heating element and a user interface configured so that the user can set the power instruction of said at least one heating element, and which has no safe operation mode to avoid dangerous situations due to unattended heating elements will be considered a conventional cooking appliance.

[0023] Preferably, the cooking appliance 2 comprising a safety kit 1 according to the invention may operate both in normal mode and in safe mode. The safe mode is indicated for people in initial cognitive deterioration processes, older people with distractions, or distracted people. However, in the event that the cooking appliance is going to be used by a person with full faculties, the user may opt to cook in normal mode. The possibility of operating in normal mode could optionally be disabled.

[0024] Figures 1 and 2 show a first embodiment of a cooking appliance 2 according to the invention, said cooking appliance 2 integrating a safety kit 1 according to a preferred embodiment of the invention.

[0025] The cooking appliance 2 of the first embodiment comprises a control unit 21, three heating elements 20a, 20b, 20c and a user interface 23 configured so that the user can set the power instruction P for said heating elements. Each heating element 20a, 20b, 20c has an associated temperature sensor 22a, 22b, 22c.

[0026] The safety kit 1 comprises a control module 10 comprising an algorithm of operating in safe mode, alarm means 11 configured to emit an alarm signal when the algorithm of operating in safe mode requires user presence confirmation, and confirmation means 12 configured so that the user can confirm his/her presence. Therefore, the safety kit 1 comprises all the hardware and software elements needed to be able to provide a conventional cooking appliance with a safe operation mode.

[0027] The control module 10 is configured to exchange information with the control unit 21 of the cooking appliance 2. Preferably, information shared between the control module 10 of the safety kit 1 and the control unit 21 of the cooking appliance 2 comprises, for example, the power instruction P set by the user for each heating element 20a, 20b, 20c. Therefore, the fact that the safety kit 1 is integrated into the cooking appliance 2 itself allows direct access to information about operating parameters of the cooking appliance 2 to which access would not be allowed in the event of being a safety device not integrated into the cooking appliance 2.

[0028] Furthermore, the control module 10 is configured to send an operating instruction to the control unit 21 of the cooking appliance 2 in the event that the user does not confirm his/her presence after the alarm signal, said

operating instruction being determined depending on the algorithm of operating in safe mode. Said operating instruction can be, for example, a power instruction that is lower than the one set by the user for the unattended heating element. Said operating instruction can also be an instruction to shut off the unattended heating element. Preferably, the algorithm of operating in safe mode of the control module 10 of the safety kit 10 is configured to implement the steps of the method of operation in safe mode of a heating element as described in the second aspect of the invention.

[0029] The control module 10 is also configured to control the alarm means 11 and the confirmation means 12 of the safety kit 1.

[0030] Preferably, the confirmation means 12 comprise a touch sensor that the user actuates by contact, thus confirming his/her presence. Alternatively, the confirmation means can comprise a rotary knob, another type of button, or any other means on which the user can act to confirm his/her presence next to the cooking appliance.

[0031] Preferably, the alarm means 11 emit audible and/or visual alarm signals when the algorithm of operating in safe mode requires user presence confirmation. Preferably, said alarm means 11 comprise at least one LED diode that emits a different colored light, such that different types of warnings can be emitted to the user depending on the situation. Therefore, for example, it can emit light of a first color when the user is required to confirm his/her presence, and light of another color to inform the user that an operating instruction is going to be modified depending on the algorithm of operating in safe mode. Preferably, the alarm means 11 also comprise a buzzer. Preferably, said at least one LED diode and said buzzer are arranged around the confirmation means 12, such that said confirmation means light up and sound differently depending on the warning they must emit in each case.

[0032] In the preferred embodiment of the safety kit 1, the confirmation means 12 comprise a single touch button arranged on one side of the cooking appliance, and the alarm means comprise at least one LED arranged around said touch button, such that the touch button will light up in the event that user presence confirmation is required.

[0033] In the preferred embodiment, the control module 10 is preferably configured to receive information from the temperature sensors 22a, 22b, 22c associated with each heating element 20a, 21b, 21c of the cooking appliance 2. As discussed above, the fact that the safety kit 1 is integrated into the cooking appliance 2 allows being able to access this information in a simple manner.

[0034] In the preferred embodiment, the safety kit 1 also comprises a connectivity module 13 configured to be able to connect to other devices or to the Internet autonomously, such that the control module 10 can notify a contact person of a use of the cooking appliance 2 considered to be unsafe through said connectivity mod-

ule 13. Therefore, the control module 10 can send, for example, an alert text message to a mobile telephone or to a tablet through said connectivity module 13.

[0035] Furthermore, in the preferred embodiment the control module 10 of the safety kit 1 is configured to be communicated with the controller 30 of an exhaust hood 3 arranged in the proximity of the cooking appliance 2 by means of a wireless communication card 24 of the cooking appliance 2, such that the control module 10 can send an off signal to the exhaust hood 3, thus cutting off the air stream, and therefore ceasing the feeding of oxygen and the air intake, in the event that the operation algorithm considers that a dangerous situation may occur.

[0036] A second aspect of the invention relates to a method of operation in safe mode of a heating element 20a, 20b, 20c of a cooking appliance 2 to avoid dangerous situations due to unattended heating elements. The method of operation in safe mode is performed for each heating element 20a, 20b, 20c of the cooking appliance 2 which is turned on independently and in parallel.

[0037] Figure 3 shows a flowchart of a preferred embodiment of the method of operation of the invention.

[0038] The method of operation in safe mode of a heating element 20a, 20b, 20c comprises a supervised cooking step S1 which is started every time the user sets the power instruction P for said heating element 20a, 20b, 20c. Every time said supervised cooking step S1 is started, a timer associated with the corresponding heating element 20a, 20b, 20c is started.

[0039] The method of operation in safe mode of a heating element 20a, 20b, 20c also comprises an alarm and presence check step S2 which is started when the supervised cooking step S1 exceeds a preset safe cooking time t_s , i.e., when the timer associated with the heating element 20a, 20b, 20c exceeds a preset safe cooking time t_s . The alarm and presence check step S2 can be prolonged for a preset alarm time t_a . During the alarm and presence check step S2, an alarm signal is emitted, thus requiring the user to confirm his/her presence. In the event that user presence is confirmed, the alarm signal emission is interrupted and the supervised cooking step S1 is restarted, thus restarting the timer associated with the heating element 20a, 20b, 20c. Preferably, the cooking appliance 2 will comprise confirmation means 12 comprising, for example, a presence confirmation touch button.

[0040] The method of operation in safe mode of a heating element 20a, 20b, 20c also comprises an actuation step S3 in which at least one operating instruction for the heating element is modified. Said actuation step S3 is performed in the event that no presence of the user is confirmed at the end of the alarm and presence check step S2.

[0041] In the preferred embodiment, each power $P_1, P_2, P_3, P_4, P_5, P_6, P_7, P_8, P_9, P_P$ has a preset safe cooking time t_s and an alarm time t_a , as shown by way of example in the graph of Figure 4.

[0042] Furthermore, in the preferred embodiment of

the method of operation in safe mode a first operating zone Z1 comprising powers P_1 , P_2 , P_3 , and a second operating zone Z2 comprising powers P_4 , P_5 , P_6 , P_7 , P_8 , P_9 , P_P are established, operating zone Z1 thus comprising the lowest operating powers and operating zone Z2 comprising the remaining powers.

[0043] Therefore, in the preferred embodiment, in the actuation step S3 the modification of the operating instruction is performed as follows:

- if the power instruction P set by the user belongs to the first operating zone Z1, the corresponding heating element 20a, 20b, 20c is shut off, and
- if the power instruction P set by the user belongs to the second operating zone Z2, the power instruction P is reduced to a power of the first operating zone Z1, for example to power P_2 , and the supervised cooking step S1 is restarted with said reduced power instruction P.

[0044] Preferably, in the method of operation in safe mode in the event that the temperature of the heating element 20a, 20b, 20c is between a preset maximum safe temperature T_{max} and a preset critical temperature T_c , an alarm signal will be emitted with a preset temperature alarm time t_{aT} frequency, and in the event that the user does not confirm his/her presence in response to the emission of the alarm signal, the corresponding heating element 20a, 20b, 20c will be shut off.

[0045] Preferably, the method of operation in safe mode comprises a temperature-based shut off step S4 which is started in the event that the heating element 20a, 20b, 20c exceeds a preset critical temperature T_c . In the temperature-based shut off step S4, an alarm signal is emitted and the corresponding heating element 20a, 20b, 20c is shut off.

[0046] Preferably, any action of the user on the cooking appliance 2 during the supervised cooking step S1 restarts said supervised cooking step S1, i.e., restarts the timer associated with the heating element 20a, 20b, 20c. Therefore, for example, if the user turns on/shuts off/modifies the instruction of another one of the heating elements 20a, 20b, 20c of the cooking appliance 2, or for example confirms his/her presence through presence confirmation means, any of said actions demonstrates that the user is present and therefore, even though said user has not modified the power instruction of the heating element 20a, 20b, 20c that is being supervised, since it has been checked that the user is present, the supervised cooking step S1 is restarted, in turn restarting the timer associated with the heating element 20a, 20b, 20c.

[0047] Preferably, in the event that the user sets a cooking time through the timer of the user interface 23 associated with a heating element 20a, 20b, 20c, a supervised cooking step S1 for said heating element 20a, 20b, 20c will not be started. In this case, the method for safe operation will only monitor the temperature of the heating element 20a, 20b, 20c, and in the event that said

temperature of the heating element 20a, 20b, 20c is between a preset maximum safe temperature T_{max} and a preset critical temperature T_c , an alarm signal will be emitted with a preset temperature alarm time t_{aT} frequency, and in the event that the user does not confirm his/her presence in response to the emission of the alarm signal, the corresponding heating element 20a, 20b, 20c will be shut off. In the same way, in the event that the temperature of the heating element 20a, 20b, 20c exceeds a preset critical temperature T_c , an alarm signal will be emitted and the corresponding heating element 20a, 20b, 20c will be shut off.

Claims

1. Safety kit configured to be integrated into a cooking appliance (2) to provide the cooking appliance (2) with a safe operation mode to avoid dangerous situations due to unattended heating elements, the safety kit (1) comprising

- a control module (10) comprising an algorithm of operating in safe mode, with the control module (10) being configured to exchange information with the control unit (21) of the cooking appliance (2),
- alarm means (11) configured to emit an alarm signal when the algorithm of operating in safe mode requires user presence confirmation, and
- confirmation means (12) configured so that the user can confirm his/her presence,

such that the control module (10) sends an operating instruction to the control unit (21) of the cooking appliance (2) in the event that the user does not confirm his/her presence after the alarm signal, said operating instruction being determined depending on the algorithm of operating in safe mode.

2. Safety kit according to claim 1, wherein the confirmation means (12) comprise a touch sensor.
3. Safety kit according to claim 1 or 2, wherein the alarm means (11) emit audible and/or visual alarm signals, said alarm means (11) preferably comprising at least one LED diode that emits a different colored light.
4. Safety kit according to any of claims 1 to 3, wherein the control module (10) is configured to receive information from the temperature sensors (22a, 22b, 22c) associated with each heating element (20a, 21b, 21c) of the cooking appliance (2).
5. Safety kit according to any of claims 1 to 4, comprising a connectivity module (13) configured to be able to connect to other devices or to the Internet autonomously, such that the control module (10) can notify

a contact person of a use of the cooking appliance (2) considered to be unsafe through said connectivity module (13).

6. Safety kit according to any of claims 1 to 5, wherein the control module (10) is configured to be communicated with an exhaust hood (3) arranged in the proximity of the cooking appliance by means of a wireless communication card (24) of the cooking appliance (2), such that the control module (10) can send an off signal to the exhaust hood (3) in the event that the operation algorithm considers that a dangerous situation may occur.

7. Cooking appliance comprising an integrated safety kit (1) according to any of claims 1 to 6.

8. Method of operation in safe mode of a heating element (20a, 20b, 20c) of a cooking appliance (2) to avoid dangerous situations due to unattended heating elements, the method comprising

- a supervised cooking step (S1) which is started every time the user sets a power instruction (P) for said heating element (20a, 20b, 20c),
- an alarm and presence check step (S2) which is started when the supervised cooking step (S1) exceeds a preset safe cooking time (t_s) and which can be prolonged during a preset alarm time (t_a), in which an alarm signal is emitted and in which in the event that presence of the user is confirmed the alarm signal emission is interrupted and the supervised cooking step (S1) is restarted, and
- an actuation step (S3) in which at least one operating instruction for the heating element is modified in the event that no presence of the user is confirmed at the end of the alarm and presence check step (S2).

9. Method of operation in safe mode according to claim 8, wherein each power ($P_1, P_2, P_3, P_4, P_5, P_6, P_7, P_8, P_9, P_P$) has a preset safe cooking time (t_s) and alarm time (t_a).

10. Method of operation in safe mode according to claim 9, wherein the following is set

- a first operating zone (Z1) comprising at least a first power (P_1, P_2, P_3), and
- a second operating zone (Z2) comprising at least a second power ($P_4, P_5, P_6, P_7, P_8, P_9, P_P$) greater than the first power (P_1, P_2, P_3), such that in the actuation step (S3) the modification of the operating instruction is performed as follows:

- if the power instruction (P) set by the user belongs to the first operating zone (Z1), the

corresponding heating element (20a, 20b, 20c) is shut off, and

- if the power instruction (P) set by the user belongs to the second operating zone (Z2), the power instruction (P) is reduced to a power of the first operating zone (Z1) and the supervised cooking step (S1) is restarted with said reduced power instruction (P).

11. Method of operation in safe mode according to any of claims 8 to 10, wherein, in the event that the temperature of the heating element (20a, 20b, 20c) is between a preset maximum safe temperature (T_{max}) and a preset critical temperature (T_c), an alarm signal will be emitted with a preset temperature alarm time (t_{aT}) frequency, and in the event that the user does not confirm his/her presence in response to the emission of the alarm signal, the corresponding heating element (20a, 20b, 20c) will be shut off.

12. Method of operation in safe mode according to any of claims 8 to 11, comprising a temperature-based shut off step (S4) which is started in the event that the heating element (20a, 20b, 20c) exceeds a critical temperature (T_c), in which an alarm signal is emitted and the heating element (20a, 20b, 20c) is shut off.

13. Method of operation in safe mode according to any of claims 8 to 12, wherein any action of the user on the cooking appliance (2) during the supervised cooking step (S1) restarts said supervised cooking step (S1).

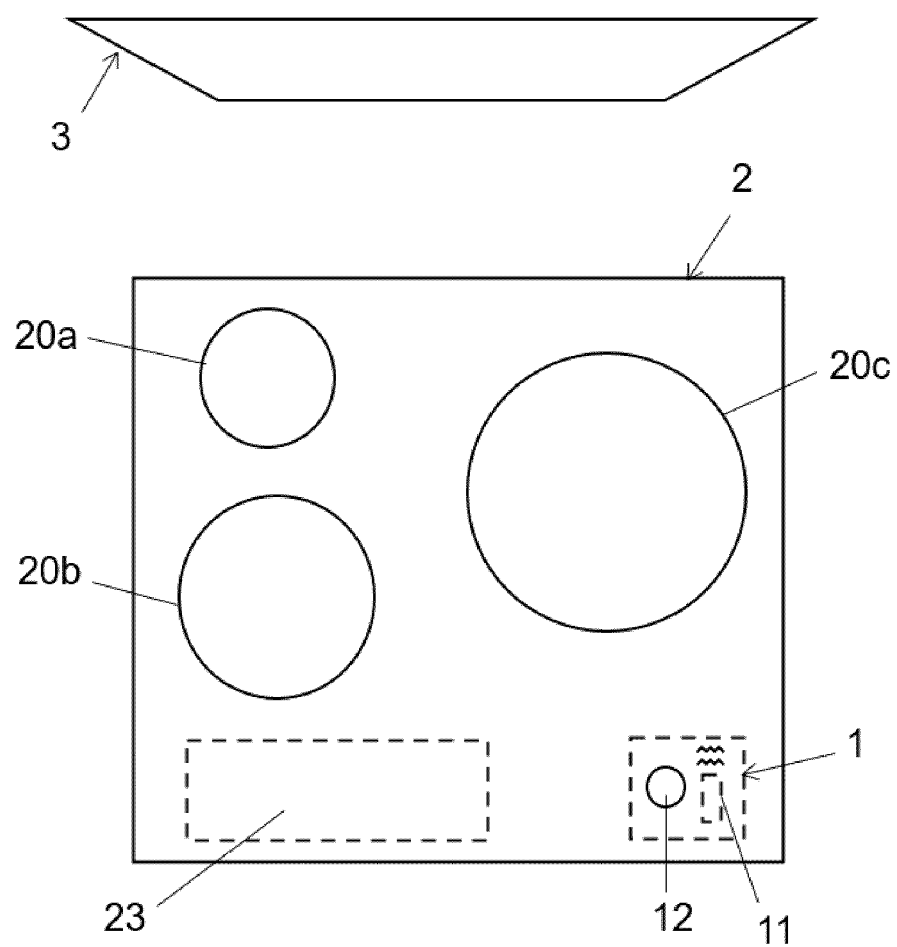


FIG. 1

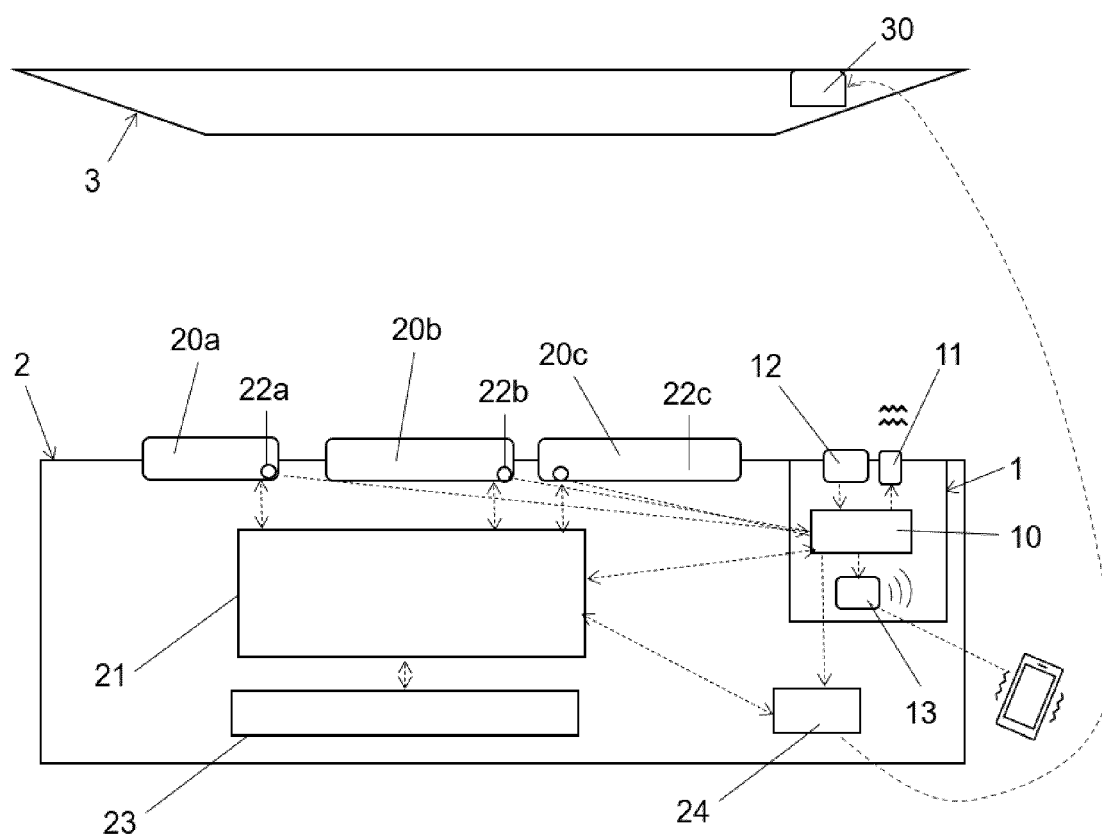


FIG. 2

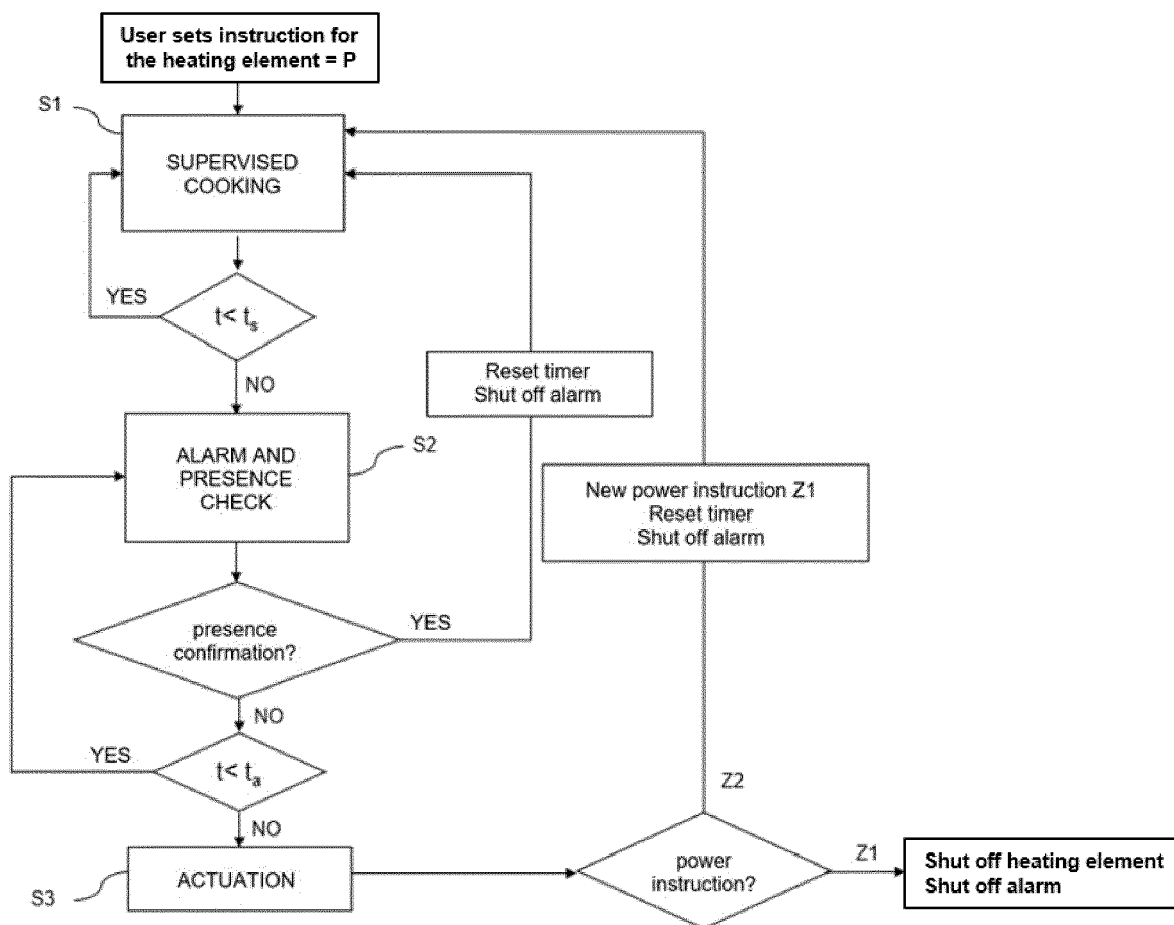
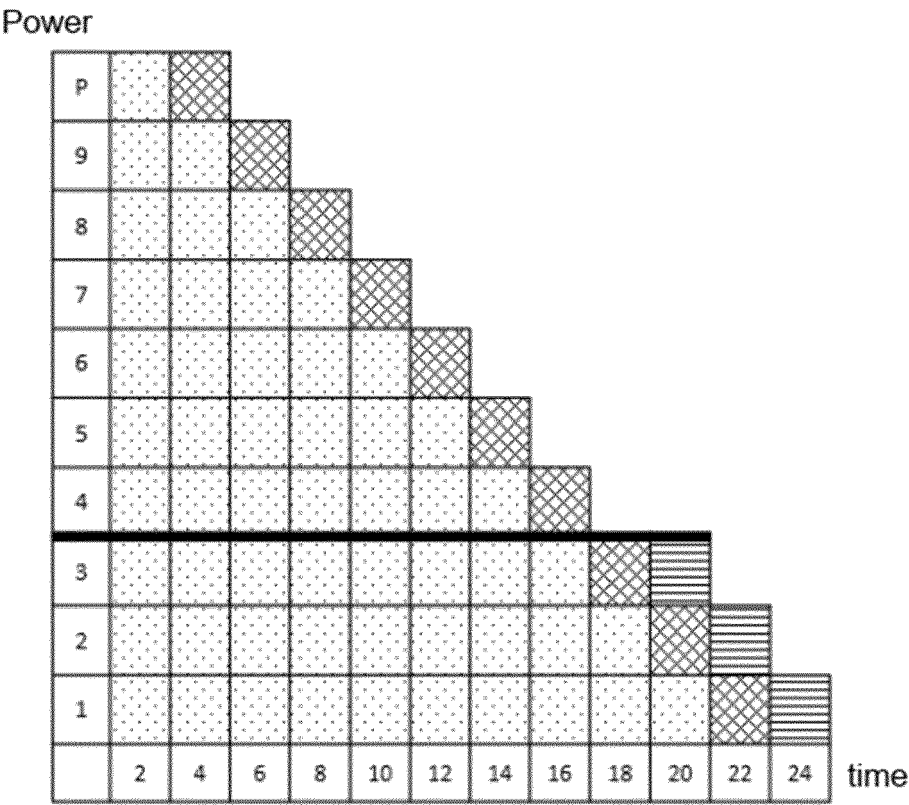


FIG. 3






	safe cooking time (ts)
	alarm time (ta)
	Preventive shut-off

FIG. 4



EUROPEAN SEARCH REPORT

Application Number

EP 23 38 2741

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Place of search The Hague		Date of completion of the search 13 December 2023	Examiner Fest, Gilles
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EPO FORM P0459

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