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(54) Title: DEVICE AND METHOD FOR SKINNING FOOD PRODUCTS

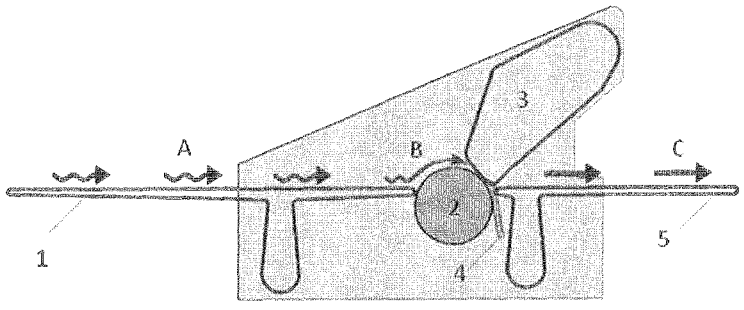


Fig. 1

(57) Abstract: The invention provides an apparatus and method to flay food products or skin fish fillets, different speed of belts (1, 5) and drum (2) as well as a push-down conveyor (3) to press the food product against the blade, with dynamically variable pressure in response to the food items being fed to the cutting device.

DEVICE AND METHOD FOR SKINNING FOOD PRODUCTS

Field of invention

The present invention relates to a method and an apparatus to flay food products or skinning fish.

Background of the invention

A part of processing food from directly after slaughter and until it is packet and shipped to storage or stores involves skinning or flaying the food product. Several methods and devices for flaying food products and skinning fish fillets are known.

EP2236040 discloses a food processing device for automatic pin-bone removal and skinning of fish fillets. The skinning part of the device has an in-feeding conveyor transporting the fish fillet over to a drum rotating in the same direction as the conveyor belt. The cutting means is a blade positioned behind and close to the drum. The skin is cut away from the fillet and the skinned fillet is transported of the drum and onto a take-away conveyor.

The problem of current skinning methods are for example that with some methods using traditional skinning devices the fish fillets are deformed, resulting in gapping of the fillets and generally decreasing the value of the product. In larger automatic food processing lines, such as in fish processing, one of the problems is that the food product is not correctly positioned or straight when it meets the skinning mechanism of the processing line. Another problem is that the food products may have varying thickness and therefore the weight of the product against the blade varies within the product, giving uneven results and loss of valuable product when to much meat is removed along with the skin.

Summary of the invention

The present invention provides an equipment to flay or skin food products such as fish and meat products. The device and method of the present invention provide a new and improved way of skinning food products, such as fish fillets, addressing current problems of skinning or flaying. The first new feature is that a drum, with a generally larger diameter than in conventional prior art machines, receives the food from an in-feeding belt, resulting in that incoming food items are stretched out or straightened when they are pulled of the in-feeding belt onto the drum as the drum rotates faster than the in-feeding belt. A second new feature is the use of a push-down conveyor belt, which is

positioned above the drum and rotates in the conveying direction just like the drum. The cutting means is positioned at the rear side of the drum (in relation to the in-feeding) with the cutting means being directed towards the drum. The push-down conveyor applies pressure to the food product as it is transferred over the drum, which allows for deep skinning of the food product and performs a cut into the fat line without removing the desired meat product. The pressure applied by the push-down conveyor is adjustable and can vary both between products and while a single product item is being flayed or skinned. The cutting means is also preferably adjustable to interact with the pressure applied by the push-down conveyor. Both the pressure of the push-down conveyor and position or gap between the cutting means and the drum is adjustable and can be computer controlled and connected to imaging means and/or other type of sensors. The skinning or flaying device of the present invention can be inserted into a processing line as a part of food processing of fish or meat, such as being placed directly after a filleting machine. The push-down conveyor both supports the fillet during skinning and thereby minimises damage to the food product, as well as preventing gaping due to the device being able to apply variable pressure for the same food product item.

In a first aspect of the present invention an apparatus is provided for flaying or skinning food products, the apparatus comprises an in-feeding conveyor, a drum, a push down conveyor, cutting means, and an out-feeding/take-away conveyor. The apparatus is characterised in that the push-down conveyor belt rotates in the conveying direction and applies a pressure against the drum as the drum pulls the food product over the drum and feeds to the cutting means, separating the skin from the food product.

In a second aspect of the present invention a method is provided for flaying or skinning food products using the device of the invention, the method comprises the steps of transporting the food product on an in-feeding conveyor onto a drum, where a push-down conveyor rotates and applies a pressure on the food product against the drum as the drum pulls the food product over the drum and over the cutting means separating the skin from the food product. The food product is then transported onto an out-feeding conveyor off the drum after the food product has been flayed or skinned.

In a preferred embodiment, the push-down conveyor belt rotates in the conveying direction and applies adjustable pressure against the drum as it pulls the food product over the drum and towards the cutting means separating the skin from the food product.

In an embodiment the drum has a relatively large diameter and rotates at a greater surface speed than the in-feeding conveyor.

Description of the invention

The following embodiments relate to the apparatus and the method of the present invention.

In an embodiment of the present invention the rotation of the pressing or push-down conveyor belt and the drum is synchronised to pull the food product over the cutting means in the conveying direction of the device.

In an embodiment of the present invention the push-down conveyor belt applies an adjustable pressure against the food product being pulled over the drum.

In an embodiment of the present invention the diameter of the drum is in the range from 70 - 300 mm, and preferably in the range from 100 to 300 mm, such as more preferably in the range 120 to 300 mm, such as in the range 150 to 250 mm, or in the range 100 to 250 mm, or more preferably in the range from 150 to 225 mm, such as but not limited to about 150 mm, about 160 mm, about 180 mm, about 190 mm, about 200 mm, about 210 mm, about 220 mm or about 225 mm or 230 mm.

In an embodiment of the present invention the location of the blade of the cutting means is at the top of the drum. (In the description herein, the terms blade and cutter are used interchangeably for convenience but may generally refer to other cutting means known in the art, such as laser beams or water jet beams.) The gap between the blade of the cutting means and the drum is preferably adjustable and can be adjusted or controlled through a computer. The gap between the blade and the drum can be adjusted as a response to image analysis of the incoming product.

The blade or corresponding cutting element will generally face the drum typically generally tangentially at the point of contact. The point of contact refers to the location on the drum where the food product meets the blade/cutting element. The point of contact is preferably on the rear side of the drum (relative to the in-feeding conveyor) and preferably at a point in the range 0-75 on the drum (where 90° is the highest point of the drum position and 0° is the point on the far rear side of the drum) and flays or skins the food product as it is in a declining direction on the drum. More preferably the point of contact is in the range from 20° to 70°, such as in the range 25-70° or the range 30°-70°, or in the range of about 45°-70°, such as about 50°, 55°, 60°, 65° or 70°.

In an embodiment of the present invention the position of the in-feeding conveyor belt is horizontal or slightly upwardly slanting towards the drum in the range 130 ° - 180 ° (when 180° is a horizontal position).

In an embodiment of the present invention the position of the out-feeding conveyor belt is horizontal (at 0°, as defined above) and preferably the surface speed of the out-feeding conveyor is substantially greater than the surface speed of the drum (such as

e.g. 10-200% greater but more typically 20-100% greater speed, such as in the range 25-50% greater). This helps keeping the food product straight during skinning and out-feeding.

In an embodiment of the present invention the control of the pressure applied by the push-down conveyor is computer controlled and can be variable between products or even during skinning of the same product.

In an embodiment of the present invention the push-down conveyor belt applies adjustable pressure against the food product being pulled over the drum, for example, where more pressure is applied while the skin is being gripped by the blade and thereafter the pressure is gradually or immediately released. This may be advantageous for fish where the flesh is not firm.

In an embodiment of the present invention the in-feeding conveyor is positioned below the highest point of the drum, where the drum has a relatively large diameter (larger than 100 mm and more preferably larger than 150 mm) and is rotating at a greater speed than the in-feeding conveyor (meaning that the surface of the drum moves faster than the surface of the in-feeding conveyor). This results in that a food product on the in-feeding conveyor, which is wrinkled for some reason is straightened out by the large drum and higher speed as compared to the in-feeding conveyor. Preferably the surface speed of the drum is in the range 10-300% faster than the surface speed of the in-feeding conveyor, such as in the range 33-200% faster, or in the range 50-100% faster.

In the present context the terms "skinning device, skinning apparatus and skinning machine" refers to an apparatus which is designed to skin or flay food products. Specific embodiments of the present invention discuss skinning of fish fillets, but any kind of food products or animals can be skinned or flayed by the method and the apparatuses of the present invention.

Detailed description of the invention

The present invention will now be described in relation to the drawings. The embodiments shown in the drawings should in no way be interpreted as limiting for the invention, but they show one embodiment of performing the method of the invention using the apparatus of the invention.

Figure 1 shows a schematic drawing of the apparatus of the invention and indicates the method steps of the invention.

Figure 2 shows a closer view of the key features of the invention and angles of the processing direction of the food items through the device of the invention.

In a first aspect of the present invention an apparatus is provided for flaying or skinning food products, the apparatus comprises an in-feeding conveyor, a drum, a push-down conveyor, cutting means, and an out-feeding/take-away conveyor. The apparatus is characterised in that the push-down conveyor belt rotates in the conveying direction and applies a pressure against the drum as it pulls the food product over the drum and over the cutting means separating the skin from the food product.

Figure 1 outlines how a skinning device of the present invention operates. The product is either manually placed on an in-feeding conveyor (1) or enters the in-feeding conveyor (1) from another device or conveyor in a food processing line. The in-feeding conveyor (1) rotates in the processing direction and moves the products to be skinned towards the skinning mechanism. The in-feeding conveyor (1) is positioned in front of a drum (2), the drum rotates in the processing direction (clock-wise, when viewing sidewise as in Fig. 1) just like the in-feeding conveyor (1). The drum (2) is made of steel in this embodiment and the surface of the drum (2) is made such that it has suitable gripping properties. The skinning device can receive the food products from the in-feeding conveyor (1) even if it is folded, skewed or wrinkled due to a large diameter of the drum and its gripping properties as well as the difference in speed between the drum (2) and the in-feeding conveyor (1) where the drum has a greater surface speed than the in-feeding conveyor. As can be seen in figure 1, the highest point of the drum (2) is positioned above the plane of the in-feeding conveyor (1) and the take-away conveyor (5), which causes wrinkled food products (A) to stretch over the drum and straighten out (B) before the skinning process starts. Fish fillets (C) come off the drum (4) straightened and exit on the take-away conveyor (5).

A push-down conveyor belt (3) is positioned above the drum (2). The push-down conveyor belt (3) has several purposes. First, the push-down conveyor belt (3) has the function to ensure that the food product will always be guided over the blade/cutter (4) of the skinning/cutting means. The pressure applied by the push-down conveyor belt (3) onto the food product is preferably provided by air-controlled jacks or other dynamically adjustable means, such that the pressure applied onto the food product is adjustable. Accordingly, the pressure applied by the push-down conveyor belt (3) can be variable during skinning of a single product based on the product. This means that skinning of a food product like a fish fillet, which has different thickness and variable stiffness along the length of the fillet, can be performed such that a certain amount of pressure is applied in the beginning when the fillet is of certain thickness and stiffness and than as the thickness changes the pressure is changed accordingly. As an example, when the fillet has passed 5 cm over the blade (4), a first amount of pressure is applied, after the

fillet has passed 15 cm over the blade (4), a second amount of pressure is applied. The pressure can be altered as often as is desired for a single type of product. Secondly, the push-down conveyor belt (3) has the function of guiding the food product over the blade (4) and onto the take-away belt (5). The pressure of the push-down conveyor belt (3) is controlled by a computer program and sensors positioned on the push-down conveyor belt (3) that provide input to the program. The sensors provide a signal identifying when a food product enters the skinning apparatus and sensors along the conveyor belts can give exact location of the product in the device.

A characteristic feature of the blade (4) of the cutting means is its location as compared to other skinning devices. Typically, the blade (4) is located at the top of the drum (2), but the blade of the present invention is on the rear side of the drum (relative to the transfer direction).

Figure 2 shows an x and y axis defining a 360° direction orientation matrix in order to better explain the position and direction of individual components of the skinning device. The position of the in-feeding conveyor belt (1) is horizontal or slightly downwardly slanting towards the drum (2) or preferably at an angle corresponding to in the range 130° - 180° relative to the drum (cf. fig 2) and the in-feeding conveyor is rotating at a slower speed than the drum (2). The edge of the blade (4) is positioned at a point of contact at 20° -70° relative to the drum. In this way the blade (4) supports the skin as it is being separated from the rest of the food products. The reason for the position/direction of the blade (4) is to reduce the surface that the product has to pass over in order to enter the take-away conveyor (5). The take-away/out-feeding conveyor belt (5) is in a horizontal position or at 0°. The take-away conveyor (5) rotates at a greater speed than the drum and thereby ensures that the food product is stretched and pulls it away from the cutting mechanism. The take-away conveyor (5) delivers the skinned food product either onto a processing line for further processing the food product (manual or automatic processing) or into a packing line/device. The food product delivered from the skinning apparatus is therefore smooth and stretched, but not wrinkled or folded in any way.

Claims

1. An apparatus for flaying or skinning food products, the apparatus comprising:

   - an in-feeding conveyor,
   - a drum located at the aft end of the in-feeding conveyor, the top surface of the drum rising above the plane of the in,
   - a push-down conveyor,
   - a cutting means, and
   - an out-feeding/take-away conveyor,

   wherein the push-down conveyor belt rotates and applies pressure against the drum as it pulls a food product over the drum and over the cutting means separating the skin from the food product.

2. The apparatus of claim 1, wherein said drum is located adjacent to the aft end of the in-feeding conveyor, the drum being elevated with respect to the in-feeding conveyor such that the top surface of the drum is higher than surface of the in-feeding conveyor adjacent to the drum.

3. The apparatus according to claim 1, wherein the rotation of the push-down conveyor belt and the drum is synchronised to pull the food product in the processing direction over the cutting means.

4. The apparatus according to claim 1, wherein the push-down conveyor belt applies an adjustable pressure against the food product being pulled over the drum.

5. The apparatus according to claim 1, wherein the diameter of the drum is in the range from 70 - 300 mm, such as in the range from 100 to 300 mm, or in the range from 100 to 250 mm, or in the range from 150 to 225 mm, or about 200mm.

6. The apparatus according to any of the preceding claims, wherein the location of a blade of the cutting means is at the top of the drum.

7. The apparatus according to claim 1, where the location of a blade of the cutting means is at the rear side of the drum in relation to the in-feeding conveyor, facing the drum at a point which is at in the range of 0-70° relative to the feed direction, and flays or skins the food product as it is in a declining direction on the drum.

8. The apparatus according to any of the claims 4 to 7, wherein the control of the pressure applied by the push-down conveyor is computer controlled.

9. The apparatus according to any of the claims 4 to 8, wherein the pressure applied by the push-down conveyor is variable during operation.

10. The apparatus according to claim 9, wherein the pressure applied by the push-down conveyor is variable during skinning of the same product.

11. The apparatus according to any of claims 8 to 10, further comprising sensors identifying when a product approaches the cutting means, said sensors providing input to said computer.

12. A method for flaying or skinning food products, the method comprising:

- transporting the food product on an in-feeding conveyor onto a drum, where a push-down conveyor rotates and applies an pressure against the drum as it pulls the food product over the drum and over cutting means separating the skin from the food product,
- wherein said drum is elevated with respect to the in-feeding conveyor such that the top surface of the drum is higher than surface of the in-feeding conveyor adjacent to the drum,rotating said drum such that it has a higher surface speed that said in-feeding conveyor,
- separating the skin from the food product by said cutting means, which are located on the rear side of the drum with respect to said in-feeding conveyor, facing the drum at a point which is at in the range of 0-70° relative to the feed direction,
- transporting the food product on an out-feeding conveyor off the drum after the food product has been flayed or skinned.

13. The method according to claim 12, where the surface speed of the out-feeding conveyor is greater than the surface speed of the drum.

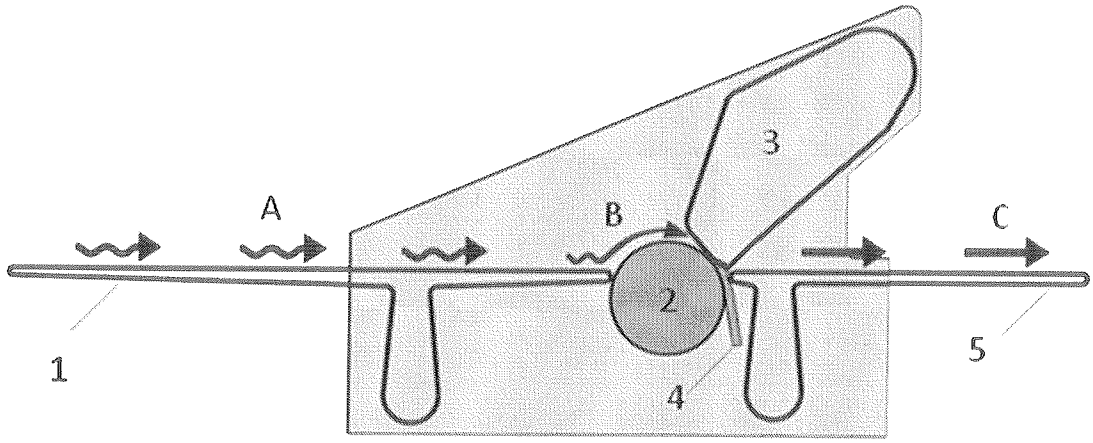


Fig. 1

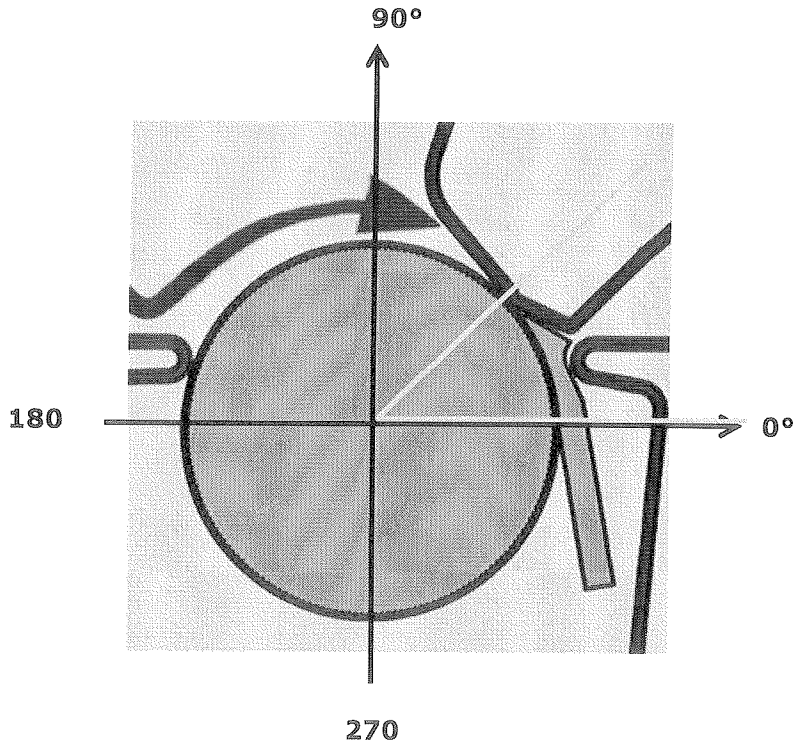


Fig. 2

INTERNATIONAL SEARCH REPORT

International application No
PCT/IS2013/050004

A. CLASSIFICATION OF SUBJECT MATTER
INV. A22C25/17 A22B5/16
ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
A22C A22B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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X	WO 02/078453 A2 (NORDISCHER MASCHINENBAU [DE]; GROSSEHOLZ WERNER [DE]; SCHWARZ OLAF [DE]) 10 October 2002 (2002-10-10) the whole document	1,12
A	US 2010/313720 A1 (GRABAU THOMAS [DE]) 16 December 2010 (2010-12-16) the whole document	1,12

☐ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

* Special categories of cited documents :

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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
26 July 2013	05/08/2013

Name and mailing address of the ISA/	Authorized officer
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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
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