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FOOD PRODUCT SLICER AND ASSOCIATED SHARPENER ASSEMBLY

Abstract

A food product slicer includes a base, a knife mounted for rotation about an axis relative to the base, the knife including a peripheral cutting edge, and a carriage assembly mounted to the base for reciprocal movement back and forth past the peripheral cutting edge of the knife. A knife sharpener includes a first sharpening component movable between a first non-sharpening position spaced from the peripheral cutting edge and a first sharpening position engaged with the peripheral cutting edge. A knife guard extends about portions of the peripheral cutting edge and includes a radially inner edge facing toward and running along the peripheral cutting edge, wherein the radially inner edge includes a radially outwardly extending channel along which the first sharpening component moves to reach the first sharpening position.

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Background/Summary

TECHNICAL FIELD

[0001] This application relates generally to food product slicers of the type commonly used to slice bulk food products and, more specifically, to a food product slicer with a rotatable slicer knife and associated knife sharpener.

BACKGROUND

[0002] Typical reciprocating food slicers have a rotatable, circular or disc-like slicing blade, an adjustable gauge plate for varying the thickness of the slice and a carriage for supporting the food as it is moved back and forth past the cutting edge of the knife, and over a knife cover plate, during slicing. A drive motor may be linked to drive the carriage back and forth during an automatic slicing operation carried out by a controller of the slicer. The gauge plate is situated along the edge of the knife toward the front of a slicing stroke and is laterally movable with respect to the knife for varying the thickness of the slices to be cut. A rotatable adjustment or indexing knob is provided manually for setting a spacing between the plane of the gauge plate surface and the plane of the knife edge for the purpose of slicing so that operators can select a thickness of slices to be produced.

[0003] Slicers knives, by nature, need to be sharpened in order to maintain a long-life and proper slicer performance. For the purpose of sharpening, a sharpening stone is brought into contact with the knife edge (typically at both the back and front sides of the knife). Limiting exposure of the knife edge is also preferred. U.S. Pat. No. 7,134,937 discloses a slicer with a sharpener and associated knife guard in which a guard member pivots between a cutting edge guard position and a cutting edge sharpening position in which sharpening stones can contact the knife edge for sharpening. Movement of the pivoting guard member is triggered by actuation of the sharpener assembly.

[0004] It would be desirable to provide a slicer with an effective knife sharpener that has more limited exposure of the knife edge, especially during sharpening.

SUMMARY

[0005] In one aspect, a food product slicer includes a base, a knife mounted for rotation about an axis relative to the base, the knife including a peripheral cutting edge, and a carriage assembly mounted to the base for reciprocal movement back and forth past the peripheral cutting edge of the knife. A knife sharpener includes a first sharpening component movable between a first non-sharpening position spaced from the peripheral cutting edge and a first sharpening position engaged with the peripheral cutting edge. A knife guard extends about portions of the peripheral cutting edge and includes a radially inner edge facing toward and running along the peripheral cutting edge, wherein the radially inner edge includes a radially outwardly extending channel along which the first sharpening component moves to reach the first sharpening position.

[0006] In another aspect, a food product slicer includes a base, a knife mounted for rotation about an axis relative to the base via a knife drive shaft, the knife including a peripheral cutting edge, a knife sharpener including a sharpening stone movable between a non-sharpening position spaced from the knife edge and a sharpening position engaged with the knife edge, and a knife guard extending about portions of the peripheral cutting edge, where the knife guard includes a radially outward extending recess along which the sharpening stone moves to reach the sharpening position.

[0007] In yet another aspect, a food product slicer includes a base, a knife mounted for rotation about an axis relative to the base, the knife including a peripheral cutting edge, wherein the peripheral cutting edge defines a cutting edge plane and a carriage assembly mounted to the base

for reciprocal movement back and forth past the peripheral cutting edge of the knife. A knife sharpener includes a first sharpening component and a second sharpening component, the first sharpening component movable between a first non-sharpening position spaced from the peripheral cutting edge and a first sharpening position engaged with the peripheral cutting edge in a first region of a knife perimeter defined by the peripheral cutting edge, the second peripheral component movable between a second non-sharpening position spaced from the peripheral cutting edge and a second sharpening position engaged with the peripheral cutting edge in a second region of the knife perimeter. A knife guard rail extends about portions of the peripheral cutting edge, the knife guard rail including a radially inner edge facing toward and running along the peripheral cutting edge in both the first region and the second region. When the first sharpening component is in the first sharpening position and the second sharpening component is in the second sharpening position, the peripheral cutting edge in both the first region of the knife perimeter and the second region if the knife perimeter is radially bounded, in the cutting edge plane, by the radially inner edge of the knife guard rail.

[0008] In another aspect, a food product slicer includes a base, a knife mounted for rotation about an axis relative to the base via a knife drive shaft, the knife including a peripheral cutting edge, a knife sharpener including a sharpening stone movable between a non-sharpening position spaced from the knife edge and a sharpening position engaged with the knife edge, and a knife guard rail having a first end and a second end, and extending about a portion of the peripheral cutting edge. The knife guard rail is configured with a face portion that faces in a first direction parallel the axis of the knife and toward a carriage side or upper side of the knife, and an entirety of the portion of the peripheral cutting edge bounded by the knife guard rail between the first end and the second end is offset from the face portion in a second direction parallel to the axis and toward a slice drop side or lower side of the knife.

Description

BRIEF DESCRIPTION OF DRAWINGS

[0009] FIGS. **1-4** show perspective views of a food product slicer;

[0010] FIGS. **5-6** show perspective views of portions of the slicer;

[0011] FIGS. **7-8** show portions of a mount component that includes a knife guard;

[0012] FIGS. **9-10** show perspective views of a region of the knife guard that facilitates knife sharpening;

[0013] FIGS. **11-16** show a sharpener assembly with sharpening and truing stones in non-sharpening positions, (FIG. **11** with sharpener cover shown, and FIGS. **12-16** with cover not shown);

[0014] FIGS. **17-18** show cross-section views of a first one of the sharpening components in the non-sharpening position;

[0015] FIGS. **19-20** show cross-section views of the first one of the sharpening components in the sharpening position;

[0016] FIG. **21** shows a perspective view of a second one of the sharpening stones in the sharpening position; and

[0017] FIGS. **22-23** show cross-section views of the second one of the sharpening stones in the sharpening position.

DETAILED DESCRIPTION

[0018] Referring to FIGS. **1-4**, a food product slicer **10** includes a base **12** and a circular, motor-driven slicing knife **14** that is mounted to the housing for rotation about an axis **16**. The left side of FIG. **1**, where the controls are located and an operator is located during slicing, is generally referred to as the front side of the slicer (which is where an operator stands for slicing), and the

right side of FIG. **1** is generally referred to as the rear side of the slicer. A food product can be supported on a manually operable (or motor driven) food carriage **20** which moves the food product to be sliced past the peripheral cutting edge **14***a* of the rotating slicing knife **14**. The food carriage **20** reciprocates from left to right relative to FIG. **1**, along a linear carriage path so that the lower end of the bulk food product slides along the surface of a gauge plate **22**, is cut by the knife **14** and then slides along a knife cover plate **24**. Food carriage **20** includes a tray mounted on a tray arm **26** that orients the food carriage tray at the appropriate angle (typically perpendicular) to the knife cutting-edge plane. The food carriage arm reciprocates in a slot **28** at a lower portion of an external housing **12***a* of the base **12**. The carriage **20** can be moved manually (e.g., by a handle) and/or the carriage **20** may also be automatically driven (e.g., as by an internal motor that drives a belt that is linked internally to the arm). A gauge plate system includes a rotatable knob **30** (connected to an opening in the base **12**) that includes a grip part **30***a* and an internal cam part that is linked to the gauge plate **22** such that rotation of the knob **30** effects movement the gauge plate, relative to a plane of the knife edge **14***a*, to adjust slice thickness. Generally, during movement of the gauge plate **22**, the food product contact surface plane of the gauge plate **22** remains substantially parallel to the plane of the knife edge **14***a*. A knife sharpener assembly **34** is also mounted on the machine and can be manually operated to sharpen the knife edge **14***a*.

[0019] In this regard, referring to FIGS. **5-23**, the slicer includes a knife guard **40** that extends about portions of the knife edge, including in a region **42** of the knife sharpener assembly **34**. Here, the sharpener assembly **34** includes an axially movable sharpening stone **34***a* (or other) and a truing stone **34***b* (or other) mounted on a pivotable arm **34***c*, with both stones movable, by operation of a control arm **34***d*, between non-sharpening positions (per FIGS. **13-18**) and sharpening positions in which they engage the knife edge (per FIGS. **19-23**). The movement of the stones may be similar to that described in U.S. Pat. No. 5,591,072.

[0020] The knife guard **40** comprises a peripheral rail **44** that is configured to both guard the knife peripheral cutting edge **14***a* and permit the sharpening and truing stones to engage with the knife peripheral cutting edge **14***a* during sharpening. More specifically, the rail **44** includes a radially outward extending channel **44***a* through or along which the stone **34***a* is movable to reach a first side of the knife peripheral cutting edge, and a slot recess **44***b*, formed in a cover plate facing side or face portion **47** of the rail, and into which portions of the structure holding the stone **34***b* (and potentially portions of the stone **34***b* itself) move to allow the stone **34***b* to engage with a second side of the knife peripheral cutting edge. Here, the channel **44***a* has a shape (e.g., substantially cylindrical) that follows the peripheral contour of the stone **34***a* (e.g., stone is circular), while the slot recess **44***b* is more rectangular in shape.

[0021] When the stones **34***a*, **34***b* are in the non-sharpening positions, the knife guard rail **44** is configured such that there is little or no exposure of the knife peripheral cutting edge. A peripheral portion of the knife cover plate **24** overlaps with the region of the location of channel **44***a* at the second side of the knife peripheral cutting edge. When the stone **34***a* is in the non-sharpening position, the stone **34***a* is located proximate an entry end of the channel **44***a* at the first side of the knife peripheral cutting edge (per FIG. **13**). This overall configuration blocks access to the knife peripheral cutting edge along the channel **44***a*. The slot recess **44***b* includes a major portion **44***b***1** that extends radially and is offset from the knife peripheral cutting edge, and only a radially inner portion **44***b***2** is deep enough to provide the stone **34***b* access to the knife peripheral cutting edge **14***a*. This provides a configuration in which the entire knife peripheral cutting edge, at least in the regions of sharpening stone contact, and more desirably in the entire region extending from one end of the rail **44** to the opposite end of the rail **44**, is offset (e.g., in a direction along the knife axis and toward the slice drop side/lower side of the knife) back from a plane in which the side or face portion **47** of the ring guard rail **44** lies, but the knife is still able to sharpened.

[0022] In embodiments, an entirety of the portion of the peripheral cutting edge that is bounded by the knife guard rail between the two ends of the rail, inclusive of edge portions in the region of the

slots **44***a* and **44***b,* is aligned with and positioned radially inward of part of the radially inwardly facing edge **44***d* of the rail **44** so to provide only a very small radial gap between the radially inward facing edge **44***d* and the peripheral cutting edge **14***a.* This limits undesired exposure of the knife peripheral cutting edge **14***a.*

[0023] Movement of the knife guard rail **44** is not needed and does not take place to achieve sharpening. In the sharpening position of the stones **34***a,* **34***b,* the upper portion of the stone **34***a,* which upper portion is, here, above the rotation axis **34***a***1** of the stone **34***a,* engages with the knife edge **14***a,* and the stone **34***a* is also covered by the rail **44**. Only a small portion of the stone **34***b* moves into the radially inner portion **44***b***2** of the slot recess **44***b.* Positioning of the stone **34***a* such that the upper portion **34***a* will engage the knife edge for sharpening is particularly useful for limiting knife edge exposure.

[0024] As explained above, the geometry of the ring guard is also important. Just enough tolerance for sharpener functionality is provided, while still covering the knife edge as much as possible. The depicted geometry will safeguard the knife while still allowing the sharpener to sharpen the knife.

[0025] Here, the knife guard **40** may be part of a single monolithic mount part **38** that is provided to serve as both the part to which a drive shaft assembly for the knife **14** mounts (e.g., per hub **38***a*), the part to which the knife cover plate **24** mounts (e.g., per openings **38***b*) and the part to which the knife sharpener assembly **34** mounts (e.g., per sharpener mount platform **38***c*). This also helps assure proper positioning and tolerance between the knife guard **40** and the knife edge **14***a,* as well as the sharpening stones.

[0026] Here, the channel **44***a* is formed at the upper side of an opening **45** through the mount part **38**, such that the sharpening stone **34***a* passes along and/or through an opening that is fully enclosed or surrounded by portions of the mount component, to reach the knife peripheral cutting edge. The opening **45** therefore operates as a tunnel through which the stone **34***a* passes. Notably, the sharpener mount platform **38***c* extends from a region below the opening **45**.

[0027] Thus, the described embodiment provides a food slicer **10** with a knife sharpener **34** including a first sharpening component **34***a* movable between a first non-sharpening position (FIGS. **17**-**18**) spaced from the knife peripheral cutting edge **14***a* and a first sharpening position (FIGS. **19**-**20**) engaged with the peripheral cutting edge. The knife guard **40** extends about portions of the peripheral cutting edge **14***a,* and the knife guard **40** includes a radially inner edge **44***d* facing toward and running along the peripheral cutting edge **14***a.* The radially inner edge **44***d* includes a radially outwardly extending channel **44***a* along which the first sharpening component **34***a* moves to reach the first sharpening position. The knife guard includes a front face **47** and a rear face **49**, wherein the front face **47** faces the carriage assembly movement path. The channel **44***a* includes an entry end toward the rear face **49** and a closed end covered by the front face **47**.

[0028] The peripheral cutting edge **14***a* of the knife defines a cutting edge plane, the front face **47** defines a knife guard plane, and the cutting edge plane is offset from the knife guard plane in a direction toward the rear face **49** (see FIG. **17**). The sharpener **34** includes a second sharpening component **34***b* movable between a second non-sharpening position (FIG. **15**) spaced from the peripheral cutting edge and a second sharpening position (FIGS. **21**-**23**) in which the second sharpening component **34***b* is engaged with the peripheral cutting edge **14***a.* The front face **47** of the knife guard includes a slot recess **44***b* into which at least part of the second sharpening component **34***b* is located when the second sharpening component is in the second sharpening position. The slot recess **44***b* includes a bottom wall **43** with a radially outer major portion **44***b***1** having a first depth and lying in a slot plane, wherein the peripheral cutting edge plane is aligned with the slot plane or is offset from the slot plane in the direction toward the rear face **49**. The bottom wall **45** includes a radially inner minor portion **44***b***2** that tapers away from the bottom wall **45** and the knife guard plane and in a direction toward the radially inner edge **44***d* of the knife guard.

[0029] When moving from the non-sharpening position to the sharpening position, the first

sharpening component **34***a* moves along a through opening **45** of the knife guard, wherein the channel **44***a* is part of a boundary defining the through opening, and the boundary fully surrounds the through opening **45**. Here, the channel **44***a* is formed by a portion of a peripherally enclosed opening **45** through a mount part **38** that includes the knife guard **40**.
[0030] The knife guard rail **44** extends about portions of the peripheral cutting edge **14***a*, and the knife guard rail **44** includes a radially inner edge **44***d* facing toward and running along the peripheral cutting edge **44***a* in both a first region where the first sharpening component **34***a* contacts the knife for sharpening and a second region where the second sharpening component **34***b* contacts the knife for sharpening. When the first sharpening component **34***a* is in the first sharpening position and the second sharpening component **34***b* is in the second sharpening position, the peripheral cutting edge **14***a* in both the first region of the knife perimeter and the second region if the knife perimeter is radially bounded, in the cutting edge plane, by the radially inner edge **44***d* of the knife guard rail **44**. The knife guard rail **44** is mounted in a fixed position and does not move when the first and second sharpening components **34***a* and **34***b* move from the first and second non-sharpening positions into the first and second sharpening positions.
[0031] Here, a radial gap between the peripheral cutting edge **14***a* of the knife **14** and the radially inner edge **44***d* of knife guard rail may be between 0.5 mm and 5 mm (e.g., less than 5 mm or less than 4 mm), and the width W of the slot recess **44***b* may be between 5 mm and 50 mm (e.g., less than 50 mm or less than 45 mm, less than 40 mm or less than 35 mm). However, variations are possible.
[0032] Overall, the described configuration provides for easy cleaning, assures that the knife edge is not significantly exposed (normally or during sharpening), requires a limited part count, and employs a knife guard that does not have parts that must move in order to sharpen the knife.
[0033] It is to be clearly understood that the above description is intended by way of illustration and example only and is not intended to be taken by way of limitation. Variations are possible.

Claims

1. A food product slicer, comprising: a base; a knife mounted for rotation about an axis relative to the base, the knife including a peripheral cutting edge; a carriage assembly mounted to the base for reciprocal movement back and forth past the peripheral cutting edge of the knife; a knife sharpener including a first sharpening component movable between a first non-sharpening position spaced from the peripheral cutting edge and a first sharpening position engaged with the peripheral cutting edge; a knife guard extending about portions of the peripheral cutting edge, the knife guard including a radially inner edge facing toward and running along the peripheral cutting edge, wherein the radially inner edge includes a radially outwardly extending channel along which the first sharpening component moves to reach the first sharpening position.
2. The food product slicer of claim 1, wherein the knife guard includes a front face and a rear face, wherein the front face faces a carriage assembly movement path, wherein the channel includes an entry end toward the rear face and a closed end covered by the front face.
3. The food product slicer of claim 2, wherein the peripheral cutting edge defines a cutting edge plane, wherein the front face defines a knife guard plane, and the cutting edge plane is offset from the knife guard plane in a direction toward the rear face.
4. The food product slicer of claim 3, wherein the sharpener includes a second sharpening component movable between a second non-sharpening position spaced from the peripheral cutting edge and a second sharpening position in which the second sharpening component is engaged with the peripheral cutting edge, wherein the front face of the knife guard includes a slot recess into which at least part of the second sharpening component is located when the second sharpening component is in the second sharpening position.
5. The food product slicer of claim 4, wherein the slot recess includes a bottom wall with a radially

outer major portion having a first depth and lying in a slot plane, wherein the peripheral cutting edge plane is aligned with the slot plane or is offset from the slot plane in the direction toward the rear face.

6. The food product slicer of claim 5, wherein the bottom wall includes a radially inner minor portion that tapers away from the bottom wall and the knife guard plane and in a direction toward the radially inner edge of the knife guard.

7. The food product slicer of claim 1, wherein, when moving from the non-sharpening position to the sharpening position, the first sharpening component moves along a through opening of the knife guard, wherein the channel is part of a boundary defining the through opening, and the boundary fully surrounds the through opening.

8. The food product slicer of claim 1, wherein the channel is formed by a portion of a peripherally enclosed opening through a mount part that includes the knife guard.

9. A food product slicer, comprising: a base; a knife mounted for rotation about an axis relative to the base, the knife including a peripheral cutting edge, wherein the peripheral cutting edge defines a cutting edge plane; a carriage assembly mounted to the base for reciprocal movement back and forth past the peripheral cutting edge of the knife; a knife sharpener including a first sharpening component and a second sharpening component, the first sharpening component movable between a first non-sharpening position spaced from the peripheral cutting edge and a first sharpening position engaged with the peripheral cutting edge in a first region of a knife perimeter defined by the peripheral cutting edge, the second peripheral component movable between a second non-sharpening position spaced from the peripheral cutting edge and a second sharpening position engaged with the peripheral cutting edge in a second region of the knife perimeter; a knife guard rail extending about portions of the peripheral cutting edge, the knife guard rail including a radially inner edge facing toward and running along the peripheral cutting edge in both the first region and the second region, wherein, when the first sharpening component is in the first sharpening position and the second sharpening component is in the second sharpening position, the peripheral cutting edge in both the first region of the knife perimeter and the second region if the knife perimeter is radially bounded, in the cutting edge plane, by the radially inner edge of the knife guard rail.

10. The food product slicer of claim 9, wherein the knife guard rail is mounted in a fixed position and does not move when the first and second sharpening components move from the first and second non-sharpening positions into the first and second sharpening positions.

11. The food product slicer of claim 10, wherein the knife guard rail is part of a mount part that defines a peripherally enclosed opening through which the first sharpening component moves to reach the first sharpening position.

12. The food product slicer of claim 10, wherein the knife guard rail includes a front face and a rear face, wherein the front face faces a carriage assembly movement path, wherein the front face defines a knife guard plane, and the cutting edge plane is offset from the knife guard plane in a direction toward the rear face.

13. A food product slicer, comprising: a base; a knife mounted for rotation about an axis relative to the base, the knife including a peripheral cutting edge; a knife sharpener including a sharpening stone movable between a non-sharpening position spaced from the peripheral cutting edge and a sharpening position engaged with the peripheral cutting edge; a knife guard rail having a first end and a second end, and extending about a portion of the peripheral cutting edge, wherein the knife guard rail is configured with a face portion that faces in a first direction parallel the axis of the knife and toward a carriage side of the knife, and an entirety of the portion of the peripheral cutting edge bounded by the knife guard rail between the first end and the second end is offset from the face portion in a second direction parallel to the axis and toward a slice drop side of the knife.