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(54) Benævnelse: **SKÆREAPPARAT TIL SKÆRING AF FØDEVAREGENSTANDE**

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DESCRIPTION

Description

FIELD OF THE INVENTION

[0001] The present invention relates to a cutting apparatus for cutting a food object while the food object is conveyed from an inlet conveyor to an outlet conveyor, and to a method of performing the same.

BACKGROUND OF THE INVENTION

[0002] For the mechanical dividing of large pieces of meat into pieces, use is typically made of a so-called portion cutter. A portion cutter is a machine with a number of conveyor belts, a computer vision system, a knife and a control unit. Typically, there are two conveyor belts which are arranged end to end with a relatively small gap between them. The computer controlled vision system can also be called a scanning system. The knife is typically of the "sword" type, i.e. a relatively long knife which is arranged at the side of the gap between the two conveyor belts. When a portion is to be cut from the piece of meat the meat is lying over the gap between the two conveyor belts, and the cut is carried out by the knife being rotated once at high speed, whereby the piece of meat is cut through.

[0003] Figure 1 shows an example of a portion cutter 100 where a food objects 103 to be cut is transported on an inlet conveyor 114 forward to the cutting facility 101 where it is first scanned 104, for example by means of laser vision equipment. A control device 106 utilizes the resulting image data 107 in generating a three dimensional profile image that is used in instructing a knife 105 where to cut such that one or more of the smaller food pieces 108-110 fulfill certain criteria, e.g. a pre-defined target such as a weight target.

[0004] One application could be to cut the end parts of the food objects, and to automatically separate these end pieces from the central part 110, where the central part may be considered as being primary part of the food object that fulfils said target, e.g. a weight target. After cutting the food object the three parts 108-110 they typically lie tight next to each other, and are received by a conveyor 115. In order to automatically separate the smaller food pieces 108-110 a device 102, sometimes referred to as Speedsort, is used. In a first step a separation is created between the end pieces and the center piece by running conveyor 116 at a higher speed than conveyor 115. In a second step the end pieces may be separated via an opening-closing conveyor 117 where the end pieces are guided on conveyor 118 resulting in two

separated streams of smaller food pieces, one being the end pieces and one being the center pieces. These two streams may be utilized as infeed for two different processing steps, where one maybe a batch creation of the center pieces using multiple of robotic devices, and where one may be a secondary process such as grinding process.

[0005] This kind of a setup is however spacious due to said Speedsort where the two extra steps take place, i.e. the space creation and the creation of the two separated streams.

[0006] Another problem is that, although not shown in the example in figure 1, the smaller food pieces have a tendency of sticking together, in this case the end pieces may stick to the center piece meaning that such a clean separation of the end pieces and the center piece as shown here fails. A center piece with an end piece sticking to it will typically be rejected or the end piece will be manually removed from the center piece. This obviously reduces the throughput of said processing step, and requires an additional labor to manually remove the end piece from the center piece. EP2968427 describes a conveyor system where an opening between an an inlet and an outlet conveyor is made to let cut trim portions fall down between the inlet and outlet conveyor.

SUMMARY OF THE INVENTION

[0007] On the above background it is an object of embodiments of the present invention to provide a cutting apparatus that requires less space and simultaneously prevents smaller food pieces from sticking together after having undergone a cutting process.

[0008] In general, the invention preferably seeks to mitigate, alleviate or eliminate one or more of the above mentioned disadvantages of the prior art singly or in any combination. In particular, it may be seen as an object of embodiments of the present invention to provide a system that solves the above mentioned problems, or other problems.

[0009] To better address one or more of these concerns, in a first aspect of the invention a cutting apparatus is provided for cutting a food object while the food object is conveyed from an inlet conveyor to an outlet conveyor, where the inlet and outlet conveyors are arranged in an end-to-end arrangement, the cutting apparatus comprising:

- a moving mechanism for adjusting the relative position between the ends of the inlet and outlet conveyors,
- a cutting device having a cutting plane extending between the inlet and outlet conveyors,
- a detection mechanism for detecting at least one characteristics related to the food object, and
- a control device for controlling the moving mechanism and the cutting device,

wherein controlling the moving mechanism includes utilizing the at least one detected characteristics in determining a target width of an opening between the ends of the inlet and

outlet conveyors,

wherein controlling of the cutting device includes subsequently cutting the food object into smaller food pieces, the target width of the opening being selected such that it allows at least one of the smaller food pieces to fall through the opening and wherein the target width is a minimum width required to allow said at least one of the smaller food pieces to fall through the opening between the ends of the inlet and outlet conveyors.

[0010] Assuming that only one of the smaller food pieces is dropped through the opening at a time, which would be the most common scenario, and assuming that said one of the smaller food pieces that is dropped through the opening is the front and/or the end piece of the food object, the utilization of the at least one detected characteristics preferably involves deciding on said target width such that the front and/or the end piece falls there through. The step of detecting at least one characteristics related to the food object may as an example include detecting a two or three dimensional profile data of the food object where the utilization of this two or three dimensional profile is used for determining the thickness of said front part. This thickness may vary greatly between successive food objects and therefore said target width needed to ensure that the front part falls there through. Accordingly, by dynamically adjusting the width of the opening in such a way it is ensured that the time needed to e.g. adjust the end(s) of the conveyors back to the end-to-end arrangement closing position is minimized. A receiving conveyor may, as an example, be positioned below the conveyors for receiving said at least one of the smaller food pieces falling through the opening. Said smaller food piece should of course not be construed as being limited to a front piece, but it could just as well include the back end piece, or any piece between the front end and the back end, or a combination thereof.

[0011] Also, the cutting apparatus is more compact since there is no need to include the means for generating a spacing between the smaller food pieces (e.g. via end-to-end arranged conveyors where the relative speed difference between the conveyors separates the smaller food pieces from each other) and a subsequent separation of the spaced apart smaller pieces when creating two separated streams of smaller food pieces.

[0012] More importantly, by the fact that said at least one of the smaller food pieces immediately after the cut falls through the opening, it is ensured that adjacent smaller food pieces will not stick together and therefore the throughput of one or more subsequent processing steps will be increased since no reject will be needed (and/or no manually labor to manually separating said adjacent smaller food pieces is needed). In one embodiment, said step of utilizing the at least one detected characteristics comprises determining the length of the at least one smaller food piece, where in case the length of the at least one smaller food piece exceeds a pre-determined length, the controlling by the control device further includes:

- instructing the moving mechanism to move the end of the outlet conveyor when the food object enters the outlet conveyor such that the end of the outlet conveyor moves with

and supports the end of the food object, where upon reaching said target width,
- instructing the cutting device to cut the food object into said smaller food piece.

[0013] Due to the support, the cut will be better where in the absence of such a support the smaller food piece prior to the cut would otherwise partly be hanging down and therefore the cut would not be as planned, e.g. be askew instead of being vertical and straight.

[0014] In one embodiment, the controlling further comprises adjusting the speed of the outlet conveyor such that the relative speed of the portion of the food object resting on the outlet conveyor and the portion resting on the inlet conveyor is essentially the same. It is thus ensured that, while providing said support for the food object, the food object will neither be pulled nor be wrinkled because said relative speed difference will be zero.

[0015] In one embodiment, the detection mechanism is selected from one or more of the following:

- an image detection device and where said at least one characteristics related to the food object is selected from one or more of the following:

  o a position of the food object,

  o a two dimensional surface profile of the food object,

  o a three dimensional profile of the food object,

- an X-ray device and where said at least one characteristics related to the food object comprises X-ray data of the food object.

[0016] In one embodiment, the cutting device is mounted to an angular adjustment mechanism configured to adjust the angle of the cut from being different from 90° in relation to a conveying direction to the food item. The flexibility of the cutting apparatus is thus increased where now the cutting angle may be changed from being a vertical cut to an angular cut, e.g. any angle different from 90°, which may be for various reasons such as for improving the appearance of the cut to make it more natural.

[0017] In one embodiment, the moving mechanism is further configured to, in response to adjusting the angle from being different from 90°, adjust the relative height position of the inlet and outlet conveyors from being in plane position to be non-in plane during the cutting. Accordingly, when adjusting the cutting angle from e.g. 90° to e.g. 60°, the vertical position of the outlet conveyor will be slightly lowered and even the horizontal position may be slightly adjusted during cutting so as to minimize said target width and to ensure that the time needed to move the inlet and outlet conveyors back to e.g. an original position where they are in an

end-to-end position is minimized.

[0018] In one embodiment, the control device is further configured to instruct the cutting device to cut the food object into smaller food piece while remaining the ends of the inlet and outlet conveyors in an adjacent position so as to generate a stream of cut pieces being conveyed by the outlet conveyor. The flexibility of the cutting apparatus is thus further increased since it is possible to create two separate streams of smaller food pieces meaning that throughput for subsequent processing, e.g. batching process, may be increased. As an example, the food object may be a large food piece such as a loin, where the ends of the loin may be the smaller food pieces that are dropped on e.g. an underlying conveyor. During operation, the front part the front part is dropped on e.g. an underlying conveyor, then the inlet and outlet conveyors are moved to an end-to-end position where the food object is cut into smaller food pieces fulfilling e.g. a fixed target weight or thickness target. This stream of the smaller food pieces may be considered as being a primary stream. This is continued until the last cut, where the reaming end part is released, e.g. via movement of the inlet conveyor end. The smaller end pieces may accordingly define a sequence of secondary stream that is to be used for another processing.

[0019] The control device may be configured to operate the cutting device and the moving mechanism based on a delay identifier which specifies a maximum delay time between the time where a cutting takes place and a time where the relative position between the ends of the inlet and outlet conveyors has reached said target width. The delay identifier could be adjustable, or statically defined, and it may e.g. define that the target width should be reached immediately or shortly after the cutting. This will allow the food items to be supported almost constantly on the conveyors and it may optimize the quality.

[0020] According to a second aspect of the invention, a method is provided of cutting a food object while the food object is conveyed from an inlet conveyor to an outlet conveyor, where the inlet and outlet conveyors are arranged in an end-to-end arrangement by a cutting apparatus which comprises:

- a moving mechanism for adjusting the relative position between the ends of the inlet and outlet conveyors,
- a cutting device having a cutting plane extending between the inlet and outlet conveyors,
- a detection mechanism for detecting at least one characteristics related to the food object, and

where the method comprises:

- utilizing the at least one detected characteristics in determining a target width of an opening between the ends of the inlet and outlet conveyors, and
- cutting, by the cutting device, the food object into smaller food pieces, the target width of the opening being selected such that it allows at least one of the smaller food pieces to fall through the opening and wherein the target width is a minimum width required to allow said at least one of the smaller food pieces to fall through the opening between the

ends of the inlet and outlet conveyors.

[0021] A simple and compact solution is thus provided allowing cutting and simultaneous release of the smaller food pieces to a receiving area, e.g. an underlying take-away conveyor or a tray/box and the like. Said at least one smaller food piece may e.g. be products for a secondary processing, e.g. chicken nuggets, whereas the remaining part of the product received by the outlet conveyor may be the remaining part of the product. In one embodiment, this may be due to that the incoming food object does not fit into a subsequent batching process because it is too heavy, whereby cutting a part of the food object the remaining part of the food object fits into the distribution needed to e.g. minimize the overweight in the subsequent batching process, or it may have a more favorable appearance.

[0022] Said at least one smaller food pieces allowed to fall through the opening may in some applications be considered as a reject and where said release through the opening may be considered as a reject facility.

[0023] In one embodiment, said at least one detected characteristics comprises detecting a two or three dimensional profile of the food object. The two or three dimension profile may in one embodiment be used in determining a cutting pattern of the food object, where the utilization of this two or three dimensional profile may be determining the thickness of said at least one smaller piece.

[0024] In one embodiment, the smaller food pieces are selected from one or more of the following:

- a trim piece at a front or a rear end of the food object or there between,
- a food portion fulfilling at least one target selected from one or more of weight target or thickness target.

[0025] In one embodiment, said step of utilizing the at least one detected characteristics comprises:

- determining the length of the at least one smaller food piece, where in case the length of the smaller food piece exceeds a pre-determined length,
- instructing the moving mechanism to move the end of the outlet conveyor when the food object enters the outlet conveyor such that the end of the outlet conveyor moves with and supports the end of the food object, where upon reaching said target width, and
- cuting the food object into said smaller food pieces.

[0026] In one embodiment, said step of adjusting the relative position between the ends of the

inlet and outlet conveyors comprises one or more of the following:

- adjusting the end of the outlet conveyor while remaining the end of the inlet conveyor fixed,
- adjusting the end of the inlet conveyor while remaining the end of the outlet conveyor fixed, or
- simultaneously adjusting the ends of the inlet and outlet conveyors.

[0027] The flexibility of the cutting apparatus is thus increased since all said moving combinations are possible. As an example, a scenario where it would be of advantage of moving both the inlet and outlet ends is to reduce the time until the ends are back in the end-to-end position, where instead moving only the end of the outlet conveyor, the end of the inlet conveyor is moved towards the end of the outlet conveyor, followed by a subsequent movement in the end-to-end position to a cutting position. This is in particular relevant where the smaller food piece is a food piece that exceeds said pre-determined length. After cut where this smaller food piece fall through the opening it may be of importance to reduce the time of moving the outlet end back to an end-to-end position, especially if incoming food objects are close to each other. A situation could occur where the subsequent food object is at the outlet end and has already started to exceed the end. By moving the end of the inlet conveyor towards the end of the outlet conveyor towards the end-to-end position, and subsequently move towards the cutting position (where the cutting place is between the conveyors), said situation is avoided.

[0028] In one embodiment, said step of cutting the food object into smaller food pieces, and said adjustment of said relative position between the ends of the inlet and outlet conveyors, is operated such that immediate after said cutting the relative position between the ends of the inlet and outlet conveyors has reached said target width. It is thus possible to support the food object as much as possible via said inlet/outlet ends of the conveyors such that the quality of the cut will be maximized. As an example, if a thickness of a smaller food object is 20 mm, the operation between the moving mechanism and the cutting device is such that after the knife has passed through the food object relative position between the ends of the inlet and outlet conveyors has reached it's target width, e.g. 20 mm (or around 20 mm) meaning that the impact from the knife ensures that the cut piece will fall through the opening.

[0029] In one embodiment, said step of detecting at least one characteristics related to the food object comprises determining the thickness of the at least one smaller food item, and where the target width is selected bases on that. As an example, if the thickness is determined to be 20 mm, the target width may be 20 mm or less than 20 mm, depending on the type of food object. If as an example the food object is fresh poultry fillet, it may e.g. be enough to have the target with 17 mm, i.e. such that it allows the smaller piece to fall through the opening.

[0030] Another example is when e.g. cutting a piece of thickness x mm, the opening may be y

mm where y<x, and when the actual reject takes place, the opening may be opened further to z mm where z may be z≥x.

[0031] In general the various aspects of the invention may be combined and coupled in any way possible within the scope of the invention. These and other aspects, features and/or advantages of the invention will be apparent from and elucidated with reference to the embodiments described hereinafter.

BRIEF DESCRIPTION OF THE DRAWINGS

[0032] Embodiments of the invention will be described, by way of example only, with reference to the drawings, in which

figure 1 shows an example of a prior art cutting apparatus,

figure 2 shows one embodiment of a cutting apparatus according to the present invention,

figure 3a-c shows one embodiment of how to create a temporal opening between ends of inlet and outlet conveyors,

figure 4a-c shows a scenario where based on e.g. a three dimensional profile image of food object, the smaller food piece may be released through the opening,

figure 5 depicts an embodiment from what is illustrated in figure 4,

figure 6 depicts a yet another scenario of the cutting apparatus in figure 2,

figure 7a,b depicts an embodiment of a cutting apparatus according to the present invention, in the absence of the housing surrounding such a cutting apparatus and in the absence of the conveyor belt on the inlet and the outlet conveyors,

figure 8a,b shows the moving mechanism in the embodiment of figure 7 in more details, and

figure 9a,b illustrate graphically the principle of how an opening/closing between the inlet and the outlet conveyors may be performed while remaining that belt tension fixed.

DESCRIPTION OF EMBODIMENTS

[0033] Figure 2 depicts on embodiment of a cutting apparatus 200 according to the present invention for cutting a food object 203 while the food object is conveyed from an inlet conveyor 214 to an outlet conveyor 215, where the inlet and outlet conveyors are arranged in an end-to-end arrangement. The cutting apparatus 200 comprises a moving mechanism 220 for adjusting the relative position between the ends of the inlet and outlet conveyors as indicated

by arrow 221 from a closing position to an open position and vice versa, from open position to a closing position or any retracted position.

[0034] The cutting apparatus further comprises a cutting device 205 having a cutting plane extending between the inlet and outlet conveyors 214, 215, a detection mechanism 204 for detecting at least one characteristics related to the food object, and a control device 206 for controlling the moving mechanism and the cutting device in response to an output signal from the detection mechanism 204. As will be discussed in more details later, the controlling of the moving mechanism includes utilizing the at least one detected characteristics in determining a target width of an opening between the ends of the inlet and outlet conveyors. In the embodiment shown here, a laser line scanner and a camera may be used where the camera is configured to detect reflected light from the outer surface of the food object and based thereon generates a three dimensional profile image. Any other type of detection mechanism know to a person skilled in the art may be implemented, e.g. X-ray and the like.

[0035] The controlling of the cutting device further includes subsequently cutting the food object into smaller food pieces 208, where the target width of the opening is selected such that it allows at least one of the smaller food pieces to fall through the opening. The target width is preferably the minimum width needed to allow said at least one 208 of the smaller food pieces to fall through the opening between the ends of the inlet and outlet conveyors meaning that for thinner pieces the width of the opening is less than for thicker smaller pieces.

[0036] Referring to the example shown here, a front part 208 is cut and immediately it is allowed to be dropped via gravity and/or knife inertia on e.g. an underlying take-away conveyor 218, that receives it (should not be limited to only end parts) and conveys it to e.g. a subsequent process. After the cut, the ends of the inlet and outlet conveyors are moved to a closing position, where e.g. a subsequent cutting process takes place and where the resulting smaller food pieces 210 are conveyed by the outlet conveyor 215 to e.g. a subsequent process, which could be a batching process. The same process may be repeated for the end part, or any part between the ends of the food object.

[0037] Figure 3a-c shows one embodiment of how to create said temporal opening between said ends of the inlet and outlet conveyors 214, 215, where the end of the inlet conveyor 214 is kept fixed while the end of the outlet conveyor is moved to an open position by said moving mechanism as shown in figure 3b followed by a subsequent cutting, resulting in that the end part falls freely through the opening as shown in figure 3c, followed by a subsequent movement of the outlet end back to the closing position (or retracted position).

[0038] Figure 4a-c shows a scenario where based on e.g. said three dimensional profile image of the food object 303, the smaller food piece to be released (in this example the front piece) through the opening exceeds a pre-determined length. In such a scenario, the control device instructs the moving mechanism to move the end of the outlet conveyor when the food object 403 enters the outlet conveyor as shown in figures 4a,b such that the end of the outlet conveyor moves with and supports the end of the food object. Upon reaching said target width

the front piece 408 is cut where it falls freely through the opening, followed by a subsequent movement back to the closing position as shown in figure 4c.

[0039] Figure 5 depicts an embodiment from what is illustrated in figure 4, except where the end of the inlet conveyor additionally moves towards and end of the outlet conveyor so as to reduce the time until the ends are in closing position. Subsequently, the ends in the closing position are both moved to the cutting position as shown in figure 5c while preserving the closing position.

[0040] Figure 6 depicts yet another scenario of the cutting apparatus in figure 2 where the end of the inlet conveyor 214 is moved as indicated by the arrow in figure 6b followed by a cut, and where the inlet end then moves back to the closing position as shown in figure 6c.

[0041] Figure 7a,b depicts an embodiment of a cutting apparatus according to the present invention, in the absence of the housing surrounding such a cutting apparatus and in the absence of the conveyor belt on the inlet and the outlet conveyors 714, 715, where in the embodiment the end of the outlet conveyor 715 is attached to a moving mechanism 720 that moves the end of the outlet conveyor from the closing position shown in figure 7a to the open position shown in figure 7b, and vice versa. The cutting device shown here is sword" type and is rotatable mounted to a frame 705.

[0042] Figure 8a,b shows the moving mechanism in the embodiment of figure 7 where arms 830, 831 are connected to an upper part or upper roller of the end of the outlet conveyor, and a lower part or lower roller of the end of the conveyor, respectively, where via synchronized movement of the arms in opposite direction the tension of the conveyor belt is remained fixed and said opening/closing between the ends may be fully controlled. The arms 830, 831 may be connected to an electrical motor (not shown) to operate accurately and in a controlled way the movement of the arms.

[0043] Figure 9a,b illustrate graphically the principle where arm 830 may be attached to the upper roller 940 and arm 831 to the lower roller 941, where via the opposite pulling/pushing forces as indicated by the horizontal arrows said opening 942 and closing may be achieved while at the same time remaining the belt tension fixed.

[0044] While the invention has been illustrated and described in detail in the drawings and foregoing description, such illustration and description are to be considered illustrative or exemplary and not restrictive; the invention is defined by the features specified in the appended claims.

REFERENCES CITED IN THE DESCRIPTION

Cited references

Patent documents cited in the description

- EP2968427A [0006]

Patentkrav

1. Skæreapparat (200) til skæring af en fødevaregenstand (203), mens fødevaregenstanden transporteres fra en indløbstransportør (214) til en udløbstransportør (215), hvor indløbs- og udløbstransportøren er anbragt i en ende-til-ende arrangement, idet skæreapparatet omfatter:

• en bevægemekanisme (220) til at justere den relative position mellem enden af indløbstransportøren og enden af udløbstransportøren

• en skæreanordning (205) med et skæreplan, der strækker sig mellem indløbs- og udløbstransportøren

• en detekteringsmekanisme (204) til at detektere mindst én karakteristisk egenskab ved fødevaregenstanden, og

• en styreenhed (206) til at styre bevægemekanismen og skæreanordningen,

hvor styringen af bevægemekanismen omfatter anvendelse af den mindst ene detekterede karakteristiske egenskab til at bestemme en målbredde af en åbning mellem enden af indløbstransportøren og enden af udløbstransportøren,

hvor styringen af skæreanordningen efterfølgende omfatter skæring af fødevaregenstanden i mindre fødevarestykker, hvor målbredden af åbningen er valgt således, at den tillader, at mindst ét (208) af de mindre fødevarestykker falder gennem åbningen, og

hvor målbredden er en minimumsbredde, der kræves for at tillade, at det mindst ene af de mindre fødevarestykker falder gennem åbningen mellem enden af indløbstransportøren og enden af udløbstransportøren.

2. Skæreapparat ifølge krav 1, hvor ét af de mindre fødevarestykker falder gennem åbningen.

3. Skæreapparat ifølge krav 2, hvor det ene af de mindre fødevarestykker, der falder gennem åbningen, er fødevaregenstandens for- og/eller endestykke.

4. Skæreapparat ifølge et af de foregående krav, hvor

anvendelsen af den mindst ene detekterede karakteristiske egenskab omfatter bestemmelse af længden af det mindst ene mindre fødevarestykke, hvor styringen ved hjælp af styreenheden, såfremt længden af det mindre fødevarestykke overstiger en forud fastlagt længde, endvidere omfatter følgende:

• bevægemekanismen gives instruktion om at flytte enden af udløbstransportøren, når fødevaregenstanden kommer ind i udløbstransportøren, således at enden af udløbstransportøren flytter sig med og støtter enden af fødevaregenstanden, hvorefter målbredden nås,

• skæreanordningen gives instruktion om at skære fødevaregenstanden i det mindre fødevarestykke.

5. Skæreapparat ifølge krav 4, hvor styringen endvidere omfatter justering af udløbstransportørens hastighed således, at den relative hastighed af den del af fødevaregenstanden, der hviler på udløbstransportøren, og den del, der hviler på indløbstransportøren, i det væsentlige er den samme.

6. Skæreapparat ifølge et af de foregående krav, hvor detekteringsmekanismen er valgt blandt ét eller flere af følgende:

• en billeddetekteringsanordning, og hvor den mindst ene karakteristiske egenskab ved fødevaregenstanden er valgt blandt ét eller flere af følgende:

o en position af fødevaregenstanden

o en todimensional overfladeprofil af fødevaregenstanden

o en tredimensional profil af fødevaregenstanden

• en røntgenanordning, og hvor den mindst ene karakteristiske egenskab ved fødevaregenstanden omfatter røntgendata for fødevaregenstanden.

7. Skæreapparat ifølge et af de foregående krav, hvor skæreanordningen er monteret på en vinkeljusteringsmekanisme, der er konfigureret til at justere vinklen α på snittet fra at være forskellig fra 90° i forhold til en transportretning for fødevaren.

8. Skæreapparat ifølge krav 7, hvor bevægemekanismen endvidere er konfigureret til som reaktion på justeringen af vinklen α fra at være forskellig fra 90° at justere den relative højdeposition af indløbs- og udløbstransportøren fra at være i plan position til at være i en ikke-plan position under skæringen.

9. Skæreapparat ifølge et af de foregående krav, hvor styreenheden endvidere er konfigureret til at give skæreanordningen instruktion om at skære fødevaregenstanden i mindre fødevarestykker, mens enden af indløbstransportøren og enden af udløbstransportøren forbliver i en tilstødende position, for således at generere en strøm af afskårne stykker, der transporteres af udløbstransportøren.

10. Skæreapparat ifølge et af de foregående krav, hvor styreenheden endvidere er konfigureret til at betjene skæreanordningen og bevægemekanismen på basis af en forsinkelsesidentifikator, der specificerer en maksimal forsinkelsestid mellem det tidspunkt, hvor en skæring finder sted, og et tidspunkt, hvor den relative position mellem enden af indløbstransportøren og enden af udløbstransportøren har nået målbredden.

11. Fremgangsmåde til skæring af en fødevaregenstand, mens fødevaregenstanden transporteres fra en indløbstransportør til en udløbstransportør, hvor indløbs- og udløbstransportøren er anbragt i en ende-til-ende arrangement, ved hjælp af et skæreapparatet, der omfatter:

• en bevægemekanisme til at justere den relative position mellem enden af indløbstransportøren og enden af udløbstransportøren

• en skæreanordning med et skæreplan, der strækker sig mellem indløbs- og udløbstransportøren

• en detekteringsmekanisme til at detektere mindst én karakteristisk egenskab ved fødevaregenstanden, og

hvor fremgangsmåden omfatter:

• anvendelse af den mindst ene detekterede karakteristiske egenskab til at bestemme en målbredde af en åbning mellem enden af indløbstransportøren og- og enden af udløbstransportøren, og

skæring ved hjælp af skæreanordningen af fødevaregenstanden i mindre fødevarestykker, hvor målbredden af åbningen er valgt således, at den tillader, at mindst ét af de mindre fødevarestykker falder gennem åbningen, og
hvor målbredden er en minimumsbredde, der kræves for at tillade, at det mindst ene af de mindre fødevarestykker falder gennem åbningen mellem enden af indløbstransportøren og enden af udløbstransportøren.

12. Fremgangsmåde ifølge krav 11, hvorved den mindst ene detekterede karakteristiske egenskab omfatter detektering af en to- eller tredimensional profil af fødevaregenstanden.

13. Fremgangsmåde ifølge krav 12, hvorved den to- eller tredimensionelle profil anvendes til at bestemme et skæremønster for fødevaregenstanden.

14. Fremgangsmåde ifølge krav 11 til 13, hvorved de mindre fødevarestykker er valgt blandt ét eller flere af følgende:
• et pyntestykke ved en for- eller bagende af fødevaregenstanden eller derimellem
• en fødevareportion, der opfylder mindst ét mål, som er valgt fra ét eller flere vægtmål eller tykkelsesmål.

15. Fremgangsmåde ifølge et af kravene 11 til 14, hvorved trinnet med at anvende den mindst ene detekterede karakteristiske egenskab omfatter:
• bestemmelse af længden af det mindst ene mindre fødevarestykke, hvor følgende finder sted, såfremt længden af det mindre fødevare overstiger en forud fastlagt længde
• bevægemekanismen gives instruktion om at flytte enden af udløbstransportøren, når fødevaregenstanden kommer ind i udløbstransportøren, således at enden af udløbstransportøren flytter sig med og støtter enden af fødevaregenstanden, hvorefter målbredden nås, og
• fødevaregenstanden skæres i det mindre fødevarestykke.

16. Fremgangsmåde ifølge et hvilket som helst af kravene 11 til

15, hvorved justeringen af den relative position mellem enden af indløbs- og udløbstransportøren omfatter ét eller flere af følgende:

• justering af enden af udløbstransportøren, mens enden af indløbstransportøren forbliver fast

• justering af enden af indløbstransportøren, mens enden af udløbstransportøren forbliver fast, eller

• samtidig justering af enden af indløbs- og udløbstransportøren.

17. Fremgangsmåde ifølge et af kravene 11 til 16, hvorved trinnet med at skære fødevaregenstanden i mindre fødevarestykker og justeringen af den relative position mellem enden af indløbstransportøren og enden af udløbstransportøren betjenes således, at den relative position mellem enden af indløbstransportøren og enden af udløbstransportøren umiddelbart efter skæringen har nået målbredden.

DRAWINGS

Drawing

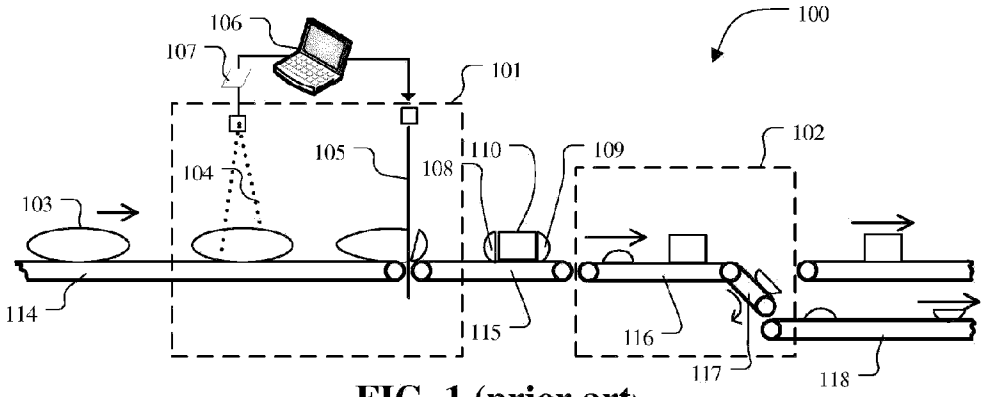

FIG. 1 (prior art)

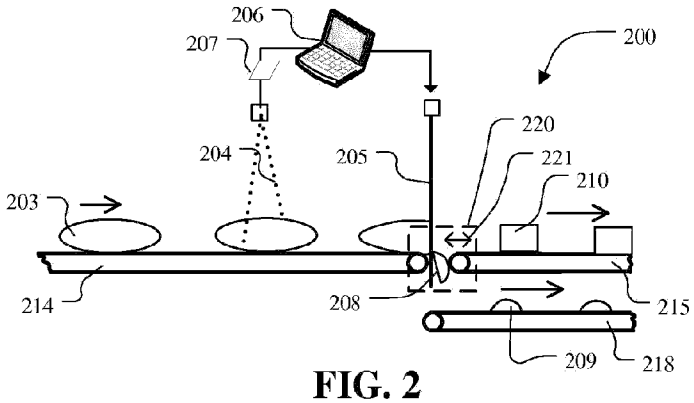

FIG. 2

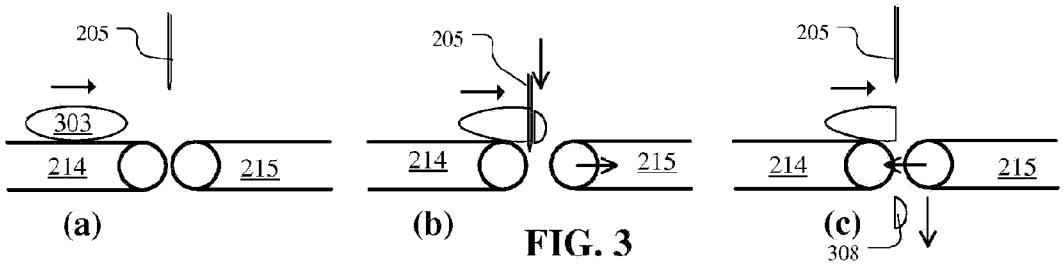

FIG. 3

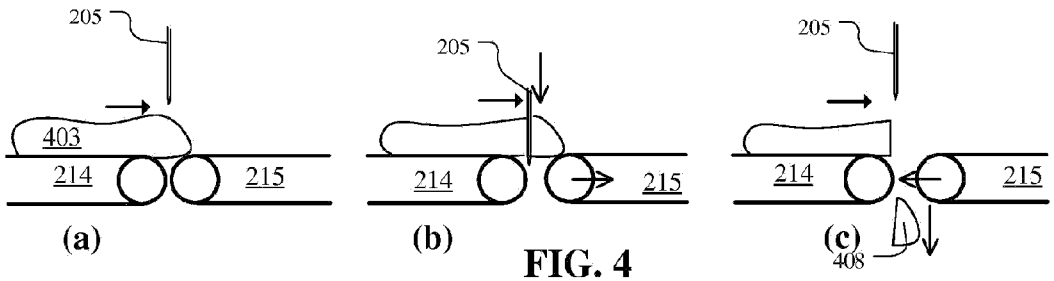

FIG. 4

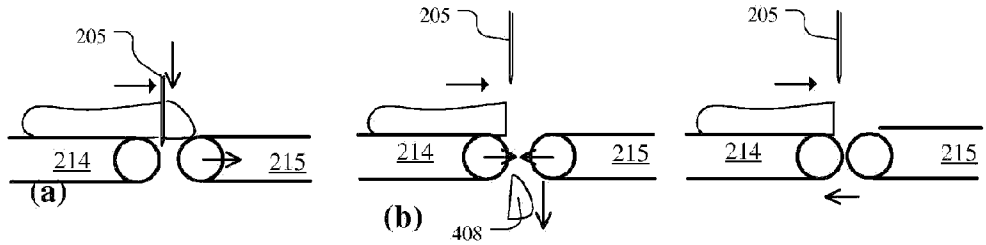

FIG. 5

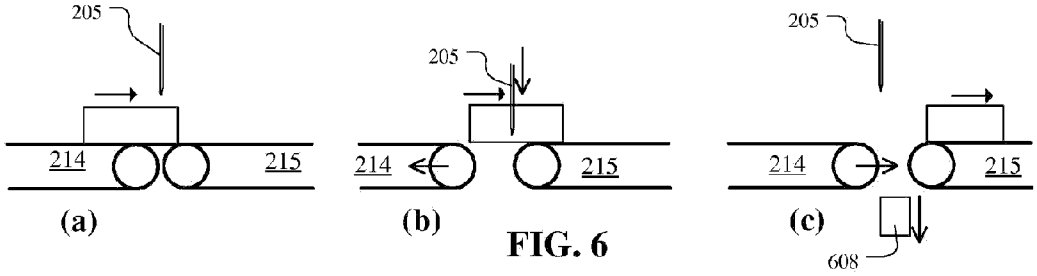

FIG. 6

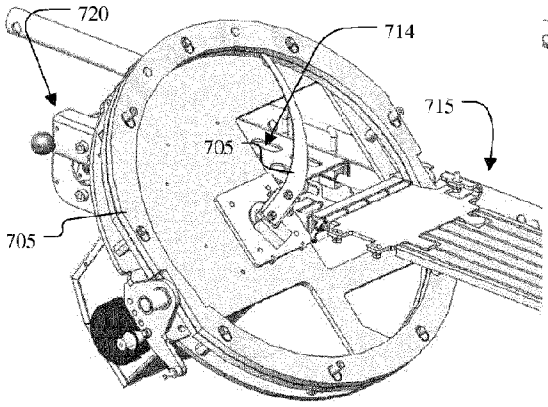

FIG. 7a

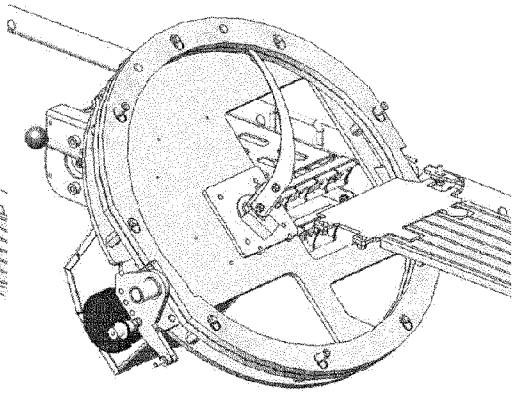

FIG. 7b

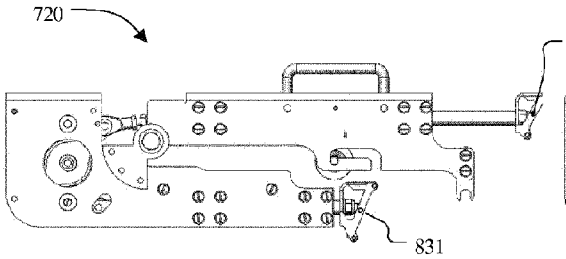

FIG. 8a

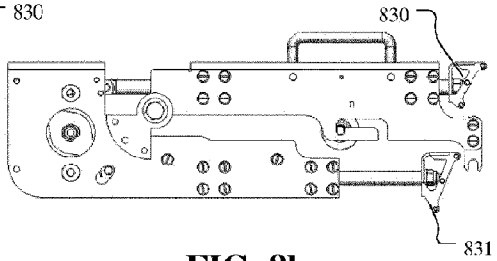

FIG. 8b

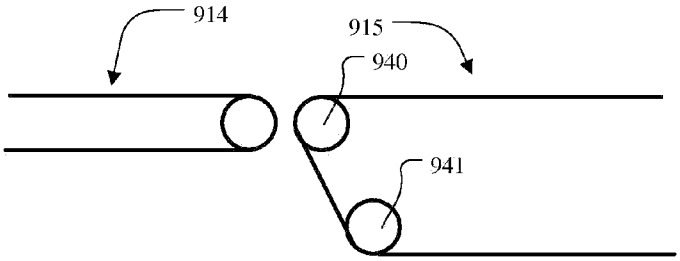

FIG. 9a

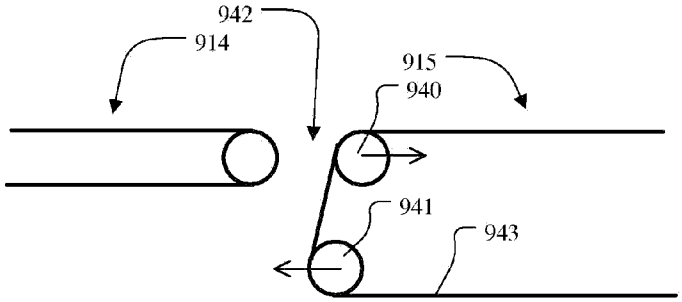

FIG. 9b