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(54) **METHOD AND DEVICE FOR COOLING FOOD PRODUCTS**

(57) There is described a method for cooling a food product (2) comprising at least the steps of placing the food product (2) to be cooled into a cooling space (4) of a cooling device (1), estimating and/or calculating a cooling time needed to cool the food product (2) from a pre-determined upper temperature limit to a pre-determined lower temperature limit, comparing the estimated and/or calculated cooling time with a pre-determined maximum cooling time and releasing and/or prompting an alert signal indicating the risk of the cooling time exceeding the pre-determined maximum cooling time if the estimated and/or calculated cooling time is larger than the pre-determined maximum cooling time. There is also described a cooling device (1) for cooling a food product comprising a cooling space (4) for receiving the food product (2) to be cooled, a calculation unit configured to estimate and/or calculate a cooling time needed to cool the food product (2) from a pre-determined upper temperature limit to a pre-determined lower temperature limit and to compare the estimated and/or calculated cooling time with a pre-determined maximum cooling time, and an alert unit configured to release an alert signal indicating the risk of the cooling time exceeding the pre-determined maximum cooling time if the estimated and/or calculated cooling time is larger than the pre-determined maximum cooling time.

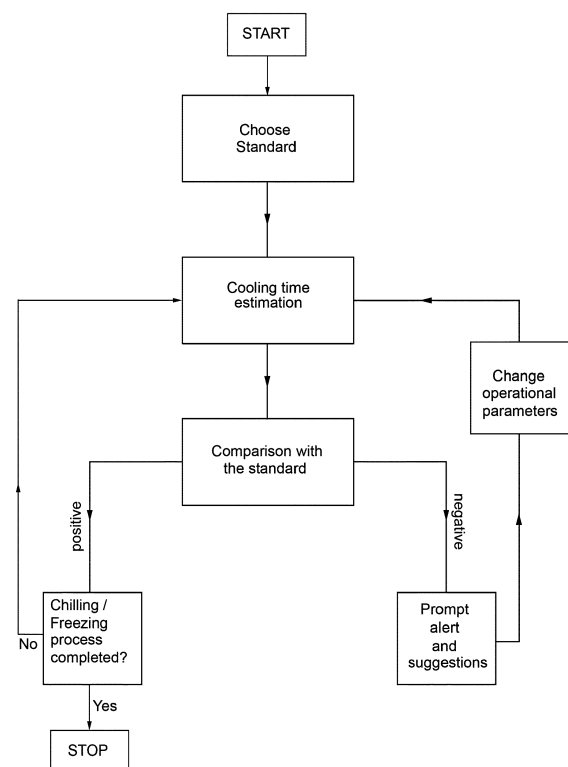


FIG. 3

Description

[0001] The present invention relates to a method for cooling food products, in particular thermally treated food products, even more particular cooked food products.

[0002] Advantageously, the present invention also relates to a cooling device for cooling food products, in particular thermally treated food products, even more particular cooked food products.

[0003] Cooling devices such as blast chillers or blast freezers, are particularly known in the professional kitchen services sector. The purpose of such cooling devices resides in cooling a cooked food product immediately after its preparation for preservation purposes.

[0004] A typical cooling device comprises a cooling chamber delimiting a cooling space of the cooling device and a door moveable between an open position and a closed position at which the door respectively allows the insertion and/or removal of the food product into and/or from the cooling space and to close and/or seal the cooling space.

[0005] A typical cooling device also comprises a temperature sensor configured to determine and/or measure a temperature of the food product, in particular so as to monitor the temperature course of the food product during its cooling within the cooling space.

[0006] A typical cooling device also comprises a display window configured to display information such as the temperature within the cooling space and/or the product temperature of the food product being disposed within the cooling space and/or operational parameters such as set-point temperatures. In some cases, such a display window is part of a human-machine interface allowing to set the operational parameters of the cooling device.

[0007] It is known that the operation of the cooling device should guarantee that the time that the food product has a temperature between roughly 57°C and 8°C is limited as this is the temperature range at which bacterial growth is the fastest. In this context, it must be mentioned that varying national standards have been developed, which define a maximum cooling time allowed for controlling the food product from a pre-defined upper temperature limit to a pre-defined lower temperature limit in order for the food product being considered to be in conformity with the safety standards otherwise the food product is to be considered to not to be in conformity. E.g. one national standard foresees that the maximum cooling time of the food product from 63 °C to 10 °C must not exceed 110 minutes.

[0008] Some cooling devices are configured to determine the real cooling time from the upper temperature limit to the lower temperature limit and compare the real cooling time with the maximum cooling time allowed. In the case that the real cooling time exceeds this maximum cooling time, the cooling device releases an alert signal indicating that the food product was not cooled according to the safety standards, meaning that the cooled food product is not suitable to be consumed by costumers

leading to unwanted and undesired commercial losses.

[0009] Thus, a need is felt in the sector to improve the known cooling device and/or the known methods for cooling food products.

[0010] One aim of the present invention is to provide for a method for cooling food products, in particular cooled food products, to overcome, in a straightforward manner, at least one of the aforementioned drawbacks.

[0011] Another aim of the present invention is to provide for a cooling device for cooling food products, in particular cooled food products, to overcome, in a straightforward manner, at least one of the aforementioned drawbacks.

[0012] According to the present invention, there is provided a method and a cooling device according to the respective independent claims.

[0013] Preferred non-limiting embodiments are claimed in the respective dependent claims.

[0014] In addition, according to the present invention, there is provided a method for cooling, in particular chilling or freezing, a food product comprising at least the steps of placing a food product to be cooled, in particular to be chilled or to be frozen, into a cooling space of a cooling device, estimating and/or calculating a cooling time needed to cool the food product from a pre-determined upper temperature limit to a pre-determined lower temperature limit, comparing the estimated and/or calculated cooling time with a pre-determined maximum cooling time and releasing and/or prompting an alert signal indicating the risk of the cooling time exceeding the pre-determined maximum cooling time if the estimated and/or calculated cooling time is larger than the pre-determined maximum cooling time. According to such a method, a user is alerted about the risk of not conforming with a safety standard as expressed in the pre-determined upper, lower temperature limits and the maximum cooling time.

[0015] According to a preferred non-limiting embodiment, a step of estimating and/or calculating is executed prior to the food product reaching the pre-determined upper temperature limit and/or prior to reaching the pre-determined lower temperature limit. As the user is alerted about the risk of non-conformity sufficiently early, the user has time to institute counter-measures so as to conform, at the end of the cooling process, with the safety standard.

[0016] According to a preferred non-limiting embodiment, the cooling device comprises an information display and during the step of releasing and/or prompting the alert signal, an information about the risk of the cooling time exceeding the pre-determined maximum cooling time is displayed in the information display, in particular within a pop-up window appearing in the information display. This allows to visually drawing the attention of a user to the possible risk of non-conformance.

[0017] According to a preferred non-limiting embodiment, the alert signal contains information inviting and/or signalling and/or suggesting a user to modify operating

parameters of the cooling device. In such a manner the user is aided in determining the correct counter-measures so as to obtaining a food produce 2 conforming at the end of the cooling process with the safety standard applied.

[0018] According to a preferred non-limiting embodiment, the method also comprises a step of adjusting and/or setting operating parameters of the cooling device. This allows a user to define some details of the cooling process.

[0019] According to a preferred non-limiting embodiment, the method also comprises at least one step of repetition, during which at least the steps of estimating and/or calculating, are repeated. In such a manner, it is possible to continuously and/or frequently and/or singularly control the conformity of the cooling process with the safety standard and not only at the beginning of the cooling process.

[0020] According to a preferred non-limiting embodiment, the method also comprises at least one step of adjusting and/or setting, which is executed after the steps of estimating and/or calculating, comparing and releasing and/or prompting and the step of repetition is executed after the step of adjusting and/or setting. This allows to control whether any change of the operating parameters resolves the problem of non-conformance with the safety standards.

[0021] According to a preferred non-limiting embodiment, the method further comprises a step of choosing and/or selecting and/or setting the pre-determined upper temperature limit, the pre-determined lower temperature limit and the pre-determined maximum cooling time. According to such an embodiment, the user can define, which safety standard has to be applied, possibly also according to the user's own standards.

[0022] According to a preferred non-limiting embodiment, the method also comprises a step of activating a cooling process for cooling the food product within the cooling space.

[0023] According to a preferred non-limiting embodiment, the method also comprises a step of determining and/or measuring the product temperature of the food product. In this way, it is possible to monitor the real-time course of the product temperature for monitoring and/or control purposes.

[0024] Advantageously, according to the present invention there is also provided a cooling device for cooling a food product comprising a cooling space for receiving the food product to be cooled, a calculation unit configured to estimate and/or calculate a cooling time needed to cool the food product from a pre-determined upper temperature limit to a pre-determined lower temperature limit and to compare the estimated and/or calculated cooling time with a pre-determined maximum cooling time, and an alert unit configured to release an alert signal indicating the risk of the cooling time exceeding the pre-determined maximum cooling time if the estimated and/or calculated cooling time is larger than the pre-determined

maximum cooling time. By providing for the calculation and the alert unit, it is possible to alert, in use, a user of the risk that the cooling process will not be executed according to the applied safety standards.

[0025] According to a preferred non-limiting embodiment, the cooling device comprises an information display and the alert unit is configured to trigger and/or control the appearance of an information about the risk of the cooling time exceeding the pre-determined maximum cooling time within the information display. This allows to visually alerting, in use, the risk of non-conformity to a user.

[0026] According to a preferred non-limiting embodiment, the cooling device further comprises a human-machine interface configured to allow for the setting and/or manipulation and/or insertion of operating parameters of the cooling device and/or for setting and/or manipulating and/or inserting the pre-determined upper temperature limit, the pre-determined lower temperature limit and the pre-determined maximum cooling time. The presence of the human-machine interface allows a user to operate and/or to set the cooling device according to the user's needs and/or any requirements and/or safety standards.

[0027] According to a preferred non-limiting embodiment, the cooling device further comprises a memory unit configured to store one or more parameter sets of pre-determined upper temperature limit, the pre-determined lower temperature limit and the pre-determined maximum cooling time. By providing for the memory unit it is possible to avoid to always set the parameter sets, but it is possible to store the needed ones and to retrieve these prior to operation of the cooling device or to rely on the previously chosen parameter set.

[0028] A non-limiting embodiment of the present invention will now be described, by way of example, with reference to the accompanying drawings, in which:

- Figure 1 is a schematic illustration of a cooling device according to the present invention, with parts removed for clarity;
- Figure 2 is a table indicating example national and customized safety standards;
- Figure 3 indicates a flow chart of the operation of the cooling device of Figure 1; and
- Figure 4 illustrates an example estimated and/or calculated temperature course of a food product during its cooling within the cooling device of Figure 1, with details removed for clarity.

[0029] With reference to Figure 1, number 1 indicates as a whole a cooling device for cooling a food product 2, in particular a thermally treated food product, even more particular a cooked food product.

[0030] Cooling device 1 is configured to cool, in particular to chill or to freeze, food products 2 as different as e.g. bakery goods, meat, fish, or any other heat-processed food product.

[0031] According to a preferred non-limiting embodi-

ment, cooling device 1 is configured to cool food product 2 from an initial product temperature to a defined and/or desired final product temperature.

[0032] According to a preferred non-limiting embodiment, cooling device 1 could be of the blast chilling type and/or of the blast freezing type. E.g. in the case of cooling device 1 being of the blast chilling type, cooling device 1 is adapted to cool, in particular to chill, food product 2 to a temperature between 5°C and 0°C and in the case of cooling device 1 being of the blast freezing-type, cooling device 1 is adapted to cool, in particular to freeze, food product 2 to a temperature below 0°C, in particular at least to -18°C or even lower.

[0033] Preferentially but not necessarily, cooling device 1 is controllable, e.g. by a user, so as to set the desired final product temperature and/or any other operational parameter of cooling device 1.

[0034] Preferentially but not necessarily, the core temperature of food product 2, as determined and/or measured at the core of food product 2 defines and/or corresponds to the product temperature of food product 2.

[0035] According to a preferred non-limiting embodiment, cooling device 1 comprises a cooling chamber 3 enclosing a cooling space 4 of cooling device 1. In particular, cooling space 4 being configured to receive at least one food product 2; i.e., in use, food product 2 is placed within cooling space 4 for cooling food product 2.

[0036] According to a preferred non-limiting embodiment, cooling device 1 also comprises a closing element, in particular a door 5, configured to selectively open and close cooling space 4.

[0037] According to a preferred non-limiting embodiment, door 5 is moveable between a closed position and an open position at which door 5 is configured to respectively open and close cooling space 4. In particular, with door 5 being controlled into the open configuration access to cooling space 4 is possible for introducing and/or removing food product 2 into and/or from cooling space 4.

[0038] Preferentially but not necessarily, door 5 is hinged to cooling chamber 3 for being moveable between the closed and open position.

[0039] According to a preferred non-limiting embodiment, cooling device 1 comprises a functional unit (not shown and known as such) configured to control the temperature, in particular to cool, cooling space 4. In particular, cooling cooling space 4 means that the functional unit is adapted to control the temperature within cooling space 4 to any defined temperature being below the ambient temperature. E.g. the functional unit is adapted to cool the cooling space to at least 5 °C and/or to at least 0°C and/or to at least -18 °C and/or to at least -41°C.

[0040] In particular, the functional unit is configured to control the temperature of cooling space 4 for cooling, in use, food product 2 placed within cooling space 4.

[0041] According to a preferred non-limiting embodiment, cooling device 1 further comprises at least one temperature sensor 6 configured to determine and/or measure the product temperature, in particular the prod-

uct temperature at the core of food product 2. In particular, temperature sensor 6 is configured to be inserted into food product 2.

[0042] With particular reference to Figure 2, it is known that, in particular in the professional food service sector, the cooling of food product 2 should and/or must follow according to defined safety standards. Such safety standards aim on guaranteeing on the preservation of food product 2 and to reduce as much as possible the growth of bacteria and/or other biological microorganisms. Furthermore, it should be noted that the bacterial growth is the fastest within a temperature range of 57°C to 8 °C.

[0043] In particular, the safety standards prescribe that a cooling time of food product 2 from a pre-defined upper temperature limit to a pre-defined lower temperature limit must not exceed a maximum cooling time in order that food product 2 is to be considered to be in conformity with a safety standard.

[0044] It should be noted that these safety standards can e.g. be national safety standards, but also customized safety standards can be considered.

[0045] With particular reference to Figure 2, three specific example safety standards are given. E.g. according to standard 1 the maximum cooling time allowed for chilling food product 2 from 63 °C to 10 °C is 110 minutes and for freezing food product 2 from 63 °C to -18 °C the maximum cooling time is 270 minutes.

[0046] With respect to the non-exhaustive examples given in Figure 2, standards 2 and 3 come along with different requirements. In particular, standard N reflects a nonspecific example, which e.g. can correspond to customized values or the nth national standard.

[0047] According to a preferred non-limiting embodiment, cooling device 1 further comprises a human-machine interface configured to allow for the setting and/or manipulation and/or insertion of:

- operating parameters of cooling device 1 such as a set point for a desired final temperature within cooling space 4 and/or a set point for a desired final product temperature; and/or
- the pre-determined upper temperature limit, the pre-determined lower temperature limit and the pre-determined maximum cooling time.

[0048] According to a preferred non-limiting embodiment, cooling device 1 comprises a memory unit to store one or more parameter sets of pre-determined upper temperature limit, the pre-determined lower temperature limit and the pre-determined maximum cooling time. In particular, each parameter set corresponds to a respective safety standard.

[0049] According to a preferred non-limiting embodiment, cooling device 1, in particular the human-machine interface, is configured such that a user is adapted to set and/or manipulate and/or insert one or more parameter sets into the memory unit.

[0050] In alternative or in addition, the memory unit contains one or more parameter sets according to factory settings of cooling device 1.

[0051] According to a preferred non-limiting embodiment, the human-machine interface is configured to allow a user for choosing and/or defining one parameter set prior and/or during and/or after operation of cooling device 1.

[0052] According to a preferred non-limiting embodiment, cooling device 1, in particular the human-machine interface, further comprises an information display configured to display information, such as the temperature within cooling space 4 and/or the product temperature of food product 2 and/or operational parameters of cooling device 1 and/or the parameter sets and/or the parameter set chosen and/or the predetermined upper temperature limit and/or the pre-determined lower temperature limit and/or the pre-determined maximum cooling time and/or the already passes cooling time and/or other information.

[0053] According to a preferred non-limiting embodiment, cooling device 1 also comprises a monitoring unit operatively connected to temperature sensor 6 and configured to monitor the product temperature in dependence of time, e.g. for determining a real-time course of the product temperature during the cooling process.

[0054] Advantageously, cooling device 1 further comprises a calculation unit configured to estimate and/or calculate the cooling time needed to cool food product 2 from the pre-determined upper temperature limit to the pre-determined lower temperature limit and to compare the estimated and/or calculated cooling time with the pre-determined maximum cooling time. In particular, the calculation unit is configured to estimate and/or calculate whether the time needed to cool food product 2 once it has, in use, reached the pre-determined upper temperature and to the pre-determined lower temperature exceeds or not the pre-determined maximum cooling time.

[0055] According to a preferred non-limiting embodiment, the calculation unit is configured to estimate and/or calculate the cooling time in dependence of the set point of the final product temperature and/or of the type and/or kind and/or format and/or size of food product 2 and/or the initial product temperature and/or any other operational parameter of cooling device 1.

[0056] With particular reference to Figure 4, the calculation unit is configured to estimate and/or calculate the time-dependent temperature curve of the product temperature, in particular starting from the initial product temperature, and to estimate and/or calculate the cooling time from the pre-determined upper temperature limit to the pre-determined lower temperature limit according to the estimated and/or calculated temperature curve.

[0057] In particular, it should be noted that, in use, the initial temperature of food product 2 is higher than the pre-determined upper temperature limit.

[0058] According to a preferred non-limiting embodiment, the calculation unit is configured to estimate and/or calculate the cooling time prior to the product tempera-

ture reaching the pre-determined upper temperature limit and/or the pre-determined lower temperature limit.

[0059] Advantageously, cooling device 1 comprises an alert unit configured to release an alert signal indicating the risk of the cooling time exceeding the pre-determined maximum cooling time if the estimated and/or calculated cooling time, in particular as estimated and/or calculated by the calculation unit, is larger than and/or exceeds the pre-determined maximum cooling time.

[0060] Preferentially but not necessarily, the alert unit is configured to trigger and/or control the appearance of an information, in particular within a pop-up window, about the risk of the cooling time exceeding the pre-determined maximum cooling time within the information display.

[0061] Preferentially but not necessarily, the alert unit is also configured to trigger and/or control the appearance of an information inviting and/or signalling and/or suggesting a user to modify operating parameters of cooling device 1, such as e.g. the set point of the final product temperature and/or any other operating parameter.

[0062] In use, cooling device 1 cools food product 2 from the initial product temperature to the final product temperature.

[0063] With particular reference to Figure 3, the method of cooling food product 2, in particular by means of cooling device 1, comprises at least the following steps:

- placing food product 2 into cooling space 4;
- estimating and/or calculating the cooling time needed to cool, in particular to chill or freeze, food product 2 from the pre-determined upper temperature limit to the pre-determined lower temperature limit;
- comparing the estimated and/or calculated cooling time with the pre-determined maximum cooling time; and
- releasing and/or prompting the alert signal indicating the risk of the cooling time exceeding the pre-determined maximum cooling time if the estimated and/or calculated cooling time is larger than the pre-determined maximum cooling time.

[0064] According to a preferred non-limiting embodiment, the step of placing is executed prior to the steps of estimating and/or calculating and comparing and releasing and/or prompting.

[0065] According to a preferred non-limiting embodiment, the step of estimating and/or calculating is executed prior to the step of comparing and the step of comparing is executed prior to the step of releasing and/or prompting.

[0066] According to a preferred non-limiting embodiment, the method also comprises a step of inserting temperature sensor 6 into food product 2, in particular being executed after the step of placing and prior to the step of estimating and/or calculating.

[0067] According to a preferred non-limiting embodi-

ment, the method also comprises a step of moving door 5 between the closed and open configuration. In particular, the door 5 is moved into the open configuration prior to the step of placing and is moved into the closed configuration after the step of placing and/or the step of inserting.

[0068] According to a preferred non-limiting embodiment, the method also comprises a step of activating a cooling process during which food product 2 (placed within cooling space 4 is cooled, in particular chilled or frozen, from the initial product temperature to the final product temperature. In particular, the functional unit is activated during the step of activating.

[0069] According to a preferred non-limiting embodiment, the method also comprises a step of monitoring, in particular executed during the cooling process, during which, in particular by the monitoring unit, the product temperature is monitored in dependence of time.

[0070] According to a preferred non-limiting embodiment, the method also comprises a step of adjusting and/or setting operating parameters of cooling device 1. In particular, the step of adjusting and/or setting can be executed prior and/or during and/or after the step of placing and/or the step of estimating and/or calculating and/or the step of comparing and/or the step of releasing and/or prompting.

[0071] Preferentially but not necessarily, the step of adjusting and/or setting comprises a sub-step of setting the set point of the final product temperature.

[0072] According to a preferred non-limiting embodiment, the method also comprises a step of determining and/or measuring the product temperature of food product 2.

[0073] According to a preferred non-limiting embodiment, the step of estimating and/or calculating is executed prior to food product 2 reaching the pre-determined upper temperature limit and/or prior to reaching the pre-determined lower temperature limit.

[0074] Preferentially but not necessarily, the step of estimating and/or calculating is executed immediately after the step of placing. In particular, immediately after means that this step is executed with food product 2 being arranged and door 5 being moved into the closed position and/or with temperature sensor 6 being inserted into food product 2.

[0075] According to a preferred non-limiting embodiment, during the step of estimating and/or calculating, the calculation unit estimates and/or calculates the estimated and/or calculated cooling time.

[0076] Preferentially but not necessarily, the calculation unit estimates and/or calculates the time-dependent temperature curve of the product temperature and estimates and/or calculates the cooling time from the pre-determined upper temperature limit to the pre-determined lower temperature limit according to the estimated and/or calculated temperature curve.

[0077] According to a preferred non-limiting embodiment, during the step of comparing, the calculation unit

compares the estimated and/or calculated cooling time with the maximum cooling time.

[0078] According to a preferred non-limiting embodiment, during the step of releasing and/or prompting the alert signal, the information about the risk of the cooling time exceeding the pre-determined maximum cooling time is displayed in the information display, in particular in a pop-up window appearing within the information display.

[0079] Alternatively or in addition, the step of releasing and/or prompting comprises the release of an acoustic signal and/or further visual signals and/or the emission of other digital signals such as the sending of an e-mail and/or of a short message (SMS) and/or similar.

[0080] According to a preferred non-limiting embodiment, the alert signal contains information inviting and/or signalling and/or suggesting a user to modify operating parameters of cooling device 1, such as the set point of the final temperature.

[0081] Preferentially but not necessarily, the step of adjusting and/or setting, is newly executed, in particular by a user, after the release of the alert signal.

[0082] Preferentially but not necessarily, the method also comprises at least one step of repetition, during which at least the steps of estimating and/or calculating and comparing are repeated and, in particular if applicable (i.e. if the estimated and/or calculated cooling time is above the pre-determined maximum cooling time), also the step of releasing and/or prompting.

[0083] Preferentially but not necessarily, the step of repetition is executed after a change of the operating parameters of cooling device 1 and/or after the step of adjusting and/or setting.

[0084] Alternatively or in addition, the step of repetition is frequently and/or continuously and/or singularly executed during the cooling of food product 2 from the initial product temperature to the final product temperature so as to frequently and/or continuously and/or singularly control the compliance of the cooling of food product 2 with the respective safety standard.

[0085] According to a preferred non-limiting embodiment, the method also comprises a step of confirming, during which a signal is issued (e.g. on the display window and/or another visual signal and/or another acoustic signal and/or any other kind of signal) indicating that the estimated and/or calculated cooling time is in conformance and/or is identical and/or below the maximum cooling time.

[0086] According to a preferred non-limiting embodiment, the method also comprises a step of choosing and/or selecting and/or setting the pre-determined upper temperature limit, the pre-determined lower temperature limit and the pre-determined maximum cooling time and/or the parameter set to be used. In particular, the step of choosing and/or selecting and/or setting is executed by a user and, in particular through the human-machine interface.

[0087] The advantages of the method and cooling de-

vice 1 according to the present invention will be clear from the foregoing description.

[0088] In particular, the method and cooling device 1 allow alerting a user immediately at the beginning of the cooling process of a possible risk of not conforming the standard requirements.

[0089] Clearly, changes may be made to the method and cooling device 1 without, however, departing from the scope of the present invention.

Claims

1. Method for cooling a food product (2) comprising at least the steps of:

- placing the food product (2) to be cooled into a cooling space (4) of a cooling device (1);
- estimating and/or calculating a cooling time needed to cool the food product (2) from a pre-determined upper temperature limit to a pre-determined lower temperature limit;
- comparing the estimated and/or calculated cooling time with a pre-determined maximum cooling time; and
- releasing and/or prompting an alert signal indicating the risk of the cooling time exceeding the pre-determined maximum cooling time if the estimated and/or calculated cooling time is larger than the pre-determined maximum cooling time.

2. Method according to claim 1, wherein the step of estimating and/or calculating is executed prior to the food product (2) reaching the pre-determined upper temperature limit and/or prior to reaching the pre-determined lower temperature limit.

3. Method according to claim 1 or 2, wherein the cooling device (1) comprises an information display; wherein during the step of releasing and/or prompting the alert signal, an information about the risk of the cooling time exceeding the pre-determined maximum cooling time is displayed in the information display.

4. Method according to claim 2, wherein during the step of releasing and/or prompting the alert signal, the information is displayed in a pop-up window.

5. Method according to any one of the preceding claims, wherein the alert signal contains information inviting and/or signalling and/or suggesting a user to modify operating parameters of the cooling device (1).

6. Method according to any one of the preceding claims, further comprising a step of adjusting and/or

setting operating parameters of the cooling device (1).

7. Method according to any one of the preceding claims, further comprising at least one step of repetition, during which at least the steps of estimating and/or calculating, are repeated.

8. Method according to claim 6, further comprising at least one step of adjusting and/or setting, which is executed after the steps of estimating and/or calculating, comparing and releasing and/or prompting; wherein the step of repetition is executed after the step of adjusting and/or setting.

9. Method according to any one of the preceding claims, further comprising a step of choosing and/or selecting and/or setting the pre-determined upper temperature limit, the pre-determined lower temperature limit and the pre-determined maximum cooling time.

10. Method according to any one of the preceding claims, further comprising a step of activating a cooling process for cooling the food product (2) within the cooling space (4).

11. Method according to any one of the preceding claims, further comprising a step of determining and/or measuring a product temperature of the food product (2).

12. Cooling device (1) for cooling a food product comprising:

- a cooling space (4) for receiving the food product (2) to be cooled;
- a calculation unit configured to estimate and/or calculate a cooling time needed to cool the food product (2) from a pre-determined upper temperature limit to a pre-determined lower temperature limit and to compare the estimated and/or calculated cooling time with a pre-determined maximum cooling time; and
- an alert unit configured to release an alert signal indicating the risk of the cooling time exceeding the pre-determined maximum cooling time if the estimated and/or calculated cooling time is larger than the pre-determined maximum cooling time.

13. Cooling device according to claim 12, further comprising an information display; wherein the alert unit is configured to trigger and/or control the appearance of an information about the risk of the cooling time exceeding the pre-determined maximum cooling time within the information display.

14. Cooling device according to claim 12 or 13, further comprising a human-machine interface configured to allow for the setting and/or manipulation and/or insertion of operating parameters of the cooling device (1) and/or for setting and/or manipulating and/or inserting the pre-determined upper temperature limit, the pre-determined lower temperature limit and the pre-determined maximum cooling time. 5
15. Cooling device according to any one of claims 11 to 14, further comprising a memory unit being configured to store one or more parameter sets, each parameter set containing at least a respective pre-determined upper temperature limit, a respective pre-determined lower temperature limit and a respective pre-determined maximum cooling time. 10 15

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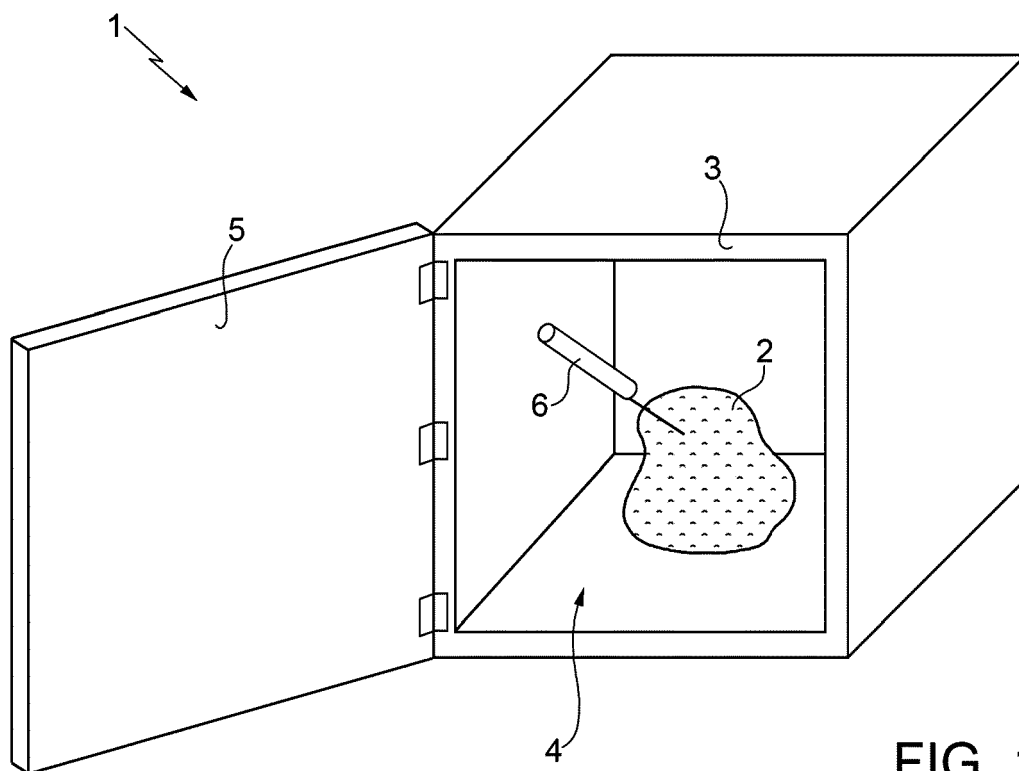


FIG. 1

Standard	CHILLING			FREEZING	
	Upper temperature limit	Lower temperature limit	Duration	Lower temperature limit	Duration
1	+63°C	+10°C	110 minutes	-18°C	270 minutes
2	+70°C	+3°C	90 minutes	-18°C	240 minutes
3	+57°C	+4°C	240 minutes	-18°C	360 minutes
N	#	#	#	#	#

FIG. 2

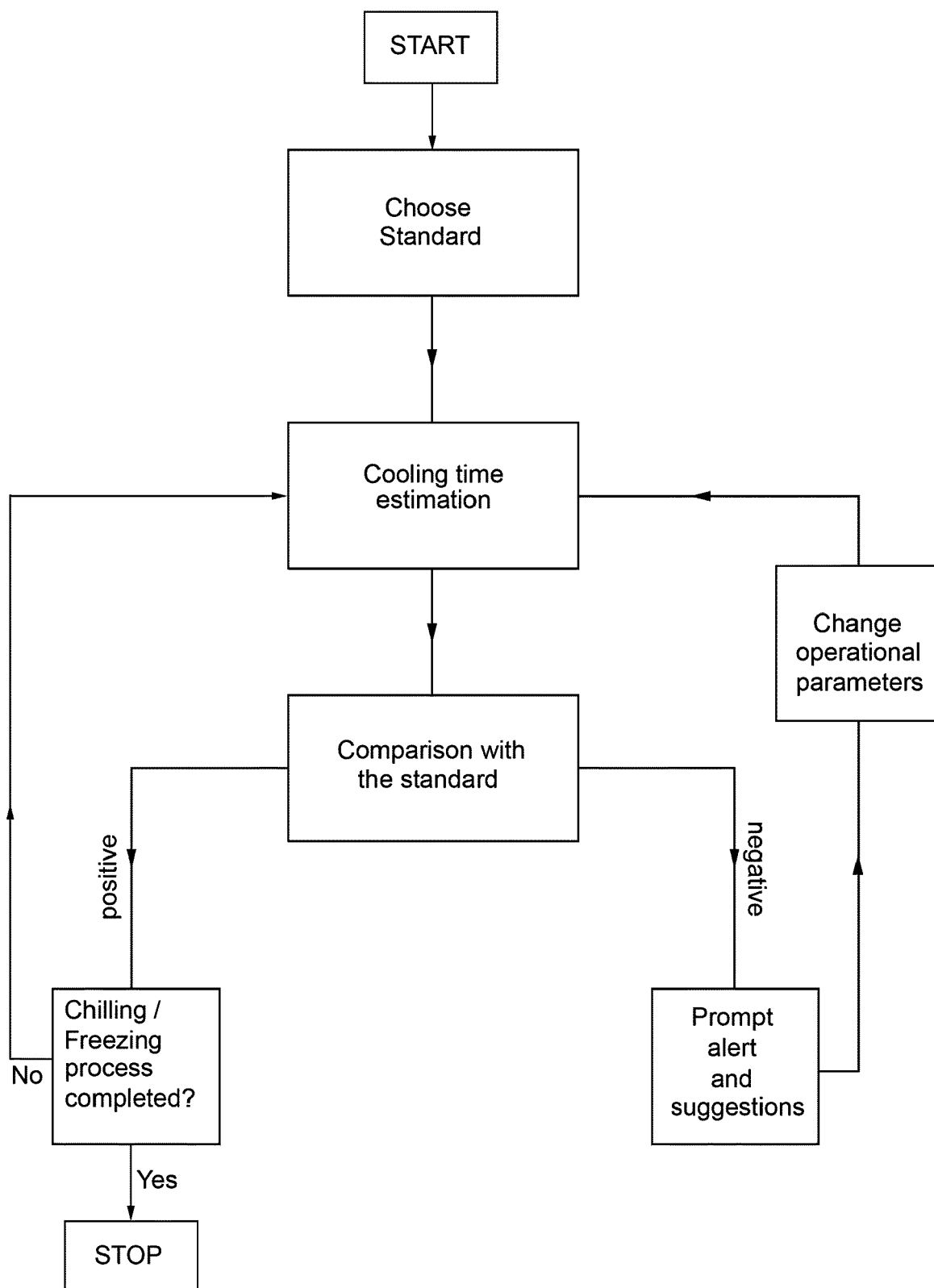


FIG. 3

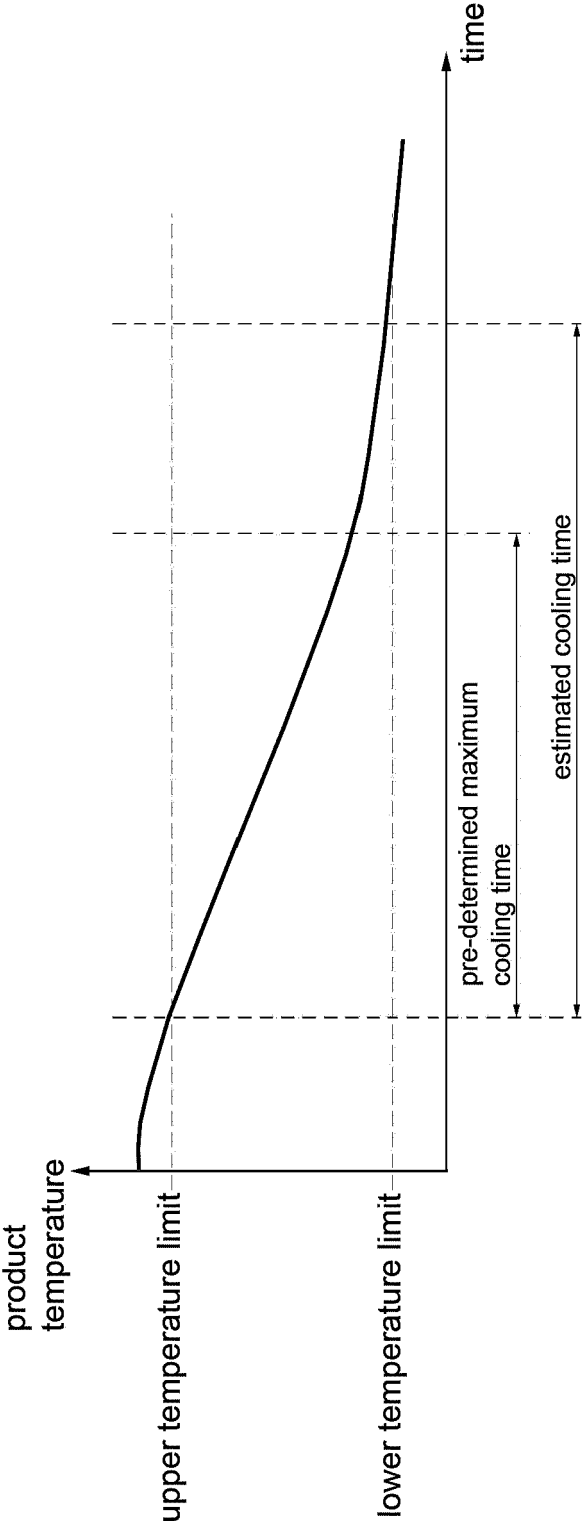


FIG. 4



EUROPEAN SEARCH REPORT

 Application Number
 EP 19 16 0325

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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	JP 2000 234832 A (SANYO ELECTRIC CO) 29 August 2000 (2000-08-29) * paragraphs [0004] - [0027]; figures 1-4 *	1-15	INV. F25D29/00
A	----- US 5 798 694 A (REBER WILLIAM L [US] ET AL) 25 August 1998 (1998-08-25) * page 4, line 14 - page 5, line 6; figures 1-4 *	1,12	
A	----- US 2018/224150 A1 (LEWIS STEVEN [US] ET AL) 9 August 2018 (2018-08-09) * the whole document *	1	
			TECHNICAL FIELDS SEARCHED (IPC)
			F25D
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 21 August 2019	Examiner Kolev, Ivelin
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			

 2
 EPO FORM 1503 03/02 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 19 16 0325

5 This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

21-08-2019

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
JP 2000234832 A	29-08-2000	JP 4104236 B2 JP 2000234832 A	18-06-2008 29-08-2000
US 5798694 A	25-08-1998	US 5798694 A US 5969606 A	25-08-1998 19-10-1999
US 2018224150 A1	09-08-2018	NONE	