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(54) **A method for controlling an automatic turning-off of a heating element of a household appliance**

(57) The present invention relates to a method for controlling an automatic turning-off of at least one heating element of a household appliance after a predetermined runtime (T). The runtime (T) depends on a pre-set power level (P) of said heating element. The runtime (T) depends further on a pre-set security level (S). The security

level (S) is elected or electable by the user. The runtime (T) decreases with an increasing pre-set power level (P). In a similar way, the runtime (T) decreases with an increasing security level (S).

EP 2 587 162 A1

Description

[0001] The present invention relates to a method for controlling an automatic turning-off of at least one heating element of a household appliance after a predetermined runtime. Further, the present invention relates to a system for controlling an automatic turning-off of at least one heating element of a household appliance after a predetermined runtime. Moreover, the present invention relates to a cooking hob provided for the above method.

[0002] The heating elements of some household appliances, in particular of cooking hobs, are automatically turned off after a predetermined runtime, if the cooking hob has not been deactivated, its heat setting has not been changed or no timer has been set.

[0003] For example, the heating element is automatically turned off after one and a half hour, if the pre-set power has a maximum value. Further, the heating element is automatically turned off after six hours, if the pre-set power has a minimum value. Moreover, the heating element is automatically turned off after four or five hours, if the pre-set power has a central value. Thus, the runtime of the heating element depends on the pre-set power of said heating element. These automatic turning-offs of the heating element are provided for energy saving, if the user has forgotten to switch off said heating element.

[0004] WO 2008/116719 A2 discloses a method preventing the accidental operation of a heating appliance. The heating appliance is switched off after a certain pre-set time. Said pre-set time is a standard value, which may be varied manually by the user. After starting a new process, said standard value is pre-set again.

[0005] WO 2009/000740 A2 discloses a method preventing the unintended operation of a heating device. All heating sources are switched off after a certain pre-set time. The pre-set time is a standard value, which may be varied manually by the user. When starting a new process, said standard value is pre-set again.

[0006] It is an object of the present invention to provide a method for controlling an automatic turning-off of at least one heating element of a household appliance after a predetermined runtime, wherein the user can control said method by electing one parameter.

[0007] The object of the present invention is achieved by the method according to claim 1.

[0008] The present invention relates to a method for controlling an automatic turning-off of at least one heating element of a household appliance after a predetermined runtime, wherein

- the runtime depends on a pre-set power level of said heating element,
- the runtime depends further on a pre-set security level,
- the security level is elected or electable by the user,
- the runtime decreases with an increasing pre-set power level,
- the runtime decreases with an increasing security level,
- the elected or electable security level is valid for all power levels of the heating element, and
- the runtime is reset and started again, when the heating element, a cooking zone, a cooking hob or the household appliance has been operated by the user.

[0009] The main idea of the present invention is the possibility that the user can elect the security level for the heating element, wherein said security level and the pre-set power level determine the runtime. By default the security level is set to a standard level and can be changed by the user. The security level has to be elected only once by the user and is valid for all power levels of the heating element. Further, the security level can be changed by the user at any time. The user can elect the security level, but not the runtime. The runtime is calculated from the pre-set power level and security level. The runtime is reset and started again, when the according heating element, a corresponding cooking zone, a cooking hob or the household appliance has been operated by the user. Thus, a new runtime is activated, if the adjustment of the according heating element, the corresponding cooking zone, the cooking hob or the household appliance has been changed by the user. Preferably, the pre-set security level remains active until another security level is elected by the user. Thus, the security level cannot be changed automatically or by any other operation.

[0010] In particular, the security levels are labelled by descriptive keywords. Said descriptive keywords allow an easy handling for the user.

[0011] For example, the security levels are labelled by the words "low", "standard", "high" and/or "very high". Alternatively, synonyms of the aforementioned words may also be used for labelling the security levels.

[0012] In particular, one predetermined security level is automatically valid, if the security level has not been elected by the user. For example, the security level labelled by the words "standard" can be used for the predetermined security level.

[0013] Further, the runtime is not directly elected or electable by the user. Only the security level is elected or electable by the user. The runtime is calculated from the pre-set power level and the pre-set security level.

[0014] Preferably, a new runtime corresponding with a new power level is restarted, after the power level has been changed by the user. Thus, the automatic turning-off depends on the last action of the user.

[0015] For example, the household appliance comprises a number of heating elements and the elected or electable security level is valid for all said heating elements.

[0016] Alternatively, the household appliance comprises a number of heating elements, and the security level is elected or electable separately for each heating element.

[0017] In particular, the household appliance is a cooking hob with at least one cooking zone, and said cooking zone comprises one or more heating elements.

[0018] For example, the runtime is between 4 hours and 7 hours, if the power level and the security level have minimum values.

[0019] In a similar way, the runtime is between 3 minutes and 30 minutes, if the power level and the security level have maximum values.

[0020] Further, the present invention relates to a system for controlling an automatic turning-off of at least one heating element of a household appliance after a predetermined runtime, wherein the system is provided for performing the method mentioned above.

[0021] Moreover, the present invention relates to a household appliance with at least one heating element, wherein the household appliance is provided for the method and/or system described above.

[0022] In particular, the present invention relates to a cooking hob with at least one cooking zone, wherein the cooking hob is provided for a method and/or system mentioned above.

[0023] At last, the present invention relates to a computer program product stored on a computer usable medium, comprising computer readable program means for causing a computer to perform a method described above.

[0024] Novel and inventive features of the present invention are set forth in the appended claims.

[0025] The present invention will be described in further detail by a preferred embodiment.

[0026] In general, the inventive method is provided for controlling an automatic turning-off of a heating element of a household appliance after a predetermined runtime. In particular, the inventive method is provided for controlling the automatic turning-off of a heating element of a cooking hob after the predetermined runtime.

[0027] The inventive method offers the user to elect a security level the household appliance or the cooking hob, respectively. As usual, the user sets a power level for the heating element.

[0028] According to the inventive method the heating element is automatically turned off after the predetermined runtime T, wherein the runtime T depends on the pre-set power level P and on the pre-set security level S.

[0029] The following table illustrates the relationships between the runtime T in dependence of the pre-set power P and the security value S. In this table the pre-set power P is characterized by dimensionless numbers correlating with values of the power delivered to the heating element.

	S = "standard"	S = "high"	S = "very high"
P = 1 to 3	T = 6 hours	T = 2 hours	T = 1 hour
P = 4 to 7	T = 5 hours	T = 90 min	T = 45 min
P = 8 to 9	T = 4 hours	T = 60 min	T = 30 min
P = 10 to 14	T = 90 min	T = 30 min	T = 15 min
power boost	T = 7 min	T = 3 min	T < 3 min

[0030] The values of the runtime T in the above table are examples and can be modified.

[0031] If the maximum value "power boost" of the power P is pre-set, then the power P is reduced to P = 14 after the runtime T. Alternatively, the corresponding heating element is deactivated in this case.

[0032] The pre-set security level S elected by the user remains active until another security level S is elected by the user. When the power level P is changed by the user, then the runtime T corresponding to the new power level P is restarted.

[0033] If the household appliance includes a number of heating elements or the cooking hob comprises several cooking zones, then the pre-set security level S is valid for all heating elements or cooking zones, respectively. Alternatively, the security levels S may be elected separately for each heating elements or cooking zones, respectively.

[0034] The method according to the present invention can be performed by an electronic control circuit. Further, the method according to the present invention can be performed by a computer program. At last, the method according to the present invention can be performed by a combination of an electronic control circuit and a computer program.

[0035] The present invention can also be embedded in a computer program product which comprises all the features enabling the implementation of the method described herein. Further, when loaded in computer system, said computer program product is able to carry out these methods.

[0036] Although an illustrative embodiment of the present invention has been described herein, it is to be understood

that the present invention is not limited to that precise embodiment, and that various other changes and modifications may be affected therein by one skilled in the art without departing from the scope or spirit of the invention. All such changes and modifications are intended to be included within the scope of the invention as defined by the appended claims.

List of reference numerals

[0037]

T runtime

P power level

S security level

Claims

1. A method for controlling an automatic turning-off at least one heating element of a household appliance after a predetermined runtime (T), wherein

- the runtime (T) depends on a pre-set power level (P) of said heating element,
- the runtime (T) depends further on a pre-set security level (S),
- the security level (S) is elected or electable by the user,
- the runtime (T) decreases with an increasing pre-set power level (P),
- the runtime (T) decreases with an increasing security level (S),
- the elected or electable security level (S) is valid for all power levels (P) of the heating element, and
- the runtime (T) is reset and started again, when the heating element, a cooking zone, a cooking hob or the household appliance has been operated by the user.

2. The method according to claim 1,
characterized in, that
the pre-set security level (S) remains active until another security level (S) is elected by the user.

3. The method according to claim 1 or 2,
characterized in, that
the security levels (S) are labelled by descriptive keywords.

4. The method according to claim 3,
characterized in, that
the security levels (S) are labelled by the words "low", "standard", "high" and/or "very high".

5. The method according to any one of the preceding claims,
characterized in, that
one predetermined security level (S) is automatically valid, if the security level (S) has not been elected by the user.

6. The method according to any one of the preceding claims,
characterized in, that
the runtime (T) is not directly elected or electable by the user.

7. The method according to any one of the preceding claims,
characterized in, that
the household appliance comprises a number of heating elements, and the elected or electable security level (S) is valid for all heating elements.

8. The method according to any one of the claims 1 to 6,
characterized in, that
the household appliance comprises a number of heating elements, and the security level (S) is elected or electable

separately for each heating element.

9. The method according to any one of the preceding claims,
characterized in, that

the household appliance is a cooking hob with at least one cooking zone, and said cooking zone comprises one or more heating elements.

10. The method according to any one of the preceding claims,
characterized in, that

the runtime is between 4 hours and 7 hours, if the power level (P) and the security level (S) have minimum values.

11. The method according to any one of the preceding claims,
characterized in, that

the runtime is between 3 minutes and 30 minutes, if the power level (P) and the security level (S) have maximum values.

12. A system for controlling an automatic turning-off of at least one heating element of a household appliance after a predetermined runtime (T),
characterized in, that

the system is provided for performing the method according to any one of the claims 1 to 11.

13. A household appliance with at least one heating element, **characterized in, that**

the household appliance is provided for a method according to any one of the claims 1 to 11 and/or the household appliance comprises a system according to claim 12.

14. A cooking hob with at least one cooking zone, **characterized in, that**

the cooking hob is provided for a method according to any one of the claims 1 to 11 and/or the cooking hob comprises a system according to claim 12.

15. A computer program product stored on a computer usable medium, comprising computer readable program means for causing a computer to perform a method according to any one of the claims 1 to 11.



EUROPEAN SEARCH REPORT

Application Number
EP 11 18 6832

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	WO 2009/050117 A1 (BSH BOSCH SIEMENS HAUSGERAETE [DE]; ALONSO FORMENTO FERNANDO [ES]; ALO) 23 April 2009 (2009-04-23) * the whole document * -----	1-15	INV. F24C7/08
			TECHNICAL FIELDS SEARCHED (IPC)
			F24C
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 2 April 2012	Examiner Rodriguez, Alexander
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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EPO FORM 1503 03.82 (P04C01)

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7

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- WO 2008116719 A2 [0004]
- WO 2009000740 A2 [0005]