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(54) **Eljárás élelmiszerek felszeletelésére**

Method and device for cutting food

The present invention relates to a method for cutting off food slices according to the preamble of Patent Claim 1.

Methods are known from high-power slicing machines, as described, for example, in DE 100 01 338, EP 0 107 056, EP 0 867 263, DE 10 2004 006120 A1, GB 2 377 362A, DE 103 33 661 A1 and GB 2 386 317. In said what are referred to as "slicers", rod-shaped or differently shaped food, for example sausage, cheese, ham or the like, is cut into slices at a very high cutting power. For example, the food rod is transported here by means of a regulated drive through a positionally fixed cutting plane, in which cutting takes place by means of a rapidly moving, generally rotating blade. The slice thickness arises from the distance advanced by the food bar between two cuts. Accordingly, at a constant blade speed, the slice thickness is regulated via the advancing speed of the food bar. The cut slices are combined, generally with a constant number of slices, to form portions and are packaged. The methods according to the prior art have the disadvantage, however, that problems occur entirely unexpectedly or that changes to the product cannot be adequately reacted to.

It was therefore the object of the present invention to provide a method which does not have the disadvantages of the prior art.

DE 10 2004 007 671 A1 discloses a method according to the preamble of Claim 1.

The object is achieved with a method according to Claim 1.

In the method according to the invention, rod-shaped or differently shaped food, for example sausage, cheese, ham or the like, is cut into slices at a very high cutting power. For example, the food rod is transported here by means of a regulated drive through a positionally fixed cutting plane, in which cutting takes place by means of a rapidly moving, generally rotating blade. The slice thickness arises from the distance advanced by the food bar between two cuts. Accordingly, at a constant blade speed, the slice thickness is regulated via the advancing speed of the food bar. The cut slices are combined, generally with a constant number of slices, to form portions and are packaged. For the division into portions, preferably the blade is moved out of the cutting plane and/or the food to be sliced is drawn back.

Furthermore, according to the invention, the device is assigned at least one product sensor which determines at least one parameter of the food bar and the signal from which is used for monitoring and/or adjusting the device or the slicing operation.

A vibration sensor may be arranged either directly on the device and therefore directly absorbs the vibrations therefrom, and/or it is arranged in the vicinity and absorbs vibrations from the air excited by the device. Accordingly, the vibration sensor may be, for example, a piezosensor or a microphone.

Furthermore, according to the invention, at least one parameter is determined with a product sensor. The product sensor may be a camera which can pick up waves of light visible to the human eye, ultraviolet radiation and/or infrared radiation. Using said camera, it can firstly be established what type of food product is involved and/or secondly what temperature said food product has. However, the sensor may also be a simple temperature sensor. The sensor may be arranged in the entry region, in the slicing region and downstream of the blade. Measurement downstream of the blade has the advantage that values, for example the temperature or mechanical values in the core of the product to be sliced, can also be determined.

The signal from the vibration sensor and/or from the product sensor is passed on to an evaluation unit which evaluates the signal therefrom.

For example, said signal can be used to determine the wear of parts, for example a bearing and other moving parts. On the basis of this analysis, a proactive service concept can be established, in which, for example, as favorable a maintenance date as possible is set and/or the required parts are ordered online.

According to the invention, the adjustment of at least one machine parameter takes place as a function of the signal from the product sensor. According to the invention, the product sensor determines the temperature of the product. On the basis of these measurements, the rotational speed of the blade and, optionally, also the advancing speed of the food bar, the cutting gap, the movement of the delivery tray, the axial movement of the blade or of the rotor for producing an unproductive cut, the product position transversely with respect to the advancing direction and/or the X-Y alignment of the cutting head are/is adjusted. The measurement and the adjustment take place preferably automatically such that operating errors are at least reduced. For example, in the case of frozen products, the rotational speed of the blade can be reduced in order to prevent the cut-off products having an undesirable trajectory.

The cut-off food slices fall onto a delivery tray on which corresponding portions are formed. By means of defined movements of said delivery tray, differently designed portions can be produced, for example shingled portions. The movement of said tray can now be controlled as a function of the signal from a sensor, since the delivery site changes as a function of, for example, product parameters, such as temperature.

A plurality of food bars are preferably sliced simultaneously.

The invention is explained below with reference to the figures. These explanations are merely by way of example and do not restrict the general inventive concept. The explanations apply equally to all of the subjects of the invention.

Figures 1, 2 show the slicing device.

Figures 1 and 2 show a slicing machine. The slicing machine 5 has a blade 11 which cuts a food bar 2 into food slices 12. The blade 11 rotates about a blade head 10. The sliced food slices 12 are generally arranged into portions on a delivery tray (not illustrated) and then packed. A person skilled in the art will recognize that a plurality of food bars can be sliced simultaneously. The food bars 2 are transported by two conveyor belts 4 continuously or discontinuously along the product line in the direction of the cutting plane 6, which is defined by the blade 11 and the cutting strip 1. During the cutting operation, the blade 11 and the cutting strip 1 interact. There must always be a cutting gap between the blade 11 and the cutting strip 1 in order to prevent the blade from touching the cutting strip. However, said cutting gap should be as small as possible in order to prevent "tearing off" of the particular slice and/or the "formation of beards". The slice thickness is produced from the distance advanced by the food bar between two cuts. At a constant blade speed, the slice thickness is regulated via the advancing speed of the food bar. The conveyor belts 4 are open on the inlet side. In the case of high-power slicers, in particular in order to form portions, unproductive cuts, in which the blade rotates without coming into engagement with the product, have to be carried out. This takes place preferably by the blade 11

being moved away from the cutting plane 6 and from the product 2. As soon as a sufficient number of unproductive cuts have been carried out, the blade is moved back in the direction of the cutting strip 1. As can be gathered in particular from figure 2, the food bar is brought at the rear end 17 thereof into contact with a gripper 18. Furthermore, figure 2 illustrates a product sensor 13, here a camera, the function of which is explained further below.

The device 5 has at least one vibration sensor (not illustrated) and/or at least one product sensor 13 which determines at least one parameter of the food bar. The signal from at least one of these sensors is used for monitoring and/or adjusting the device or the slicing operation.

The vibration sensor is arranged either directly on the device and therefore directly absorbs the vibrations therefrom and/or it is arranged in the vicinity and absorbs vibrations from the air excited by the device. Accordingly, the vibration sensor may be, for example, a piezosensor or a microphone.

The vibration sensor measures the frequency and the amplitude of the vibrations which occur.

At least one parameter is determined by the product sensor 13. The present case involves a camera which can pick up and process waves of the light visible to the human eye, ultraviolet radiation and/or infrared radiation. A person skilled in the art will understand that it may also be expedient, however, in certain applications to filter the wavelength of the observed light. Using said camera, it can firstly be established what type of food product is involved and/or secondly what temperature said food product has. The sensor may also be a sensor which picks up mechanical properties of the product. The sensor may be arranged in the input region, in the slicing region and downstream of the blade. In the illustration according to figure 2, the camera 13 is arranged measuring of the blade and can determine, for example, the temperature in the core of the food bar. The camera can be directed toward the food bar 2 and/or toward the cut-off food slices 12.

The signal from the product sensor is passed on to an evaluation unit which evaluates the signal therefrom. An evaluation can take place, for example, by means of a comparison of the measured frequencies and amplitudes of the vibrations with stored values in order to determine changes. As a result, wear of parts, for example a bearing and other moving parts, can be determined.

Furthermore, the vibration sensor can be used for adjusting the cutting gap. The cutting gap is the gap between the blade 11 and a cutting strip 1. The size of said gap can be changed by adjustment of the blade 11 and/or of the cutting edge 1. In principle, for an optimum cutting result, the cutting gap should be as small as possible, and the blade, during the rotation thereof, should not touch the cutting strip. The blade and/or the cutting strip can now be moved toward each other, with the blade 11 rotating, until they touch or virtually touch, as a result of which the vibrations measured by the sensor change. In particular when the blade 11 and cutting strip 1 touch, there is generation of a noise which is measured by the vibration sensor. The evaluation unit then knows that the cutting gap is very small or is too small. The gap is preferably then enlarged again by a predetermined amount by the cutting strip and/or the blade being moved away from each other. This adjustment of the cutting gap is carried out preferably under operating conditions, at the selected cutting power (nominal rotational speed). Said adjustment preferably takes place after the blade for producing an unproductive cut has been moved away from the cutting strip 1 and back again. By means of the magnitude of the rotational speed of the blade, by means of temperature influences, by means of the type of food to be sliced and/or by means of wear, the shape of the blade

and therefore the size of the cutting gap during the slicing operation change. With the signal from the vibration sensor, it is possible to check said cutting gap during the slicing of a food and, if appropriate, to readjust said cutting gap, and to repeat said adjustment as often as desired without the cutting operation having to be interrupted or the rotational speed of the blade reduced.

Preferably, furthermore, the degree of the bluntness of the blade is determined with the vibration sensors. Depending on the degree of sharpness of the blade, the vibration behavior of the slicing device and/or the noise produced during cutting of the food products change/changes. For example, by means of a comparison with stored vibration profiles, the evaluation device can determine how sharp the blade still is and the service life it still has left before it has to be replaced and, as a result, can preferably establish a proactive blade-changing strategy. As a result, the downtime during the replacement is reduced.

Furthermore, the adjustment of at least one machine parameter takes place as a function of the signal from the product sensor 13. The product sensor determines the temperature of the product. On the basis of this measurement, the movement of the delivery tray is adjusted and, optionally, so too is the rotational speed of the blade 11, the advancing speed of the food bar 2, the cutting gap, the movement of the delivery tray and/or the X-Y alignment of the cutting head 10 are/is adjusted. The measurement and the adjustment take place preferably automatically, and therefore operating errors are at least reduced. For example, in the case of frozen products, the rotational speed of the blade can be reduced in order to prevent the cut-off products from having an undesirable trajectory.

List of designations:

1	Cutting edge, cutting strip
2	Food bar
3	Cutout
4	Transport means, traction belt
5	Slicing device
6	Cutting plane
7	Recess
8	Fastening means
9	Blade edge
10	Cutting head
11	Blade
12	Food slice
13	Product sensor
14	Product line
15	-
16	-
17	End of the product bar facing away from the blade
18	Gripper

Eljárás élelmiszerek felszeletelésére

Szabadalmi igénypontok

1. Eljárás egy élelmiszerrúd (2) felszeletelésére egy szerkezettel, amely egy forgó késsel (11) és legalább egy továbbító eszközzel (4, 18) rendelkezik, amely eljárásnál az élelmiszerrudat egy előtoló kényszerpályába (14) helyezzük be és a továbbító eszközzel (4, 18) a kés (11) irányába továbbítjuk és eközben felszeleteljük, ahol a szerkezethez legalább egy termékérzékelőt rendelünk hozzá, amely az élelmiszerrúd legalább egy paraméterét megállapítja, és ennek jelét felhasználjuk a szerkezet vagy a felszeletelési folyamat ellenőrzéséhez és/vagy beállításához, ahol paraméternek a termék hőmérsékletét vesszük, ***azzal jellemezve***, hogy ennek mérésére alapítva szabályozzuk a lerakóasztal mozgását.

2. Az előző igénypont szerinti eljárás, ***azzal jellemezve***, hogy a szerkezet egy vágóléccel (1) rendelkezik, és a kés (11) és a vágóléc (1) közötti vágórés beállítását a termékérzékelő segítségével hajtjuk végre.

3. A 2. igénypont szerinti eljárás, ***azzal jellemezve***, hogy a vágórést a mindenkori vágási fordulatszámnál állítjuk be.

4. Az előző igénypontok bármelyike szerinti eljárás, ***azzal jellemezve***, hogy az adagképzéshez legalább egy üres vágást végzünk és a vágórés beállítását az üres vágás után hajtjuk végre.

5. Az előző igénypontok bármelyike szerinti eljárás, ***azzal jellemezve***, hogy a kés (11) eltompulását a termékérzékelővel állapítjuk meg.

6. Az előző igénypontok bármelyike szerinti eljárás, ***azzal jellemezve***, hogy több élelmiszerrudat szeletelünk fel egyidejűleg.

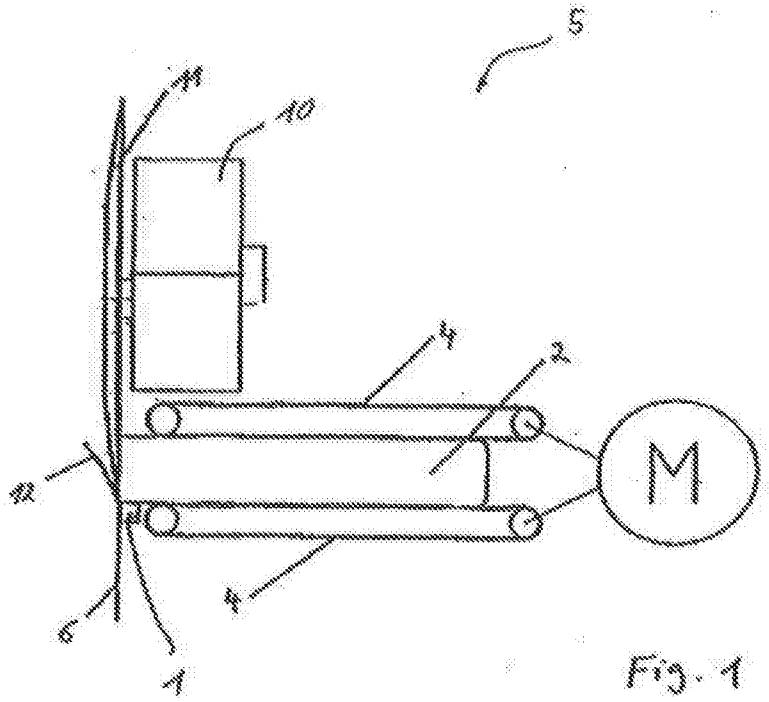

Fig. 1

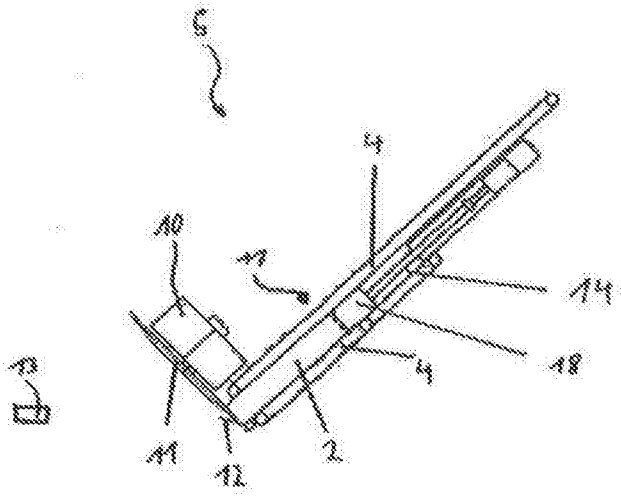

Fig. 2

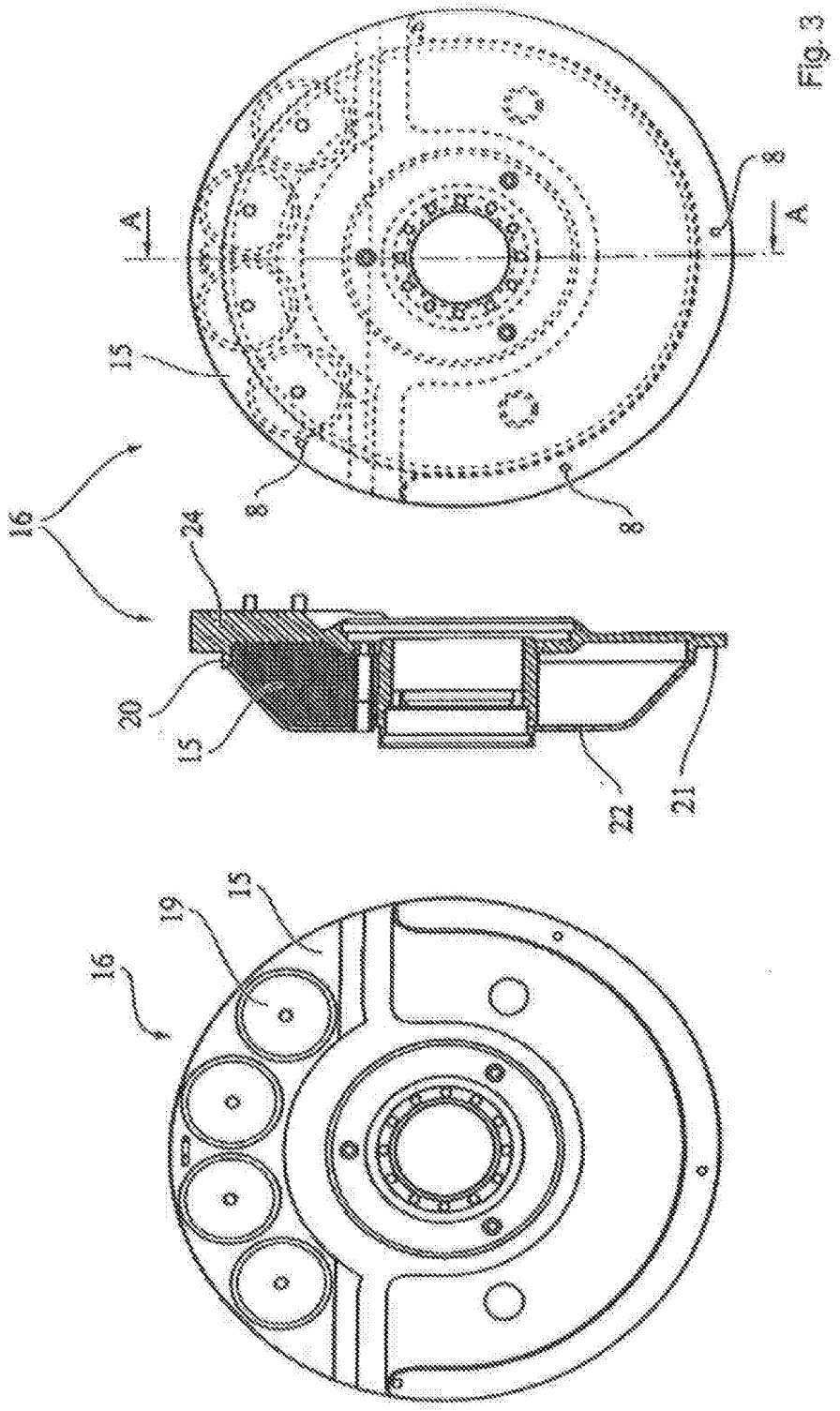

Fig. 3

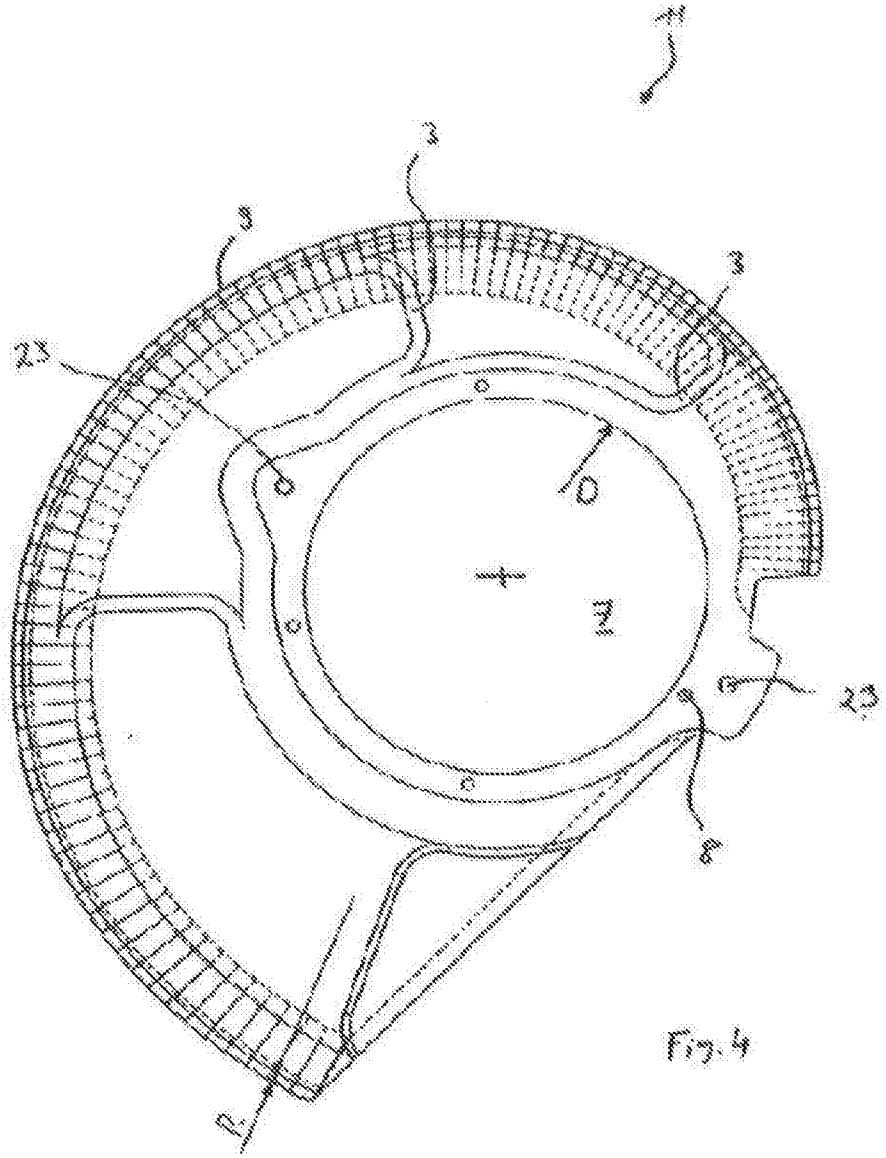

Fig. 4