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(54) **Cutting apparatus for cutting vegetable food products**

(57) Apparatus (1) for cutting vegetable products (2) such as tubers, e.g. potatoes, in two or more parts. The apparatus comprises:

- at least one movable seat (6) for holding the product to be cut, the seat comprising a passage (8),
- a stationary knife (39) and

- drive means (5) for pulling the seat along a path crossed by the knife while the knife goes through the passage in the seat.

The drive means may for example be a belt. At the position of the knife the path extends along a straight line extending in a direction parallel to the knife.

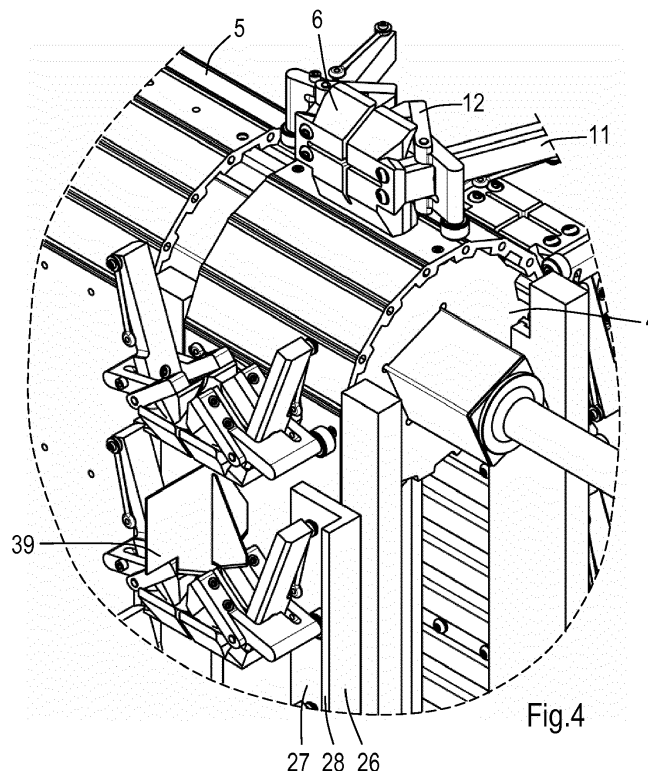


Fig.4

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Description

[0001] The invention relates to a cutting apparatus for cutting vegetable floor products, such as tubers, in particular potatoes.

[0002] In the field of convenience food, food wholesale and catering potatoes or similar vegetables are usually peeled and cut into parts. To ensure an equal cooking or baking time for each of the resulting parts, the potatoes should be cut in parts of more or less equal size.

[0003] DE 4212556 discloses an apparatus for cutting peeled potatoes in a high-speed continuous process into two or four parts. The potatoes are received and centered in shaped seats with a central gap. The seats are arranged on a rotating drum. By rotating the drum the seats are moved along a fixed knife, which passes the central passage during movement of the respective seats.

[0004] The potato is cut by a straight knife when it follows the curved path of the drum. As a result the potato may shift relative to the seat. This results in less accurate cutting. Although the seats in DE 4212556 carrying the potatoes are shaped to have some centering effect, a substantial part of the potatoes may still not be centered properly and the cut halves or quarters may still differ considerably in size. Moreover, the required gap should be relatively wide, particularly if the knives comprises crossing blades to cut the potatoe in more than two parts. Such wide gaps provide less support for the potatoes during cutting.

[0005] It is an object of the invention to provide an apparatus allowing more accurate cutting of potatoes or similar food products into equal parts, even in a high speed cutting process.

[0006] The object of the invention is achieved with an apparatus for cutting vegetable products, in particular potatoes. The apparatus comprises:

- at least one movable seat for holding the product to be cut, the seat comprising a passage,
- a stationary knife and
- drive means for pulling the seat along a path crossed by the knife while the knife goes through the passage in the seat. At the position of the knife the path extends along a straight line extending in a direction parallel to the knife. This way, the knife cuts the product along a straight cutting surface and easier and more accurate cutting is achieved.

[0007] The drive means may for example comprise a belt or chain conveyer. Such a conveyer defines a straight path between two rollers and is therefore particularly suitable to guide the seat via a straight line along the knife. To provide a high throughput the drive means may for instance comprise a conveyer carrying a plurality of aligned seats. This allows continuous high-speed processing of the potatoes, for instance a processing speed of about 150 potatoes per minute per lane or more.

[0008] In a specific embodiment, the holding seat may

for example comprise at least two symmetrically configured centering arms for resiliently engaging opposite sides of a product to be cut. The centering arms may be movable, e.g., independently movable, between a centering position and a release position or open position, the centering arms being resiliently biased towards the centering position, for example by respective springs. In a specific embodiment, the centering arms may for example be slidable and/or pivotable about a pivot axis between the aforementioned centering position and the release position, the centering arms being resiliently biased towards the centering position. The centering arms are balanced when the springs are stretched by extensions of substantially equal lengths. The forces exerted by the opposite arms are balanced when the potato is centered in the seat. The potato to be cut will generally be peeled and is easily moved by the centering arms balancing each other, particularly if the seat surface is of a low friction material, in particular a plastic material, such as PTFE.

[0009] The seats can for example be cup-shaped, e.g., with a deepest point forming the center of the knife passage. The potato will be centered at the deepest point of the cup shape so the knife will be accurately centered relative to the potato.

[0010] The apparatus may for example comprise one or more cams engaging the centering arms as they pass the cams to temporarily move the centering arms from the centering position into the release position before the seat passes the knife. The cams may for example push a rear end of a centering arm to pivot it temporarily into the release position against the action of the biasing force. The cams can for example be part of a guide running along at least a part of the path of the seats.

[0011] The centering arms can be provided with a first end for engaging a product to be cut and an opposite second end. The centering arm may be pivotable about a pivot axis between the first and second end. The second ends of the respective centering arms may be configured to be engaged a cam on a guide so as to pivot the centering arm into the release position. In this position a product can be positioned on the seat. After passage of the cam the centering arm can be pivoted back into the centering position, e.g., under the action of a biasing spring.

[0012] Optionally, the guide may comprise a second cam for pivoting the centering arms between the first cam and the knife. This contributes to further improvement of the centering.

[0013] The apparatus may have two symmetrically arranged opposite guides flanking the path of the seats, with symmetrically arranged cams of substantially equal length at either side of the path of the seats. The guides may for example be angled profiles.

[0014] The conveyor comprises a discharge part where the seats follow a downward path, the apparatus comprising a second set of cams at the discharge part of the conveyer for temporarily moving the centering arms from the centering position into the release position.

[0015] For halving the potatoes, a knife can be used comprising a single blade, extending parallel to the direction of movement of the driving means. If the potatoes need to be quartered, a knife can be used with two crossing knife blades, the passage in the seat having a matching cross shape. The center of the cross shaped passage may coincide with the center of the seat. More blades can be used if the potatoes need to be cut in even smaller parts.

[0016] The apparatus of the invention is particularly suitable for cutting potatoes or similar tubers, such as turnips, beetroots or sugar beets, or other vegetables, such as cabbages or onions, or fruit types, such as apples.

[0017] The invention will be further explained with reference to the accompanying drawings, showing an exemplary embodiment.

Figure 1: shows an exemplary embodiment of an apparatus according to the present invention in front view;

Figure 2A: shows one of the seats of the apparatus of Figure 1 in front view;

Figure 2B: shows the seat of Figure 2A in top view;

Figure 3A: shows the seat of Figure 2A crossing the knife in front view;

Figure 3B: shows the seat of Figure 3A in top view;

Figure 4: shows in more detail in perspective view the upper end of the apparatus of Figure 1;

Figure 5: shows the apparatus of Figure 1 in rear view;

Figure 6: shows the apparatus of Figure 1 with a potato supply device in side view;

Figure 7: shows a detail of the arrangement of Figure 6.

[0018] Figure 1 shows a cutting apparatus 1 for cutting potatoes 2, or similar food products, into four essentially equal parts. The apparatus 1 comprises a vertically arranged belt conveyer with a frame 3 carrying two parallel rollers 4 driving an endless belt 5 with a row of aligned, equidistantly arranged seats 6 for holding individual potatoes 2 to be cut. At the front side shown in Figure 1, the conveyer transports the seats 6 in upward direction A.

[0019] Figures 2A and 2B shows a seat 6 in more detail. The seat 6 is made of a low friction material and is cup shaped. The seat 6 has a cross shaped centered passage opening 8. The deepest point of the cup shape coincides with the center point of the cross-shaped passage 8. In Figures 2A and 2B the seat 6 carries a peeled or unpeeled potato 2. Due to the cup-shape of the seat 6 the potato 2 slides to the center point of the seat 6.

[0020] The seat 6 comprises a backside support 9 which is attached to the endless belt 5. At both sides of the back support 9 the seat 6 is provided with two oppositely arranged uprights 11 extending upwardly from a lower edge of the seat 6. The uprights 11 are outwardly inclined, diverging in upward direction. Both uprights piv-

otally support a respective resiliently centering arm 12. The centering arms 12 have a U-shaped main body, with legs 13 at both sides of the respective upright 11. At the ends above the seat 6 the legs 13 carry curved flanges 14. The flanges 14 of the two legs 13 extend in each other's direction. A gap 16 between the two flanges 14 is aligned with the passage opening 8 in the seat 6. The surfaces 17 of the flanges 14 directed towards the seat 6 are slightly concavely curved to improve proper gripping a peeled or unpeeled potato 2. The opposite ends of the legs 13 are connected by a base section 18 forming a bearing for a wheel 19 pointing towards the belt. The wheel 19 is rotatable about a rotational axis X. The two legs 13 are connected to the uprights 11 and are pivotable relative to the upright about a pivot axis Y. A spring 21 extends between a top end of the upright 11 and the centering arm 12 at a point 22 between the pivot axis Y and the rotational axis X of the wheel. The spring 21 biases the centering arms 12 into a closed centering position, as shown in Figure 3A. By pushing down the wheel 19, the centering arm 12 pivots upwardly into an open release position allowing to receive a peeled or unpeeled potato 2 or a similar product to be cut in the cup shaped seat 6 (see Figure 2A).

[0021] After a potato 2 is laid in the seat 6 the centering arms 12 are pivoted downward under the action of the springs 21 to engage the potato 2. The resilient forces exerted by the two centering arms 12 will be balanced such that the two springs 21 are stretched by extensions of substantially equal lengths. The potato 2 is easily moved over the low friction material of the seat 6. As a result, and due to the symmetrical arrangement and shape of the seat 6, the centering arms 12, and the springs 21, the potato 2 is accurately centered by the balancing centering arms 12.

[0022] As shown in Figure 1 the apparatus 1 has two opposite angled profiles 26 both having a first leg 27 parallel to the belt 5 and a forwardly pointing second leg 28 substantially under substantially right angles with the first leg 27. The two first legs 27 have free ends pointing towards each other and defining a vertical gap 29 allowing passage of the backside supports 9 of the seats 6. The respective opposite ends of the first legs 27 are connected to the respective second legs 28. The surfaces of the second legs 28 facing the seats 6 are provided with cams 31 engaging the wheels 19 of the centering arms 12. The seats 6 are moved upwardly by the belt 5. When the seats 5 pass the cams 31 the cams 31 engage the wheels 19 and the centering arms 12 pivot upwardly into their open release position shown in Figure 2A. After passing the cams 31, the centering arms 12 pivot back into the closed position under the action of the springs 21. The cams 31 of the one angled profile 26 are at the same height and have the same lengths as the opposite cams 31 of the other angled profile, so as to form a symmetrical configuration. To allow gradual pivoting the cams 31 have chamfered front sections 32 and end sections 33.

[0023] Cams 31 are present at two heights of the an-

gled profiles 26: a pair of opposite longer cams 34 at the lower side and a pair of opposite shorter cams 35 at a distance above the longer cams 34. The longer cams 34 are at the level of a potato supply device 37, as shown in Figure 5. When a seat 6 passes the two opposite longer cams 34 the centering arms 12 are opened and a potato 2 is positioned in the seat 6. After passing the longer cams 34 the centering arms 12 pivot down and center the potato 2. Subsequently, the seat 6 passes the shorter cams 34 and the centering arms 12 are opened and closed again to achieve further improvement of centering.

[0024] Between the upper ends of the two angled profiles 26 is a knife 39, shown in more detail in Figure 3A. The knife 39 comprises two crossing blades 41, 42: A first blade 41 is substantially under right angles with the belt 5, the second blade 42 cross the first blade 41 centrally under right angles and is substantially parallel to the belt 5. This way the knife 39 has a cross shaped cross section, which is aligned with the respective cross shaped passages 8 through the seats 6.

[0025] The knife 39 is stationary and is fixed to a frame of the apparatus 1 at the other side of the transport belt 5. The two crossing blades 41, 42 of the knife 39 have downwardly pointing V-shaped cutting edges 43. At one side of the first blade 41, the second blade 42 is shorter than at the other side of the first blade 41. This asymmetry serves to optimize load distribution of the forces applied to the knife blades 41, 42.

[0026] The belt 5 pulls the seats 6 upwardly along a straight vertical path until the seats 6 pass the return roller 4. The knife 39 is positioned at a location where the path extends along a straight line extending in a direction parallel to the crossing line of the blades 41, 42 of the knife 39.

[0027] The belt 5 lifts the seats 6 past the two cams 34 with a potato 2 clamped between the two centering arms 12 and draws it along the stationary knife 39. The knife 39 passes the gap 16 between the flanges of the centering arms 12, cuts the potato 2 into quarters and passes the cross-shaped passage 8 in the seat 6. Due to the accurate centering by the centering arms 12 and the cup shape of the seats 6, centrally aligned with the knife 39, the potato 2 is accurately cut into four sections of substantially the same size. The seat 6 strips the potato parts from the knife 39 without leaving parts of the potato 2 sticking to the knife 39.

[0028] In alternative embodiment, a knife can be used having a single blade for cutting the potato in two parts instead of four. The single blade may for example be parallel to the belt 5 or under right angles thereof or make any suitable angle with the belt 5, as long as the blade centrally crosses the passage opening of the seat 6.

[0029] After passing the upper return roller 4 the seat 6 is moved downward and upside down, as shown in Figure 5 by arrow A'. Notwithstanding the upside down position of the seat 6, the potato 2 is held in place by the two centering arms 12 of the seat 6.

[0030] At the rear side, the apparatus 1 has two angled profiles 44 in the same arrangement as the two angled profiles 26 at the front side of the apparatus 1. In the lower section of the apparatus, the angled profiles 44 at the rear side comprise two opposite cams 46 engaging the wheels 19 of the seats 6 as they pass. This pivots the centering arms 12 into the release position releasing the respective potatoes 2 which fall down into a collection unit or discharge conveyer (not shown). This way the potatoes 2 fall only from a limited height without being damaged.

[0031] Figure 6 shows the apparatus 1 in combination with a potato supply device 47. The potato supply device 47 has a funnel 48 filled with potatoes guided by the funnel 48 to slide down under gravity to a discharge opening where they are picked up one by one by supports 49 carried by a vertical chain conveyer 51 which runs with the same speed as the belt 5 of the apparatus 1. The distance between the supports 49 corresponds to the distance between the seats 6 of the apparatus 1. The up-going part of the chain conveyer 51 faces the up-going part of the apparatus 1, such that the supports 49 are next to the upper part of the seats 6. The supports 6 are tilted under the command of a control unit (not shown). The distance between the supports 49 and the seats 6 is such that tilting the support 49 makes the potato 2 slide onto the seat 6, as shown in more detail in Figure 7.

Claims

1. Apparatus (1) for cutting vegetable products (2) such as tubers, e.g. potatoes, in two or more parts, the apparatus comprising:
 - at least one movable seat (6) for holding the product to be cut, the seat comprising a passage (8),
 - a stationary knife (39) and
 - drive means (5) for pulling the seat along a path crossed by the knife while the knife goes through the passage in the seat,**characterized in that** at the position of the knife the path extends along a straight line extending in a direction parallel to the knife.
2. The apparatus of claim 1, wherein the drive means (5) comprise a belt conveyer or chain conveyer.
3. The apparatus of claim 1 or 2, wherein the seat (6) comprises at least two oppositely arranged centering arms (12) for resiliently engaging opposite sides of a product to be cut.
4. Apparatus according to claim 3, wherein the centering arms (12) are movable between a centering position and a release position, and wherein the centering arms are resiliently biased towards the centering

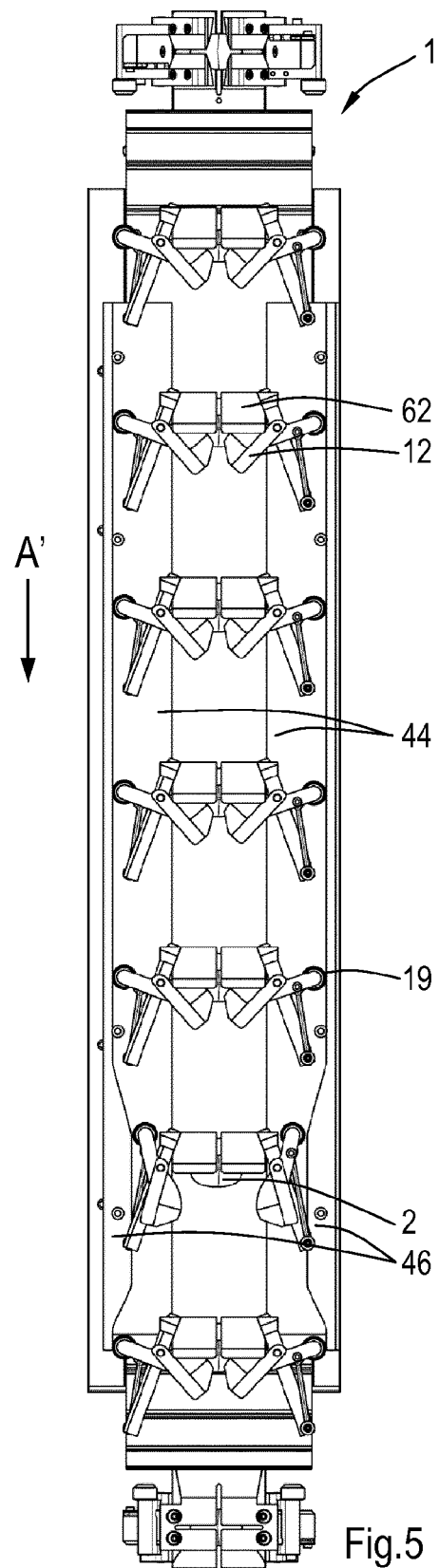
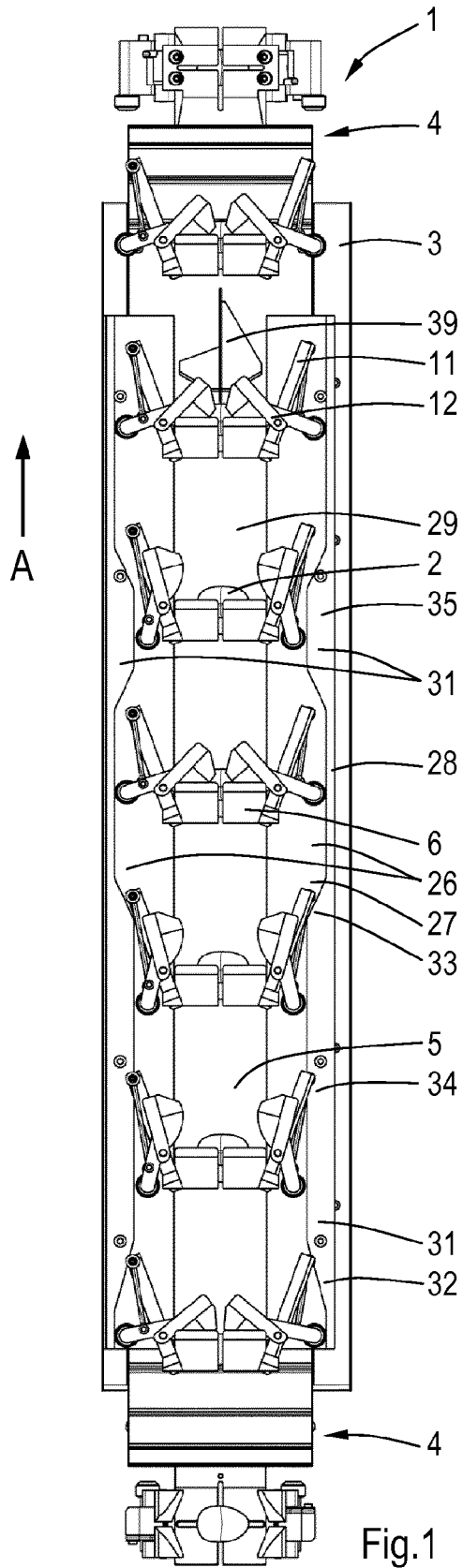
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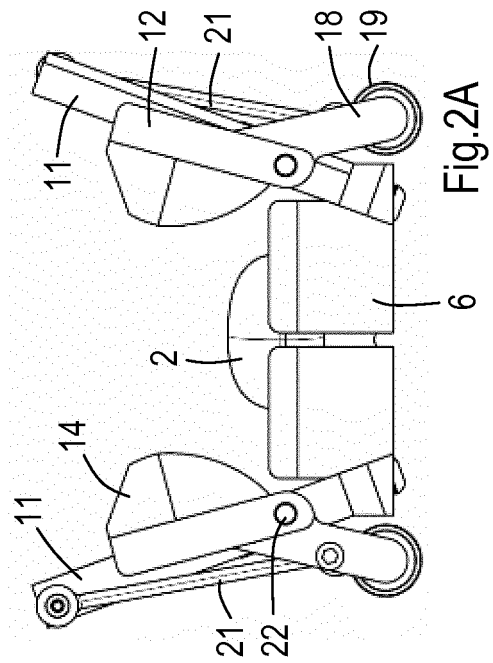
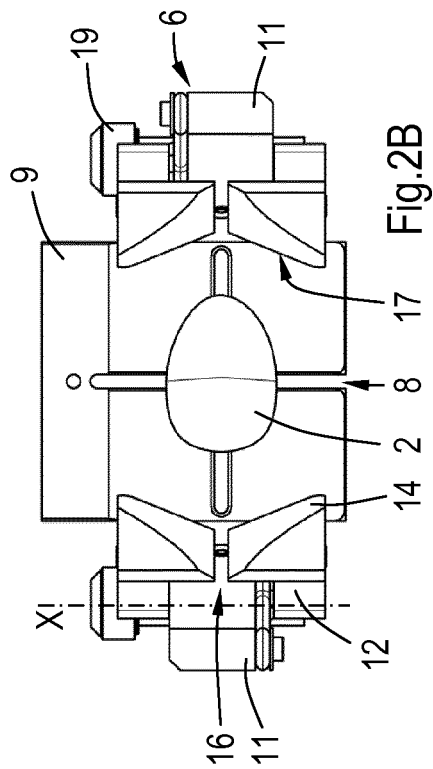
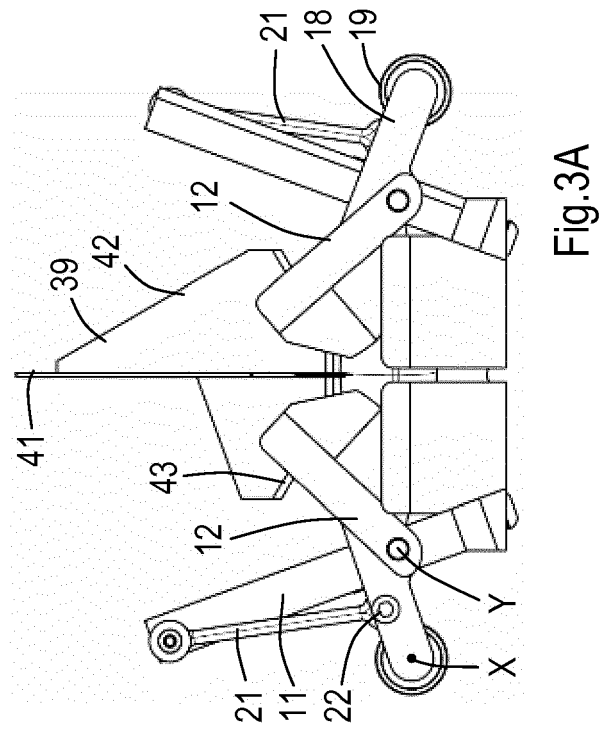
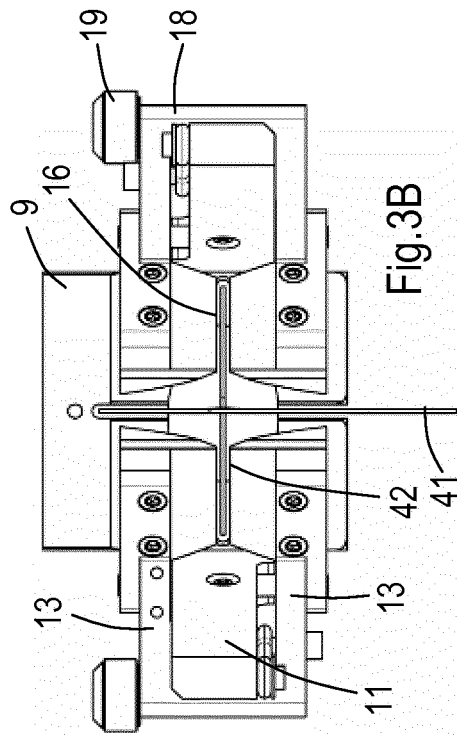
5. Apparatus according to claim 4, wherein the centering arms (12) are pivotable about a pivot axis between said centering position and said release position. 5
6. Apparatus according to claim 4 or 5, wherein the centering arms (12) are biased towards the centering position by respective springs (21). 10
7. Apparatus according to claim 4, 5 or 6, comprising one or more cams (31) engaging the centering arms as they pass the cams to move the centering arms (12) from the centering position into the release position before the seat (6) passes the knife (39). 15
8. Apparatus according to claims 7 wherein the cams (31) are arranged to push a rear end of a centering arm (12) to pivot it into the release position against the action of a biasing spring (21). 20
9. Apparatus according to any preceding claim wherein the drive means comprise a conveyer (5) carrying a plurality of aligned seats (6). 25
10. Apparatus according to claim 7 or 8 and 9, wherein the conveyor comprises a discharge part where seats (6) follow a downward path, the apparatus comprising further cams at the discharge part of the conveyer for temporarily moving the centering arms (12) from the centering position into the release position. 30
11. Apparatus according to any preceding claim, wherein the knife (39) comprises at least two crossing knife blades (41, 42), the passage in the seat having a matching cross shape. 35
12. Apparatus according to claim 11, wherein the center of the cross shaped passage coincide with the center of the seat (6). 40

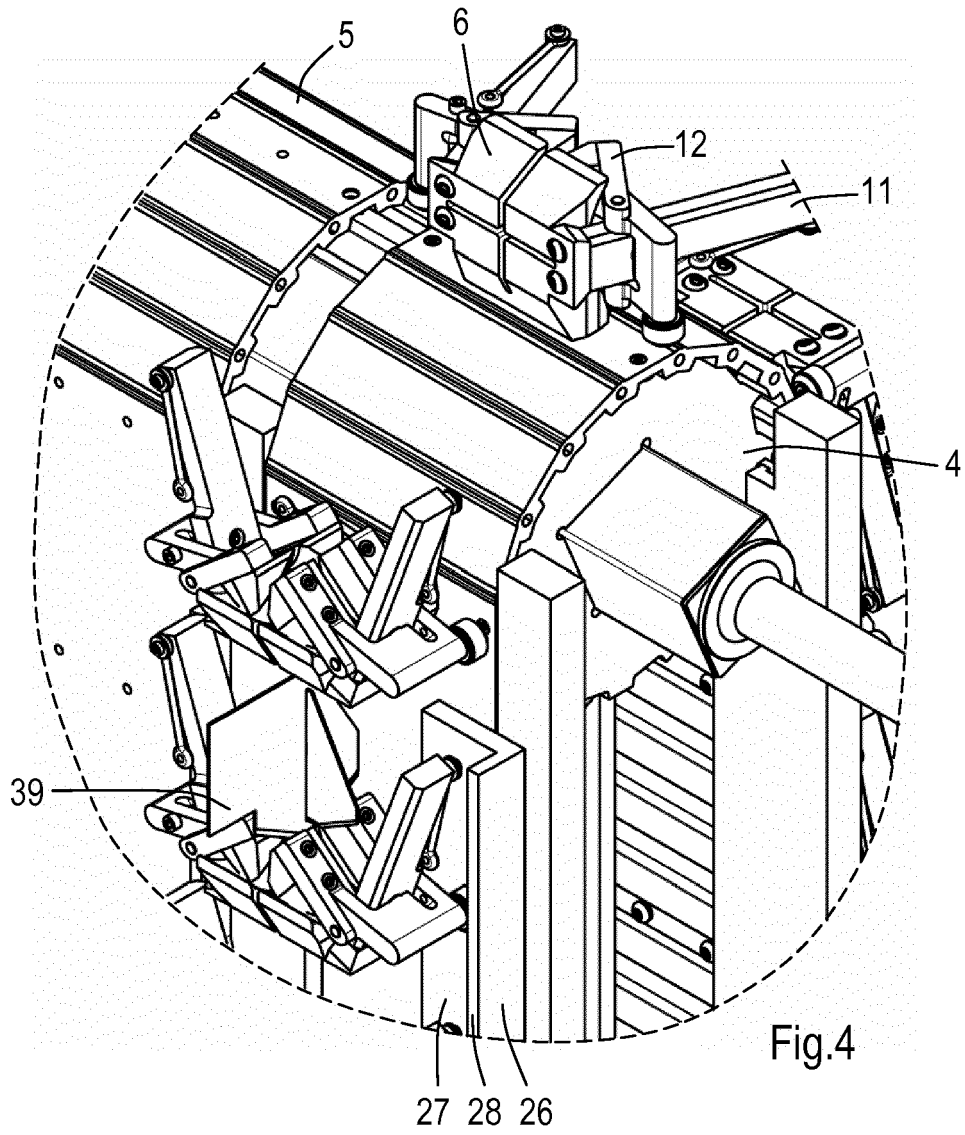
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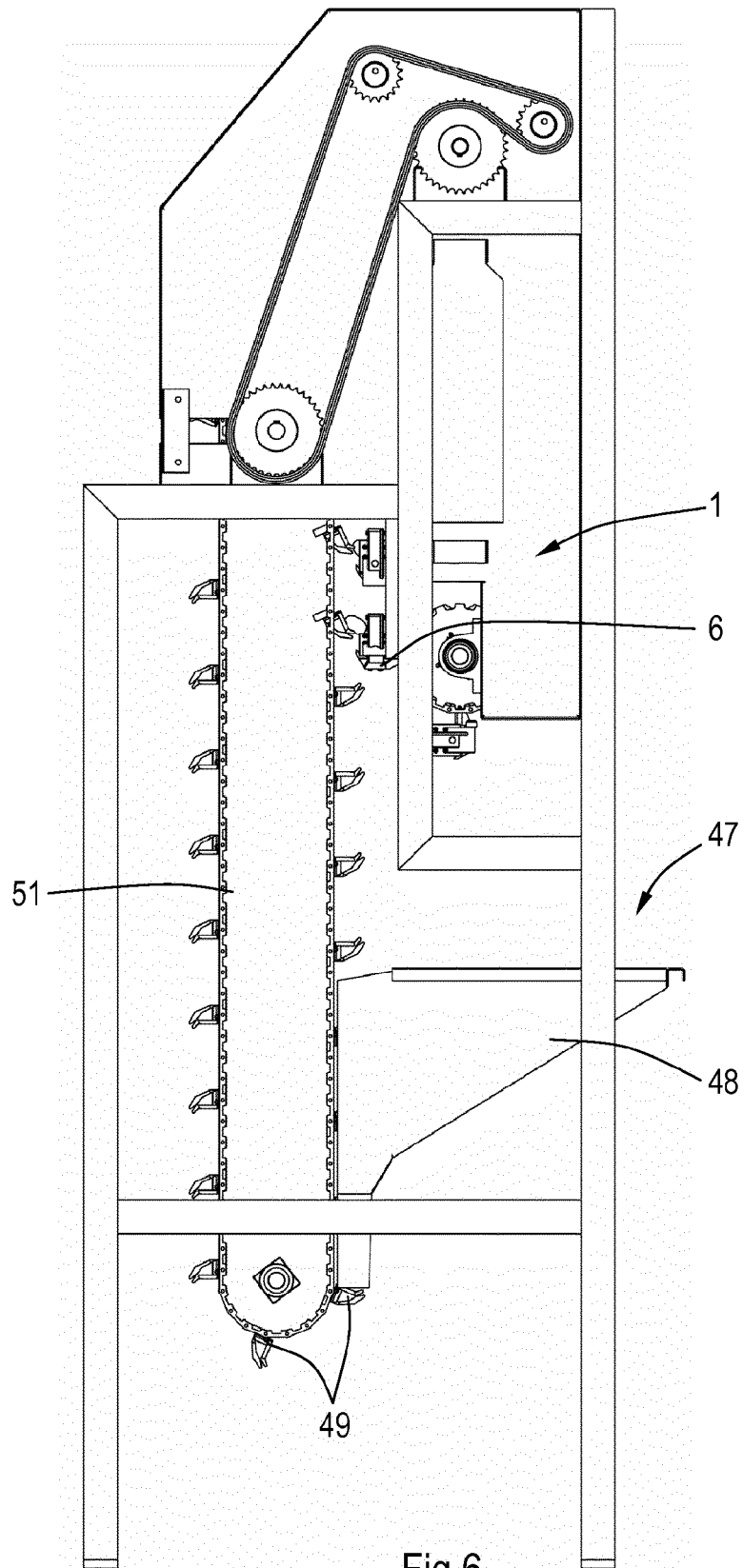


Fig.6

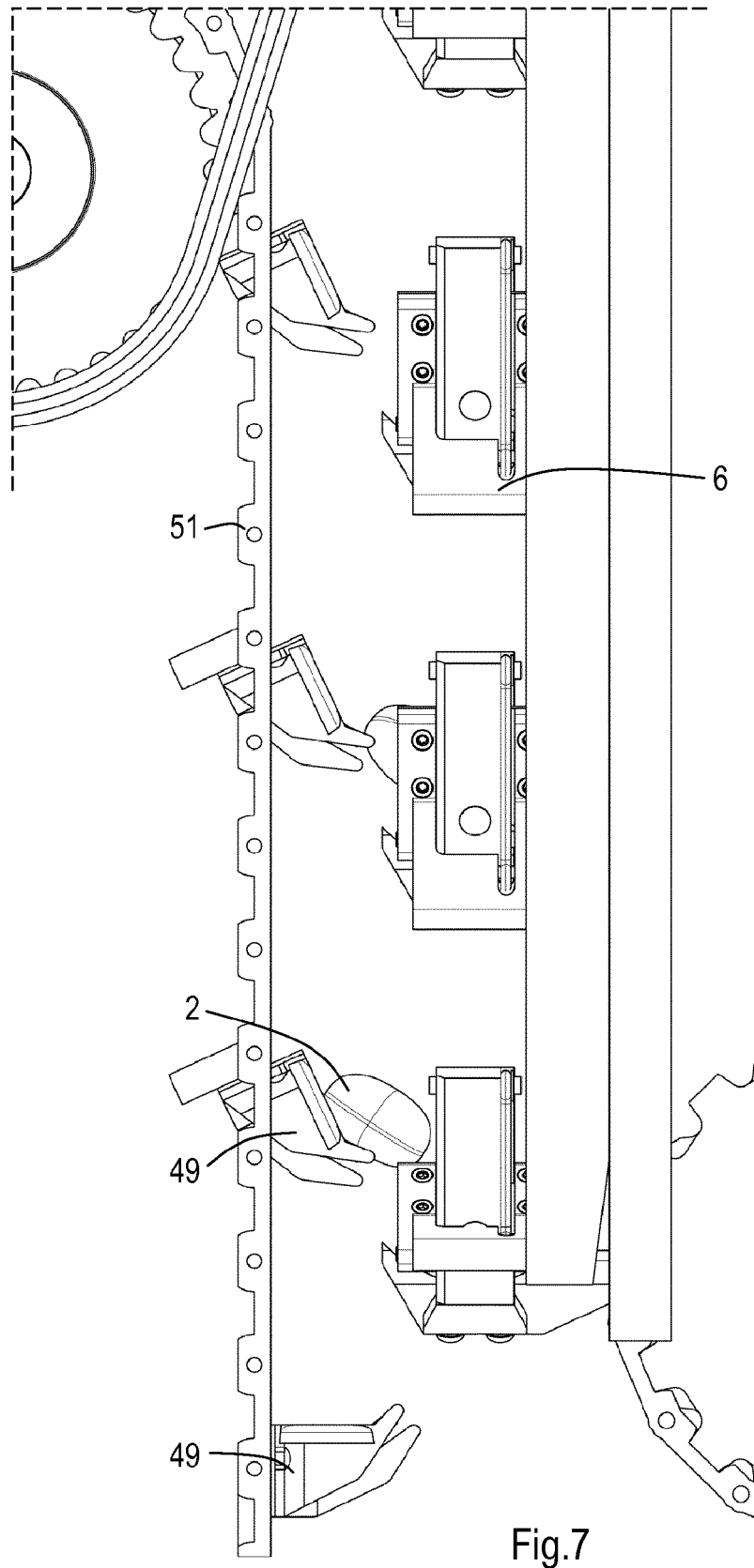


Fig.7



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Application Number
EP 14 19 3666

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The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 21 April 2015	Examiner Müller, Andreas
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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

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