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Technical field

The invention is related to a method for cooking food in a cooking device.

5 Background

EP723115 describes a method for cooking meat where the cooking chamber is heated up with hot air in a food temperature regulating phase in such a way that the food temperature follows a time-dependent desired food temperature function. In this way a certain food temperature (core temperature) can be reached at a desired time. However, it has been found that it takes relatively long until the food has been cooked by following this procedure because the slope of the time-dependent desired food temperature function must not be chosen to be too steep in order to avoid local overheating at the meat surface.

20 Disclosure of the invention

The invention has the objective to provide a method of this type, which makes it possible to cook the food quickly but at the same time in a gentle manner. This objective is solved by the subject matter of the independent claim.

According to this, the food temperature is measured. Furthermore, a cooking chamber temperature in the cooking chamber outside the food is controlled, at least during a food temperature regulating phase of the cooking period, in such a way that the food temperature follows a time-dependent desired food temperature function. For this purpose the cooking chamber is at least partially heated up by heated steam (optionally by also using further heating means), with the result that a more efficient heat input in the food is made possible without having to use a very high temperature in the

cooking chamber. In order to avoid a wash out of the food by the steam, the food is arranged in a bag in the cooking chamber.

Preferably, the desired food temperature function is chosen such that it rises up to an end food temperature such that the desired core temperature is reached at the end of the food temperature regulating phase. In this case the cooking duration or the end time when the food shall be finished can be preset in the way described in EP 723115.

Advantageously it should be taken care that the cooking chamber temperature never rises too much. In a preferred embodiment this can be achieved by controlling the cooking chamber temperature in such a way that it surpasses the end food temperature by maximally 20°C, particularly maximally 15°C, particularly maximally 10°C. Alternatively or additionally the cooking chamber temperature can be controlled in such a way that it doesn't surpass a predefined fixed limit temperature, wherein the fixed limit temperature is smaller than 90°C, particularly smaller than 80°C, particularly smaller than 70°C.

As soon as the corresponding limit temperature is reached, the temperature is lowered below the desired food temperature function in order to make sure that the cooking chamber temperature doesn't rise further.

The invention is particularly suitable to cook meat (wherein in the present context fish is also counted as meat), because in this case the cooking process can be terminated after reaching the desired core temperature. The method may however also be used for other types of food, i.e. vegetables.

35 Short description of the drawings

Further embodiments, advantages and applications of the invention result from the dependent claims and from the now following description by means of the figures. Thereby it is shown in:

5 Fig. 1 the most important components of a cooking device and

 Fig. 2 the qualitative course of the food temperature TGG, the cooking chamber temperature TGR and the desired food temperature TGS.

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Ways of carrying out the invention

 The cooking device according to Fig. 1 has a cooking chamber 1 for receiving the food 2, i.e. on a
15 metal plate or a grid 3. Furthermore, the device has a controller 4 and a steam generator 5. The steam generator 5 serves to heat up the cooking chamber 1 by means of steam. Further means for heating up the cooking chamber may also be present, e.g. resistive heaters. The cooking
20 device is preferably an oven with a steam cooking function, it may however also be e.g. a pure steam cooking device.

 The controller 4 comprises, amongst others, means 6 for generating a desired food temperature
25 function, meaning a time-dependent desired value TGGs of the food temperature TGG. The means 6 may e.g. be a memory and computing means which generate such a function in a known way. Preferably, the means 6 is formed such that the desired food temperature function rises
30 monotonously in a food temperature regulating phase of the device starting from a start value, particularly strictly monotonously, up to an end food temperature TGGE.

 Furthermore, the controller 4 comprises a
35 first regulator 7 (i.e. loop controller) and a second regulator 8 (i.e. loop controller), each of which compare a current value with desired value and generate a

controlling variable in such a way that the current value adapts to the desired value.

The first regulator 7 is connected to a food temperature measurement probe 10. The latter measures the food temperature TGG approximately in the middle of the food 2, this being the so-called core temperature. The desired value TGGs of the food temperature is supplied by the means 6 as desired value to the regulator 7. The regulator 7 compares the food temperature TGG and its desired value TGGs and generates from it a desired cooking chamber temperature TGRS which is chosen in such a way that the food temperature TGG tends to reach its desired value TGGs.

The second regulator 8 is connected to a cooking chamber temperature measurement probe 11. It measures the cooking chamber temperature TGR. The second regulator receives the desired value TGGs from the first regulator, compares it with the current cooking chamber temperature TGR and generates from it a control signal for the steam generator. This control signal controls the steam generation and is chosen in such a way that the cooking chamber temperature TGR tends to reach its desired value TGRS.

The regulators 7 and/or 8 or generally the controller 4 are advantageously formed in such a way that the food temperature doesn't surpass a limit temperature TLIM, at least during a part of the cooking process, not even if a higher cooking chamber temperature would actually be desirable for reaching the desired value TGGs. In this way a thermal damage of the food surface can be avoided. The limit temperature TLIM is preferably chosen depending on the desired end food temperature TGGE, particularly in such a way that the limit temperature TLIM is maximally 20°, particularly maximally 15°, particularly maximally 10°, higher than the end food temperature TGGE. Additionally or alternatively, the limit temperature TLIM may also be chosen independently

from the end food temperature. In this case the value of the limit temperature TLIM is of preferably maximally 90°C, particularly maximally 80°C, particularly maximally 70°C. The limit temperature TLIM normally depends on the food to be cooked.

In the following the cooking method carried out with the above cooking device will be described. It has to be noted, though, that the described cooking method only matches one of multiple possible operating modes of the cooking device. The cooking device is normally able to cook food also by employing other conventional methods.

If the user wishes to choose the operating mode described herein, he packs the food 2 into a bag 14 before cooking. For this purpose, a, preferably flexible, bag 14 is used, which can be sealed in a gas-tight manner. Optionally, the bag 14 may have an overpressure valve in order to release gas coming out of the food to the environment.

Preferably, the bag with the food is at least partially evacuated before cooking, such that it is under underpressure with respect to the cooking chamber 1 and abuts against the food.

The bag 14 has multiple advantages. On the one hand it avoids that the food is washed out by condensing steam, as already mentioned. Furthermore, it keeps the juice as well as possible marinades and spices within the food, particularly when it is at least partially evacuated.

It also avoids that the food is dried out, thus improving the heat transfer in the food, this resulting amongst others in the possibility of increasing the core temperature or the food temperature, respectively, faster.

An at least partial evacuation of the bag 14 also has the advantage that the heat transfer from the

cooking chamber 1 to the food is better than in case the bag wouldn't rest against the food.

Before cooking, the food temperature measurement probe 10 is inserted into the food. In the embodiment according to Fig. 1 the measurement probe 10 has been inserted into the food 2 through a sealing plate 15 and the bag 14. It is the task of the sealing plate 15 to seal the location where the measurement probe 10 has entered the food through the bag. The sealing plate 15 preferably consists of an elastic material with sealing properties, like e.g. an elastomer, and is glued to the bag 14. Other sealing means of suitable types are also conceivable.

Alternatively to this, the food temperature measurement probe 10 can also be inserted into the food 2 before the latter is inserted into the bag 14. In this case the food temperature measurement probe 10 can e.g. communicate with the controller 4 in a wireless way, or a cable can be guided to the exterior through the bag opening 16.

The food 2 provided with the measurement probe 10 and sealed in the bag 14 is then inserted into the cooking chamber 1, and the cooking program is initiated. The following steps of this cooking program run automatically and are controlled by the controller 4. The course of the cooking temperature TGG, of the desired food temperature TGGs and the cooking chamber temperature TGR during the cooking program are shown in Fig. 2.

The cooking program starts at a time t_0 . First the steam generator 5 is activated, such that the cooking chamber temperature TGR starts increasing. (Optionally the cooking chamber can be also heated e.g. by a resistive heater or another suitable heating means.) At a time t_1 (which can be identical to the time t_0 or which can be after the time t_0) the food temperature regulating phase starts, during which the desired food temperature is generated by the means 6 and the

regulators 7 and 8 operate as described above. In the present embodiment the food temperature regulating phase extends over the time interval t_1 to t_4 .

The desired food temperature function generated by the means 6 is shown in Fig. 2 exemplarily in a dashed way as a slope which rises linearly e.g. from the ambient temperature at the time t_1 up to the end food temperature TGGE at the time t_4 . The time interval t_1 to t_4 may be preset depending on the food type. Alternatively or additionally it can also be preset, within certain boundaries, by the user by inputting the time t_4 , e.g. in the way described in EP 723115. For meat, the duration from t_1 to t_4 preferably amounts to 0.5 - 3 hours, particularly 1 - 2 hours.

In the example according to Fig. 2 the food temperature at the time t_1 is relatively low (e.g. because the food comes out of the refrigerator), this being the reason why the first regulator 7 tends to prescribe a relatively high desired cooking chamber temperature TGRS, which is, however, prevented by reaching the upper limit TLIM at the time t_2 . In the example according to Fig. 2, in the time interval t_2 to t_3 the desired cooking chamber temperature TGRS is limited to TLIM. By this, an excessive overheating of the food surface is avoided. This is only an example - depending on the food, weight and temperature as well as further parameters the upper limit TLIM may also be reached in other process phases or even never.

In any case the food temperature rises and it reaches such a high value at the time t_3 that the regulator 7 prescribes a desired cooking chamber temperature TGRS which is lower than TLIM, and an actual regulation of the food temperature TGG to the corresponding desired value TGGS can take place. In this way the food temperature TGG follows the desired food temperature function until the time t_4 .

In the example according to Fig. 2 a high temperature phase is carried out after the food temperature regulation phase, starting from the time t_4 . Its aim is to clear the juice which came out of the food as well as to brown a little the food surface, this being considered advantageous, particularly for meat.

For this, the cooking chamber temperature is kept during the high temperature phase at least for a minute at at least 80°C , advantageously during 1 to 10 minutes at 80° to 100°C .

After the high temperature phase the cooking chamber temperature TGR should be decreased as soon as possible in order to avoid temperature damages inside the food. For this, the cooking chamber may be ventilated, or, speaking more generally, more intense ventilation takes place in the high temperature phase as compared to the food temperature regulating phase.

Thereafter the food is finished and may be taken out of the cooking chamber.

Notes:

The steam generator 5 can generate steam at around 100°C . It is however conceivable that a steam generator 5 is used which generates overheated steam at a temperature above 100°C .

The described method is well suited, as mentioned at the beginning, for meat in particular. In this case the end food temperature TGGE is chosen according to the generally known advantageous core temperature of the respective meat type.

The method may however also be used e.g. for vegetables. In this case the food temperature at the end of the food temperature regulating phase shall be kept at the desired end food temperature TGGE for a while.

The temperature TGR in the cooking chamber 1 is preferably always below 100°C during the entire

method. Despite this, a good heat input into the food is possible by using steam.

While preferred embodiments of the invention have been described in this application, it is clearly
5 noted that the invention is not restricted to them and may be carried out in other ways within the scope of the now following claims.

P a t e n t k r a v

1. Fremgangsmåde til at tilberede en fødevare (2) i en tilberedningsindretning med et tilberedningskammer (1) i løbet af et tilberedningstidsrum, hvor en
5 fødevaretilberedningstemperatur (TGG) måles, og hvor tilberedningskammertemperaturen (TGR) i det mindste under en fødevaretilberedningstemperatur-reguleringsfase af tilberedningsvarigheden styres i tilberedningskammeret uden for fødevaren (2) på en sådan måde, at fødevaretilberedningstemperaturen (TGG) følger et tidsafhængigt fødevaretilberedningstemperatur-
10 indstillingsværdiforløb, **kendetegnet ved, at** tilberedningskammeret (1) i det mindste delvist opvarmes ved hjælp af opvarmet damp, og at fødevaren (2) er anbragt i en pose (14) i tilberedningskammeret (1).
2. Fremgangsmåde ifølge krav 1, hvor fødevaretilberedningstemperaturindstillingsværdiforløbet vælges på en sådan måde, at det stiger monotont med tiden indtil en slut-fødevaretilberedningstemperatur (TGGE).
3. Fremgangsmåde ifølge krav 2, hvor tilberedningskammertemperaturen (TGR) styres på en sådan måde, at den ikke overskrider en grænsetemperatur (TLIM), hvor grænsetemperaturen (TLIM) er valgt afhængigt af slut-fødevaretilberedningstemperaturen (TGGE), og især hvor grænsetemperaturen (TLIM) ligger højst 20°, især højst 15°, især højst 10°, over temperaturen på slut-fødevaretilberedningstemperaturen (TGGE).
- 20
4. Fremgangsmåde ifølge et af kravene 1 eller 2, hvor tilberedningskammertemperaturen (TGR) styres på en sådan måde, at den ikke overskrider en grænsetemperatur (TLIM), hvor den faste grænsetemperatur er mindre end 90°C, især mindre end 80°C, især mindre end 70°C.
- 25
5. Fremgangsmåde ifølge et af de foregående krav, hvor der efter fødevaretilberedningstemperatur-reguleringsfasen gennemføres en højtemperaturfase, mens tilberedningskammertemperaturens (TGR) holdes på mindst 80°C
- 30

under mindst et minut.

6. Fremgangsmåde ifølge krav 5, hvor tilberedningskammertemperaturen (TGR) i højtemperaturfasen holdes på 80° til 100°C i 1 til 10 minutter.

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7. Fremgangsmåde ifølge et af kravene 5 eller 6, hvor tilberedningskammertemperaturen (TGR) efter højtemperaturfasen reduceres ved hjælp af forøget udluftning af tilberedningskammeret (1) i forhold til fødevaretilberedningstemperatur-reguleringsfasen.

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8. Fremgangsmåde ifølge et af de foregående krav, hvor posen (14) med fødevaren (2) i det mindste delvist tømmes for luft før tilberedningen.

9. Fremgangsmåde ifølge et af de foregående krav, hvor den målte fødevaretilberedningstemperatur (TGG) ved hjælp af en første regulator (7) sammenlignes med en fødevaretilberedningstemperatur-indstillingsværdi (TGGS), der er afledt af fødevaretilberedningstemperatur-indstillingsværdiforløbet, og der afhængigt heraf genereres en tilberedningskammertemperatur-indstillingsværdi (TGRS), og

20 den målte tilberedningskammertemperatur (TGR) ved hjælp af en anden regulator (8) sammenlignes med tilberedningskammertemperatur-indstillingsværdien (TGRS) og en dampgenerator (5) styres afhængigt heraf, hvor dampen genereres med dampgeneratoren (5).

25 **10.** Fremgangsmåde ifølge et af de foregående krav, hvor fødevaren (2) er kød.

11. Fremgangsmåde ifølge et af de foregående krav, hvor fødevaretilberedningstemperaturen (TGG) altid ligger under 100°C under fremgangsmåden.

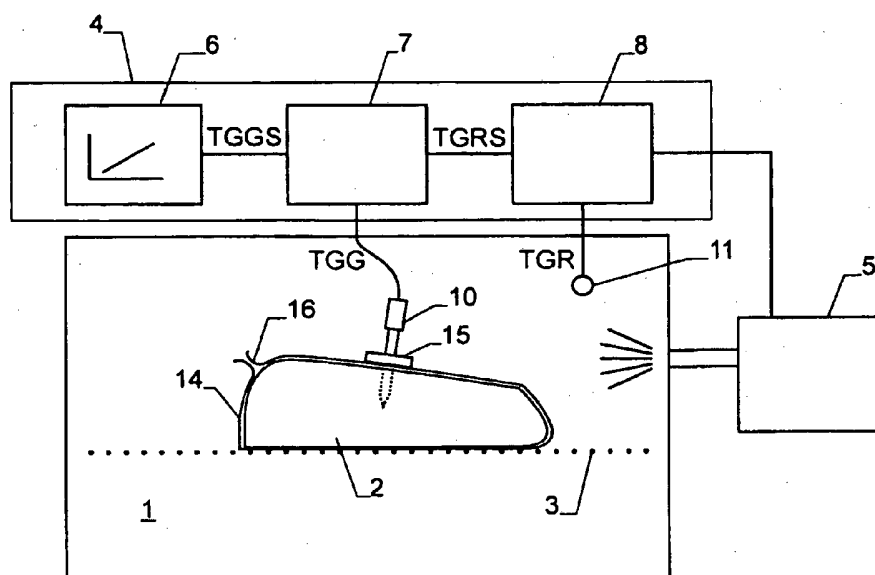


Fig. 1

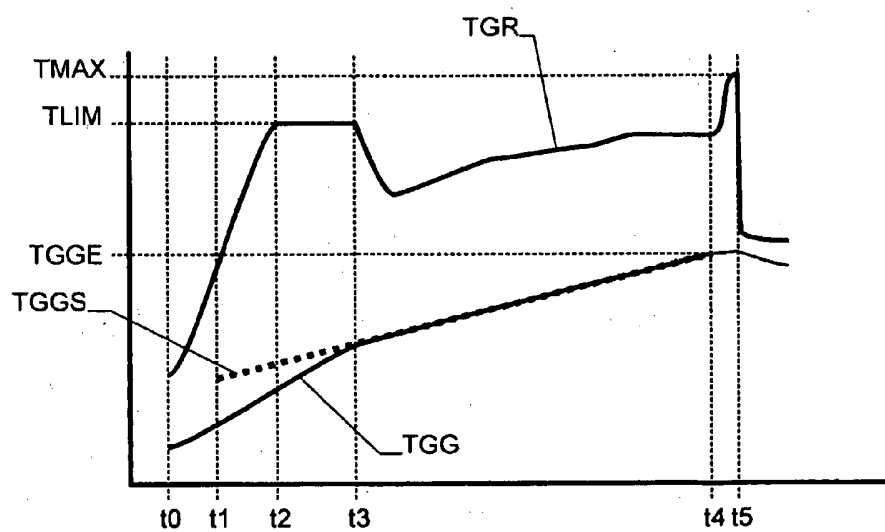


Fig. 2