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Description

The present invention generally involves the field of technology pertaining to methods and apparatus for sectionalizing cuttable material into discrete particles of predetermined shape and size. More specifically, the invention relates to an improved machine for cutting a food product, particularly slabs of fresh or frozen tempered meat, into diced sections.

Machines for sectionalizing or dividing materials into smaller discrete portions through a series of cutting operations are well known in the art. Such machines are particularly suited for cutting food products, such as vegetables and fruits, into discrete pieces having a substantially rectangular or diced configuration. This is generally accomplished by conveying a large piece of the food product through a rotating bank of circular knives which initially cut the product into a plurality of elongate strips that are thereafter directed into a crosscut assembly wherein a rotating bank of elongate knives effect transverse cutting of the strips into diced sections. The bank of circular knives is associated with either a rotating feed drum or a stationary transfer plate, and defines a throat therebetween for receiving the conveyed product. The bank of elongate knives is provided with an associated stationary stripper plate having a cooperating shear edge against which the transverse cutting of the strips is accomplished.

As an example of the prior art there is known US-A-2603262 which discloses the preamble of claim 1. Also known, for example is US-A-2060540 which discloses a slicing machine.

Although conventional dicing machines have been proven effective for the dicing of certain food products, particularly vegetables, the use of such machines in the dicing of meat products have heretofore not been entirely satisfactory. For example, the dicing of fresh meat products is difficult due to the soft consistency of the meat which prevents effective cutting of same into strips by a bank of circular knives. Also, when a stationary plate is utilized in association with a bank of circular knives, portions of the meat which often contain adhesive substances are caused to adhere to the plate and thereby result in plugging of the machine. Another disadvantage is realized when a rotating feed drum is used in association with the circular knives since the drum tends to feed that product too quickly past the knives, thereby preventing the proper cutting of the product into strips.

Although the prior art does teach many different kinds of meat slicing and cutting machines either presently or potentially available for commercial use, there is still no known satisfactory machine capable of reliably and rapidly cutting slabs of both fresh and frozen tempered meat into strips, and thereafter cutting the strips into diced sections of consistent size and configuration. This is a significant deficiency since much of the commercially available meat is initially cut into the shape of slabs when removed from the animal carcass for subsequent processing.

Accordingly the present invention is characterised in that the conveyor assembly includes a driven, generally horizontal feed belt for supporting and conveying the product, whereby the feed roll is positioned near an end of the feed belt, a carriage supporting the feed roll for vertical movement and biasing means operatively associated with the feed roll to resiliently bias the feed roll against the product on the feed belt and the rotatable feed drum having said peripheral surface defines a plurality of circumferentially spaced grooves extending generally across the product feed path adapted to contact the product so as to retard the movement of the product through the feed throat.

Thus it will be seen that there is provided an improved machine for sectionalizing cuttable material into discrete pieces of a desired size and configuration which can efficiently and reliably produce diced sections of food products at high speeds, and is particularly suited for producing discrete diced sections from slabs of flesh or frozen tempered meat.

The invention also extends to a method of cutting a product into a plurality of diced sections using the apparatus of claim 1 characterised in that the conveyor assembly includes a driven, generally horizontal feed belt for supporting and conveying the product, whereby the feed roll is positioned near an end of the feed belt, a carriage supporting the feed roll for vertical movement and biasing means operatively associated with the feed roll to resiliently bias the feed roll against the product on the feed belt and the rotatable feed drum having said peripheral surface defines a plurality of circumferentially spaced grooves extending generally across the product feed path adapted to contact the product so as to retard the movement of the product through the feed throat.

An embodiment of the invention will now be described by way of example and with reference to the accompanying drawings, in which:-

Figure 1 is a front elevational view, partly in section, showing a preferred embodiment of a dicing machine according to the invention.

Figure 2 is a partial perspective view of the machine shown in Figure 1, with the discharge chute and hood assembly removed, and particularly depicting the feed roll, first knife roll, crosscut assembly, and pulley and gear assembly.

Figure 3 is a cross-sectional view taken along the line 3-3 of Figure 2,

Figure 4 is a cross-sectional view taken along the line 4-4 of Figure 3,

Figure 5 is cross-sectional view taken along the line 5-5 of Figure 3, and

Figure 6 is partial cross-sectional view of the strip cutting assembly, particularly depicting the first knife roll and retarding means on the peripheral surface of the associated feed drum.

A dicing machine 1, according to a preferred embodiment of the invention, shall now be described with initial reference to Figs. 1 and 2. As shown therein, machine 1 is mounted on a rectangular-shaped support frame 3 by bolting a component support base 5 of machine 1 to a plurality of inwardly directed plates 7. Frame 3 includes a plurality of legs 9 sized to support machine 1 at a desired height. Frame 3 may be of any appropriate conventional design and is preferably formed from tubular or channel-shaped metal members welded or bolted together.

Machine 1 includes an electric motor 11 for driving a pulley and gear assembly 13 which rotates the corresponding drive shafts of all of the components in a manner to be hereinafter detailed. Pulley and gear assembly 13 and its associated components are housed within a hood assembly 15 which permits easy access to assembly 13 and its components for maintenance purposes. A discharge chute 17 extends outwardly from hood 15 and frame 3 for discharging diced product DP produced by machine 1. The operation of machine 1 may be controlled by an appropriate known electrical or electronic system housed in a control box 19, through which electrical power may be transmitted to motor 11 for driving pulley and gear assembly 13.

Machine 1 also includes a conveyor assembly 21 which comprises a horizontal feed belt 23 provided with a driven roll 25 and an idler roll 27. Roll 25 is driven by a gear 26 in a manner to be later described.

As shown in Fig. 2, assembly 13 includes a main drive pulley 29 mounted on a main drive shaft 31 which is rotated by the power output shaft of motor 11 through a main drive belt 33. Assembly 13 is supported on a pair of spaced side frames 35 and 37 which extend vertically from support base 5. A crossbar 43 is clamped in side frames 35 and 37. A driveshaft 45 of a crosscut assembly 47 is supported in side frames 35 and 37. A stripper plate 49, forming a portion of crosscut assembly 47, is also bolted to crossbar 43. Drive shaft 45 of crosscut assembly 47 is provided with a gear 51 which is engaged with and driven by a larger gear 53 mounted on main drive shaft 31 opposite drive pulley 29. A main drive gear 55 is also mounted on drive shaft 31 inwardly of drive pulley 29 and is in driving engagement with a secondary drive gear 57 for rotating a drive shaft 59. Rotation of main drive shaft 31 also drives a secondary pulley 61 through a secondary drive belt 63 for rotating a drive shaft 65. A feed roll 67, forming a part of conveyor assembly 21, is supported for rotation on drive shaft 65, with the latter being supported at its opposite ends on a carrier frame 69. Roll 67 may be provided with a plurality of longitudinal grooves 68 spaced around its periphery for engaging food product P. A pair of brackets 71 and 73 extend forwardly of frame 69 and are journalled for pivotal movement about main drive shaft 31. The opposite side of carrier 69 is provided with a pair of rearwardly extending brackets 75 and 77 which are supported on a pair of spring loading assemblies 79 and 81, respectively. Assemblies 79 and 81 are attached to corresponding pairs of spaced lugs 83 and 85 for pivotal movement about a pair of support shafts 87 and 89, respectively.

With reference to Fig. 3, feed roll 67 is supported in a floating manner by carrier 69 and biased downwardly towards the upper flight of feed belt 23 and directly above driven roll 25 by spring loading assembly 79. The bias imparted to roller 67 is realized by means of a coil spring 91 supported on a shaft 93 between a pair of opposed follower sleeves 95 and 97. The outer end of shaft 93 is threaded to receive an adjustment nut 99 for compressing or expanding spring 91 to vary the degree of bias, and a lock nut 101 for maintaining the bias adjustment. The other end of shaft 93 is secured to shaft 87 by a nut 103 for pivotal movement about lugs 83. A nut 105 is provided on shaft 93 for engagement by bracket 75 to establish the vertical position of roll 67 with respect to belt 23 and driven roll 25. Lugs 83 are rigidly secured to an upright 107 carried by support frame 3. Another upright (not shown) is provided for supporting lugs 85 in the same manner, and spring loading assembly 81 has the same structure and function as that described for assembly 79. It is thus apparent that assemblies 79 and 81 may be adjusted to secure the desired degree of spring loading imparted to carrier 69 so that feed roll 67 shall be permitted to realize a corresponding degree of resiliency when a food product P is engaged between feed roll 67 and driven roll 25 while it is being conveyed on belt 23 in the direction indicated by arrow A. Feed roll 67 is rotated by shaft 65 in the indicated clockwise direction. Driven roll 25 is rotated in the indicated counterclockwise direction.

Immediately downstream from feed roll 67 and its associated feed belt 23 is a feed throat 111 of a strip cutting assembly 113 that includes a first knife roll 114 defined by a plurality of longitudinally spaced circular knives 115 supported on main drive shaft 31, and a feed drum 117 supported on drive shaft 59. Each blade 115 is separated from

an adjacent knife 115 by an annular spacer ring 119, with knives 115 and rings 119 being carried on an arbor 121 supported on shaft 31. Feed drum 117 is provided with an outer circumferential surface 123 which is configured to retard the movement of food product P through throat 111 of assembly 113 for a purpose and in a manner to be later described.

Strips of food product P exiting strip cutting assembly 113 are conveyed directly to crosscut assembly 47. Assembly 47 includes a second knife roll 124 defined by a longitudinal block 125 supported on drive shaft 45 for rotation in the indicated counterclockwise direction. A plurality of elongate knives 127 are circumferentially spaced around block 125 for sequential cooperation with a shear edge 129 provided on stripper plate 49. Diced food product DP exiting from crosscut assembly 47 is discharged through chute 17.

The details of pulley and gear assembly 13 and the driving engagement thereof with corresponding driveshafts of driven roll 25, feed roll 67, strip cutting assembly 113 and crosscut assembly 47 shall now be described with reference to Figs. 4 and 5. With initial reference to Fig. 4, it is seen that feed roll 67 is supported for rotation on drive shaft 65 which is in turn journalled through a pair of opposed bearings 131 and 133 carried by brackets 71 and 73, respectively. The circumferential surface of roll 67 is provided with a plurality of longitudinally spaced peripheral grooves 135. The spacings between grooves 135 correspond to the spacings between circular knives 115 so that edge portions of knives 115 are intermeshed within grooves 135. Drive shaft 31 of first knife roll 114 is journalled through a pair of bearings 137 and 139 carried by side frames 35 and 37, respectively. Longitudinal block 125 of crosscut assembly 47 is supported for rotation on drive shaft 45, the latter also being journalled through a pair of opposed bearings 141 and 143 carried by side frames 35 and 37, respectively. Stripper plate 49 is provided with a plurality of longitudinally spaced slots 145 therein. The spacings between slots 145 also correspond to those of knives 115 so that edge portions of knives 115 are intermeshed within slots 145. As therefore apparent from Fig. 4, knives 115 are intermeshed with feed roll 67 and stripper plate 49 during rotation of drive shafts 31, 45 and 65.

With reference to Fig. 5, feed drum 117 of strip cutting assembly 113 is supported for rotation on drive shaft 59, the latter being journalled in a pair of opposed bearings 147 and 149 carried by side frames 35 and 37, respectively. The outer circumferential surface 123 of drum 117 is provided with a plurality of longitudinally spaced peripheral grooves 151, the spacings of which also correspond to those of knives 115 so that edge portions of knives 115 are intermeshed within grooves 151. Thus, knives 115 and feed drum 117 remain intermeshed during rotation about their respective driveshafts 31 and 59.

As also shown in Figs. 4 and 5, main driveshaft 31 is provided with a flanged sleeve 153 for supporting gear 53 and a smaller outer gear 155, the latter being disposed in driving engagement with gear 26 of driven roll 25 for driving feed belt 23 of conveyor assembly 21, as shown in Fig. 1.

Each circular knife 115 of first knife roll 114 may advantageously be provided with a serrated or scalloped peripheral cutting edge, as shown in Fig. 3. However, a plurality of circular knives 157 having plain cutting edges may also be advantageously utilized, as shown in Fig. 6. The choice of cutting edge configuration may be determined in accordance with the nature and consistency of food product P being cut by knife roll 114.

As also shown in Fig. 6, circumferential surface 123 of feed drum 117, in addition to being provided with peripheral grooves 151, is also configured to define a plurality of longitudinally extending and circumferentially spaced grooves 159. Each groove 159 is defined by a radial face 161 and a corresponding tangential face 163. In the indicated counterclockwise direction of rotation of drum 117, faces 161 are directed rearwardly of the direction of food product P travel through feed throat 111 of assembly 113. In this way, faces 161 serve to engage and retard the movement of product P through throat 111 during the cutting thereof, a procedure determined to be highly advantageous during the cutting of fresh meat due to its soft consistency. This retarding effect permits knives 115 or 157 to impart the appropriate slicing action on slabs of fresh meat, particularly when rotated at a peripheral speed that is at least twice the peripheral speed of feed drum 117. It is, of course, understood that the described configuration of surface 123 is only preferred and that other configurations are possible so long as such configurations serve the desired function of retarding the movement of food product P through throat 111 of assembly 113.

Variations in the relative peripheral speeds of feed roll 67, first and second knife rolls 114 and 124, feed drum 117, feed roll 67 and driven roll 25 of conveyor assembly 21 are realized by varying the ratios of the gearing rotating the respective drive shafts through appropriate substitution and replacement of the gears forming pulley and gear assembly 13.

The manner in which machine 1 is utilized in dicing food product P shall now be described with reference to the figures, particularly Fig. 3.

The degree of spring bias imparted to feed roll 67 by spring loading assembly 79 and vertical

position of roll 67 relative to driven roll 25 is established in accordance with the thickness and consistency of food product P and to compensate for occasional oversize pieces of product P moving between feed roll 67 and driven roll 25.

When machine 1 is placed in a mode of operation, motor 11 drives pulley and gear assembly 13, thereby imparting rotation in the indicated directions of driven roll 25, feed roll 67, first knife roll 114, feed drum 117 and second knife roll 124 of crosscut assembly 47.

Product P exiting from between feed roll 67 and drive roll 25 in the direction indicated by arrow A is directly and horizontally transferred to feed throat 111 of strip cutting assembly 113 and is cut into plural strips by first knife roll 114 intermeshed with feed drum 117, the width of the strips corresponding to the spacings between circular knives 115. As indicated in Fig. 3, knife roll 114 is rotated by main drive shaft 31 in a clockwise direction, while associated feed drum 117 is rotated in a counterclockwise direction. Strips of product P exiting assembly 113 are conveyed to crosscut assembly 47 wherein blades 127 effect transverse cuts of the strips against shear edge 129 of stripper plate 49. This produces diced sections DP of product P, which sections DP are then discharged through chute 17.

The spring-biased feed roll 67 in combination with the intermeshed disposition of first knife roll 114 within feed roll 67, feed drum 117 and stripper plate 49, collectively contribute to a high speed and reliable dicing of product P by machine 1 in a manner that cannot be duplicated by conventional dicing machines.

The nature of machine 1 renders it particularly advantageous for the dicing of fresh, cooked or frozen tempered slabs of meat. When it is desired to dice slabs of fresh meat, pulley and gear assembly 13 is configured so that feed roll 67 will rotate at a peripheral speed that is approximately the same speed as feed belt 23. Feed drum 117 of assembly 113 is rotated at approximately the same peripheral speed as meat product P being conveyed by roll 67 and belt 23. However, first knife roll 114 is rotated at a peripheral speed that is at least twice the peripheral speed of feed drum 117. This minimum difference in peripheral speeds was found to produce a continuous slicing action on fresh meat. Since fresh meat has a soft consistency, the rapid rotation of circular knives 115 tends to move meat product P too quickly through assembly 113. In order to realize a proper cutting action of meat product P into the desired strips, feed drum 117 is therefore provided with the circumferential surface 123 configuration depicted in Fig. 6 to retard the movement of meat product P being conveyed through feed throat 111 of assembly 113, thus allowing knives 115 to perform the required slicing action on meat product P. The cut strips of meat product P are then directed to crosscut assembly 47 for transverse cutting to produce diced sections DP therefrom.

When it is desired to dice slabs of cooked or frozen tempered meat, pulley and gear assembly 13 is adjusted to rotate first knife roll 114 at a peripheral speed that is only slightly faster than the peripheral speed of feed drum 117. The smaller variation between the peripheral speeds of blades 115 and drum 117 is possible because cooked or frozen tempered slabs of meat have a harder consistency than fresh meat.

Claims

1. Apparatus for cutting a product into diced sections having a conveyor assembly (21) for supporting and conveying the product, and a rotatable feed roll (67) positioned near an exit end of the conveyor assembly, the rotatable feed roll (67) supported by a carriage (69) and adapted to engage and convey the product into a feed throat (111); a rotatable first knife roll (114) having a plurality of spaced apart, circular knives (115) extending across a product feed path for cutting the product into a plurality of strips; a rotatable feed drum (117) extending generally parallel to the first knife roll (114) and defining therewith a feed throat (111), the rotatable feed drum (117) having a plurality of longitudinally spaced peripheral grooves (151); a crosscut assembly (47) including a second knife roll (124) having a plurality of elongate knives (127) extending generally across the product feed path; a stripper plate (49) defining a shear edge (129), the stripper plate (49) being operatively associated with the first knife roll (114) to remove the product from between the spaced knives (115) after the product has been cut into a plurality of strips and a shear edge (129) operatively associated with the second knife roll (124) such that the elongate knives (127) cooperate with the shear edge (129) to cut the product into diced sections, the stripper plate (49) including a plurality of spaced slots (145); and drive means (11,13,33) operatively associated with the first knife roll (114), the feed drum (117), the feed roll (67), and the second knife roll (124) so as to rotate the first knife roll (114), the feed drum (117), the feed roll (67) and the second knife roll (124), characterised in that the conveyor assembly (21) includes a driven, generally horizontal feed belt (23) for supporting and conveying the product, whereby the feed roll (67) is positioned near an end

of the feed belt (23), a carriage (69) supporting the feed roll (67) for vertical movement and biasing means (91) operatively associated with the feed roll (67) to resiliently bias the feed roll (67) against the product on the feed belt (23) and the rotatable feed drum (117) having said peripheral surface defines a plurality of circumferentially spaced grooves (159) extending generally across the product feed path (111) adapted to contact the product so as to retard the movement of the product through the feed throat (111).

2. Apparatus according to claim 1 characterised in that the plurality of longitudinal grooves (159) in the feed drum (117), are each defined by a generally radial face (161) and a generally tangential face (163).

3. Apparatus according to claim 2 characterised in that the generally radial face (161) faces in a direction generally opposite the direction of rotation of the feed drum (117).

4. Apparatus according to any preceding claim characterised in that the drive means (11, 13, 33) rotates the first knife roll (114) and feed drum (117) in opposite directions.

5. Apparatus according to any preceding claim characterised in that the drive means (11, 13, 33) rotates the first knife roll (114) at a peripheral speed of at least approximately twice the peripheral speed of the feed drum (117).

6. Apparatus according to any preceding claim characterised in that each of the generally circular knives (115) has a scalloped cutting edge.

7. Apparatus according to any preceding claim characterised in that the biasing means comprises spring means (91) operatively associated with the feed roll (67).

8. Apparatus according to claim 7 characterised by means (99) to adjust the biasing force of the spring means (91).

9. Apparatus according to any preceding claim characterised in that the conveyor assembly (21) comprises a driven roll (25) and an idler roll (27) for driving the feed belt (23), the driven roll (25) being disposed at an exit end of the feed belt (23) substantially below the feed roll (67).

10. A method of cutting a product into a plurality of diced sections using the apparatus of claim 1 characterised by the steps of:

conveying the product along a product feed path by a conveyor assembly (21) including a driven, generally horizontal feed belt (23) having an exit end and a rotatable feed roll (67) positioned near the exit end of the feed belt (23) to engage the product;

biasing the feed roll (67) against the product on the feed belt (23);

cutting the product into a plurality of strips by passing it directly from the conveyor assembly (23) and feed roll (67) into a feed throat (111) defined by a rotatable first knife roll (114) having a plurality of spaced apart, generally circular knives (115) extending across the product feed path, and a rotatable feed drum (117) extending generally parallel to the first knife roll (114) and having a peripheral surface defining a plurality of longitudinal grooves (159) extending generally across the product feed path so as to contact the product so as to control the speed of the product through the feed throat (111);

providing a stripper plate (49) defining a shear (129) in operative association with the first knife roll (114) to remove the product strips from between the spaced apart knives (115);

providing a crosscut assembly (47) having a second knife roll (124) with a plurality of elongate knives (127) extending generally across the product feed path and interacting with the shear edge (129) to cut the product strips into a plurality of diced sections; and

providing a drive means (11, 13, 33) to rotate the first knife roll (114), the feed roll (67), the feed drum (117) and the second knife roll (124).

11. A method according to claim 10 characterised by the step of rotating the knife roll (114) at a peripheral speed that is at least approximately twice the peripheral speed of the feed drum (117).

Patentansprüche

1. Vorrichtung zum Schneiden eines Produktes in würfelförmige Teilstücke, aufweisend: eine Förder-Baugruppe (21) zum Tragen und Fördern des Produktes und eine rotierbare Vorschubrolle (67), welche nahe bei einem Ausgangs-Ende der Förder-Baugruppe angeordnet ist, wobei die rotierbare Vorschubrolle (67) durch einen Tragrahmen (69) getragen und dazu befähigt ist, mit dem Produkt in

Eingriff zu gelangen und dieses in eine Zufuhr-Eintrittsöffnung (101) hineinzubefördern; eine drehbare erste Messerwalze (114) mit einer Vielzahl von voneinander beabstandeten, kreisförmigen Messern (115); die quer über einen Produkt-Zuführweg verlaufen, um das Produkt in eine Vielzahl von Streifen zu schneiden; eine rotierbare Zuführtrommel (117), welche sich im wesentlichen parallel zu der ersten Messerwalze (114) erstreckt und zusammen mit dieser eine Zuführ-Eintrittsöffnung (111) begrenzt, wobei die rotierbare Zuführtrommel (117) eine Vielzahl von in der Längsrichtung voneinander beabstandeten, über den Umfang verlaufenden Nuten (151) aufweist; eine Querschneide-Baugruppe (47), welche eine zweite Messerwalze (124) umfaßt, die mit einer Vielzahl von langgestreckten Messern (127) versehen ist, die sich im wesentlichen quer über den Produkt-Zuführweg erstrecken; eine Abstreifplatte (49), welche eine Abscherkante (129) definiert, wobei die Abstreifplatte (49) betriebsmäßig mit der ersten Messerwalze (114) in Verbindung steht, um das Produkt aus den Zwischenräumen zwischen den voneinander beabstandeten Messern (115) zu entnehmen, nachdem das Produkt in eine Vielzahl von Streifen geschnitten worden ist, wobei eine Abscher-Kante (129) betriebsmäßig mit der zweiten Messerwalze (124) verbunden ist, derart, daß die langgestreckten Messer (127) mit der Abscher-Kante (129) zusammenarbeiten, um das Produkt in würfelförmige Teilstücke zu schneiden, und wobei die Abstreifplatte (49) eine Vielzahl von in gegenseitigem Abstand befindlichen Schlitzen (145) aufweist; sowie Antriebsmittel (11, 13, 33), welche betriebsmäßig mit der ersten Messerwalze (114), der Zuführtrommel (117), der Vorschubrolle (67) und der zweiten Messerwalze (124) gekoppelt sind, so daß die erste Messerwalze (114), die Zuführtrommel (117), die Vorschubrolle (67) und die zweite Messerwalze (124) in Rotation versetzt werden, **dadurch gekennzeichnet**, daß die Förder-Baugruppe (21) umfaßt: ein angetriebenes, im allgemeinen horizontales Zubringerband (23) zum Tragen und Fördern des Produktes, wodurch die Vorschubrolle (67) nahe bei einem Ende des Zubringerbandes (23) angeordnet ist, einen Tragrahmen (69), der die Vorschubrolle (67) für eine vertikale Bewegung trägt, und Vorspannungs-Mittel (91), die betriebsmäßig mit der Vorschubrolle (67) verbunden sind, um die Vorschubrolle (67) gegen das Produkt auf dem Zubringerband (23) federnd vorzuspannen, und daß die rotierbare Zuführtrommel (117), welche die erwähnte Umfangs-Oberfläche aufweist, eine Vielzahl von in der Umfangsrichtung voneinander beabstandeten Nuten (159) definiert, welche sich im allgemeinen quer über den Produkt-Zuführweg (111) erstrecken und dazu befähigt sind, mit dem Produkt in Berührung zu gelangen, so daß die Bewegung des Produktes durch die Zuführ-Eintrittsöffnung (111) verzögert wird.

2. Vorrichtung nach Anspruch 1, **dadurch gekennzeichnet**, daß eine jede von der Vielzahl der sich in Längsrichtung erstreckenden Nuten (159) auf der Zuführtrommel (117) durch eine im allgemeinen radiale Fläche (161) und eine im allgemeinen tangentiale Fläche (163) begrenzt ist.

3. Vorrichtung nach Anspruch 2, **dadurch gekennzeichnet**, daß die im allgemeinen radiale Fläche (161) in eine Richtung weist, welche im allgemeinen entgegengesetzt der Richtung der Rotation der Zuführtrommel (117) ist.

4. Vorrichtung nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet**, daß die Antriebsmittel (11, 13, 33) die erste Messerwalze (114) und die Zuführtrommel (117) in einander entgegengesetzten Richtungen in Rotation versetzen.

5. Vorrichtung nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet**, daß die Antriebsmittel (11, 13, 33) die erste Messerwalze (114) mit einer Umfangsgeschwindigkeit von mindestens annähernd dem zweifachen der Umfangsgeschwindigkeit der Zuführtrommel (117) in Rotation versetzen.

6. Vorrichtung nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet**, daß jedes der im allgemeinen kreisförmigen Messer (115) eine ausgebogte oder ausgezackte Schneidkante aufweist.

7. Vorrichtung nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet**, daß die Vorspannungs-Mittel eine Federvorrichtung (91) aufweisen, welche betriebsmäßig mit der Vorschubrolle (67) verbunden ist.

8. Vorrichtung nach Anspruch 7, **gekennzeichnet durch** Mittel (99) zum Einstellen der Vorspann-Kraft der Federvorrichtung (91).

9. Vorrichtung nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet**, daß die Förder-Baugruppe (21) eine angetriebene Rolle (25) sowie eine Leerlauf- oder Mitläufer-Rolle (27) zum Antreiben des Zubringerbandes

(23) aufweist, wobei die angetriebene Rolle (25) an einem ausgangsseitigen Ende des Zubringerbandes (23) im wesentlichen unterhalb der Vorschubrolle (67) angeordnet ist.

10. Verfahren zum Schneiden eines Produktes in eine Vielzahl von würfelförmigen Teilstücken unter Verwendung der Vorrichtung gemäß Anspruch 1, **gekennzeichnet durch** die folgenden Schritte:
Fördern des Produktes entlang einem Produkt-Zuführweg mittels einer Förder-Baugruppe (21), welche ein angetriebenes, im allgemeinen horizontales Zubringerband (23) mit einem Ausgangs-Ende sowie eine rotierbare Vorschubrolle (67) umfaßt, welche nahe bei dem Ausgangs-Ende des Zubringerbandes (23) angeordnet ist, um mit dem Produkt in Eingriff zu gelangen;
Vorspannen der Vorschubrolle (67) gegen das Produkt auf dem Zubringerband (23);
Schneiden des Produktes in eine Vielzahl von Streifen dadurch, daß es unmittelbar von der Förder-Baugruppe (23) und der Vorschubrolle (67) in eine Zuführ-Eintrittsöffnung (111) hineingeschickt wird, welche durch eine erste rotierbare Messerwalze (114) mit einer Vielzahl von voneinander beabstandeten, im allgemeinen kreisförmigen Messern (115), welche sich quer über den Produkt-Zuführweg erstrecken, sowie durch eine rotierbare Zuführtrommel (117) definiert ist, welche sich im allgemeinen parallel zu der ersten Messerwalze (114) erstreckt und eine Umfangs-Oberfläche aufweist, welche eine Vielzahl von sich in der Längsrichtung erstreckenden Nuten (159) definiert, welche sich im allgemeinen quer über den Produkt-Zuführweg zum Zwecke der Berührung des Produktes erstrecken, so daß die Geschwindigkeit des Produktes durch die Zuführ-Eintrittsöffnung (111) gesteuert wird;
Vorsehen einer Abstreiferplatte (49), welche eine Abscher-Kante (129) definiert, welche sich in betriebsmäßiger Verbindung mit der ersten Messerwalze (114) befindet, um die Produkt-Streifen aus den Zwischenräumen zwischen den voneinander beabstandeten Messern (115) zu entfernen;
Vorsehen einer Querschneide-Baugruppe (47) mit einer zweiten Messerwalze (124) mit einer Vielzahl von langgestreckten Messern (127), welche sich im allgemeinen quer über den Produkt-Zuführweg erstrecken und mit der Abscher-Kante (129) zusammenwirken, um die Produkt-Streifen in eine Vielzahl von würfelförmigen Teilstücken zu schneiden; und
Vorsehen von Antriebs-Mitteln (11, 13, 33), um die erste Messerwalze (114), die Vorschubrolle (67), die Zuführtrommel (117) und die zweite Messerwalze (124) in Rotation zu versetzen.

11. Verfahren nach Anspruch 10, **gekennzeichnet durch** den Schritt des Rotierenlassens der Messerwalze (114) mit einer Umfangsgeschwindigkeit, welche zumindest angenähert gleich dem zweifachen Betrag der Umfangsgeschwindigkeit der Vorschubrolle (117) ist.

Revendications

1. Appareil pour découper un produit en morceaux en forme de dés comportant : un ensemble convoyeur (21) pour supporter et convoyer le produit, et un rouleau d'alimentation mobile en rotation (67) placé près d'une extrémité de sortie de l'ensemble convoyeur, le rouleau d'alimentation mobile en rotation (67) étant supporté par un chariot (69) et étant conçu pour venir en prise et convoyer le produit dans un étranglement d'alimentation (111) ; un premier rouleau de couteaux (114) mobile en rotation possédant une pluralité de couteaux circulaires (115), espacés, s'étendant transversalement au trajet d'alimentation de produit, pour découper le produit en une pluralité de bandes ; un tambour d'alimentation mobile en rotation (117) s'étendant globalement parallèlement au premier rouleau de couteaux (114) et définissant avec celui-ci un étranglement d'alimentation (111), le tambour d'alimentation mobile en rotation (117) possédant une pluralité de rainures périphériques (151) espacées longitudinalement ; un ensemble de découpe transversale (47) comprenant un second rouleau de couteaux (124) possédant une pluralité de couteaux allongés (127) s'étendant globalement transversalement au trajet d'alimentation de produit ; une plaque de séparation (49) définissant un bord de cisaillement (129), la plaque de séparation (49) étant associée fonctionnellement avec le premier rouleau de couteaux (114) pour retirer le produit d'entre les couteaux (115) espacés, après que le produit a été découpé en une pluralité de bandes et un bord de cisaillement (129) associé fonctionnellement avec le second rouleau de couteaux (124) de telle manière que les couteaux allongés (127) coopèrent avec le bord de cisaillement (129) pour découper le produit en des morceaux en forme de dés, la plaque de séparation (49) comportant une pluralité de fentes espacées (145) ; et un moyen d'entraînement (11, 13, 33) associé de manière fonctionnelle avec le premier rouleau de couteaux (114), le tambour d'alimentation (117), le rouleau d'alimentation (67), et le second rou-

leau de couteaux (124) de manière à entraîner en rotation le premier rouleau de couteaux (114), le tambour d'alimentation (117), le rouleau d'alimentation (67) et le second rouleau de couteaux (124), caractérisé en ce que l'ensemble convoyeur (21) comprend : une courroie d'alimentation (23) entraînée, globalement horizontale, pour supporter et convoyer le produit, ce par quoi le rouleau d'alimentation (67) est placé près d'une extrémité de la courroie d'alimentation (23) ; un chariot (69) supportant le rouleau d'alimentation (67) pour un déplacement vertical ; et un moyen de rappel (91) associé de façon fonctionnelle avec le rouleau d'alimentation (67) pour rappeler de manière élastique le rouleau d'alimentation (67) contre le produit, sur la courroie d'alimentation (23) ; et en ce que le tambour d'alimentation rotatif (117), ayant ladite surface périphérique, définit une pluralité de rainures (159), espacées le long de la circonférence, s'étendant globalement transversalement au trajet d'alimentation de produit (111), conçues pour contacter le produit de manière à retarder le déplacement du produit dans l'étranglement d'alimentation (111).

2. Appareil selon la revendication 1, caractérisé en ce que les rainures longitudinales (159) dans le tambour d'alimentation (117), sont chacune définies par une face globalement radiale (161) et une face globalement tangentielle (163).

3. Appareil selon la revendication 2, caractérisé en ce que la face globalement radiale (161) est tournée dans un sens globalement opposé au sens de rotation du tambour d'alimentation (117).

4. Appareil selon l'une quelconque des revendications précédentes, caractérisé en ce que le moyen d'entraînement (11, 13, 33) entraîne en rotation le premier rouleau de couteaux (114) et le tambour d'alimentation (117) dans des sens contraires.

5. Appareil selon l'une quelconque des revendications précédentes, caractérisé en ce que le moyen d'entraînement (11, 13, 33) entraîne en rotation le premier rouleau de couteaux (114) à une vitesse périphérique d'au moins environ deux fois la vitesse périphérique du tambour d'alimentation (117).

6. Appareil selon l'une quelconque des revendications précédentes, caractérisé en ce que chacun des couteaux (115) globalement circulaires présente un bord de coupe dentelé.

7. Appareil selon l'une quelconque des revendications précédentes, caractérisé en ce que le moyen de rappel comprend un moyen formant ressort (91) associé de manière fonctionnelle avec le rouleau d'alimentation (67).

8. Appareil selon la revendication 7, caractérisé par un moyen (99) pour régler la force de rappel du moyen formant ressort (91).

9. Appareil selon l'une quelconque des revendications précédentes, caractérisé en ce que l'ensemble convoyeur (21) comprend un rouleau entraîné (25) et un rouleau fou (27) pour entraîner la courroie d'alimentation (23), le rouleau entraîné (25) étant placé à une extrémité de sortie de la courroie d'alimentation (23), sensiblement au-dessous de la courroie d'alimentation (67).

10. Procédé de découpe d'un produit en une pluralité de morceaux en forme de dés en utilisant l'appareil de la revendication 1 caractérisé par les étapes de :

convoyage du produit suivant un trajet d'alimentation en produit par un ensemble convoyeur (21) incluant une courroie d'alimentation (23), entraînée, globalement horizontale, ayant une extrémité de sortie et un rouleau d'alimentation mobile en rotation (67) placé près de l'extrémité de sortie de la courroie d'alimentation (23) pour venir en prise avec le produit ;

rappel du rouleau d'alimentation (67) contre le produit sur la courroie d'alimentation (23) ;

découpe du produit en une pluralité de bandes en le faisant passer directement à partir de l'ensemble convoyeur (23) et du rouleau d'alimentation (67) dans un étranglement d'alimentation (111), défini par un premier rouleau de couteaux (114) mobile en rotation comportant une pluralité de couteaux globalement circulaires (115), espacés, s'étendant transversalement au trajet d'alimentation de produit, et un tambour d'alimentation mobile en rotation (117) s'étendant globalement parallèlement au premier rouleau de couteaux (114) et ayant une surface périphérique définissant un pluralité de rainures longitudinales (159) s'étendant globalement transversalement au trajet d'alimentation de produit, de manière à contacter le produit de façon à commander la vitesse du produit dans l'étranglement d'alimentation (111) ;

utilisation d'une plaque de séparation (49)

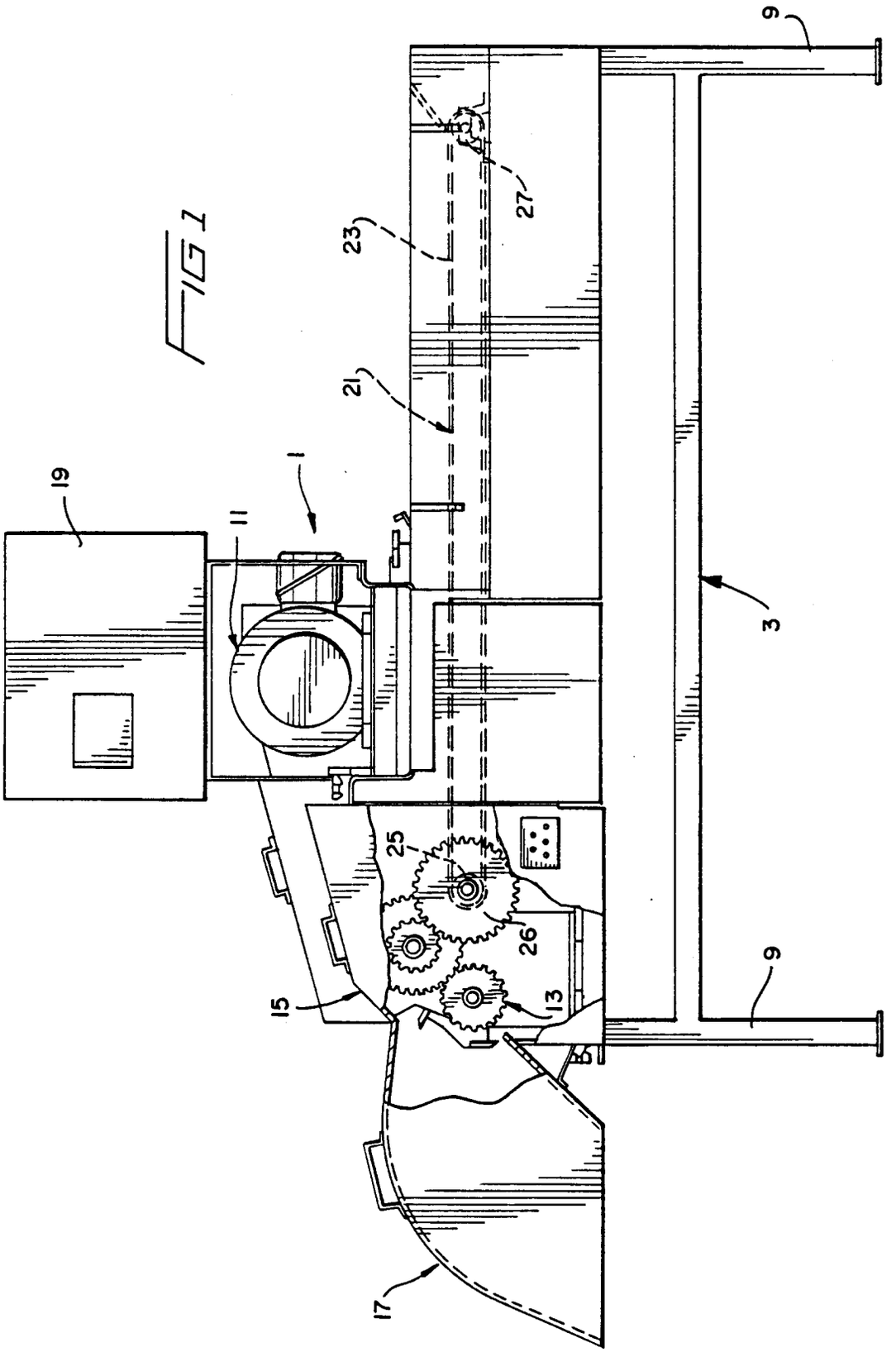
définissant un cisaillement (129) en association fonctionnelle avec le premier rouleau de couteaux (114) pour retirer les bandes de produit d'entre les couteaux espacés (115) ;

utilisation d'un ensemble de découpe transversale (47), possédant un second rouleau de couteaux (124) avec une pluralité de couteaux allongés (127) s'étendant globalement transversalement au trajet d'alimentation de produit et coopérant avec le bord de cisaillement (129) pour couper les bandes de produits en une pluralité de morceaux en forme de dés ; et

utilisation d'un moyen d'entraînement (11, 13, 33) pour entraîner en rotation le premier rouleau de couteaux (114), le rouleau d'alimentation (67), le tambour d'alimentation (117) et le second rouleau de couteaux (124).

11. Procédé selon la revendication 10, caractérisé par l'étape d'entraînement en rotation du rouleau de couteaux (114) à une vitesse périphérique qui est au moins environ deux fois la vitesse périphérique du tambour d'alimentation (117).

FIG 1



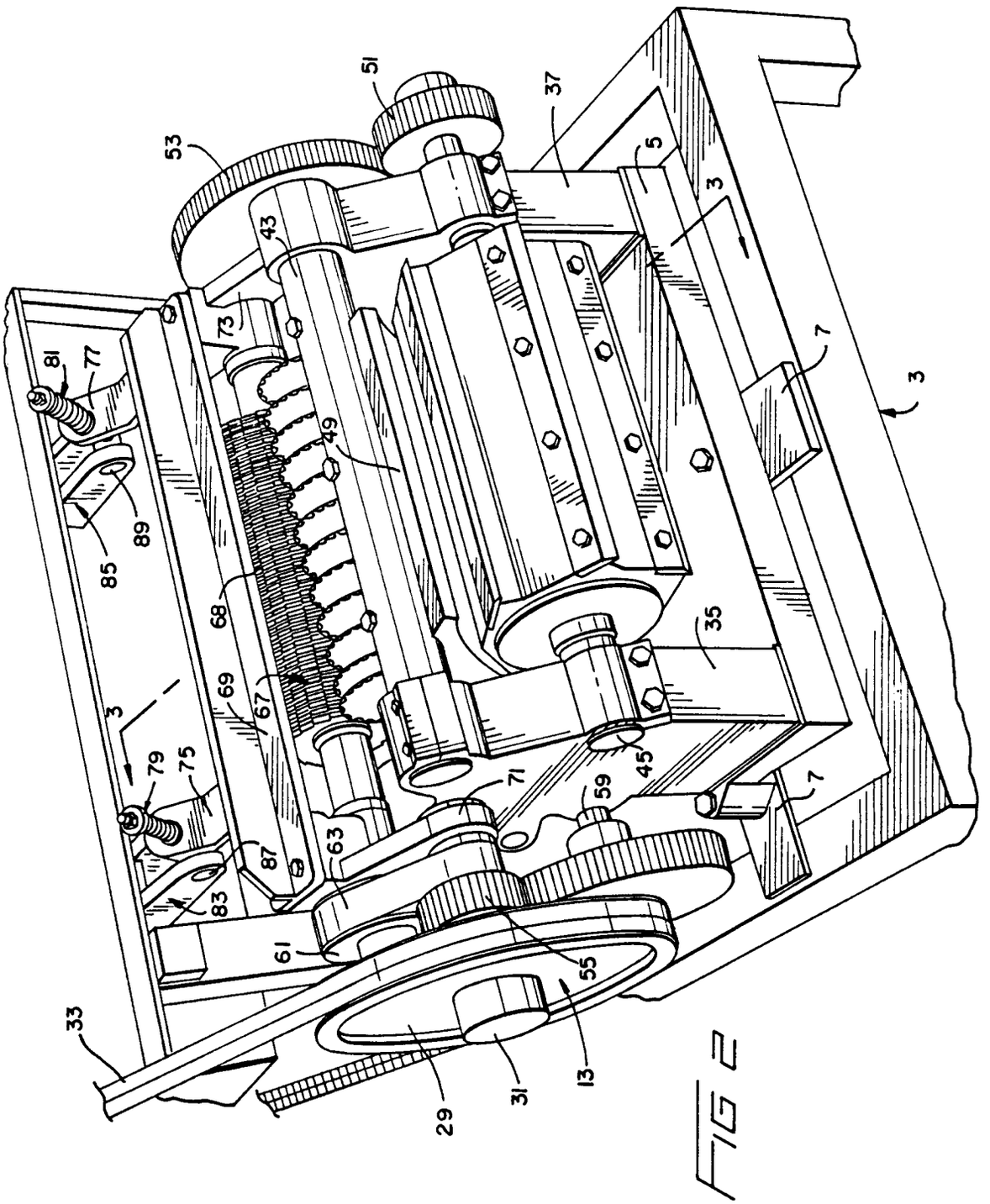

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FIG 2

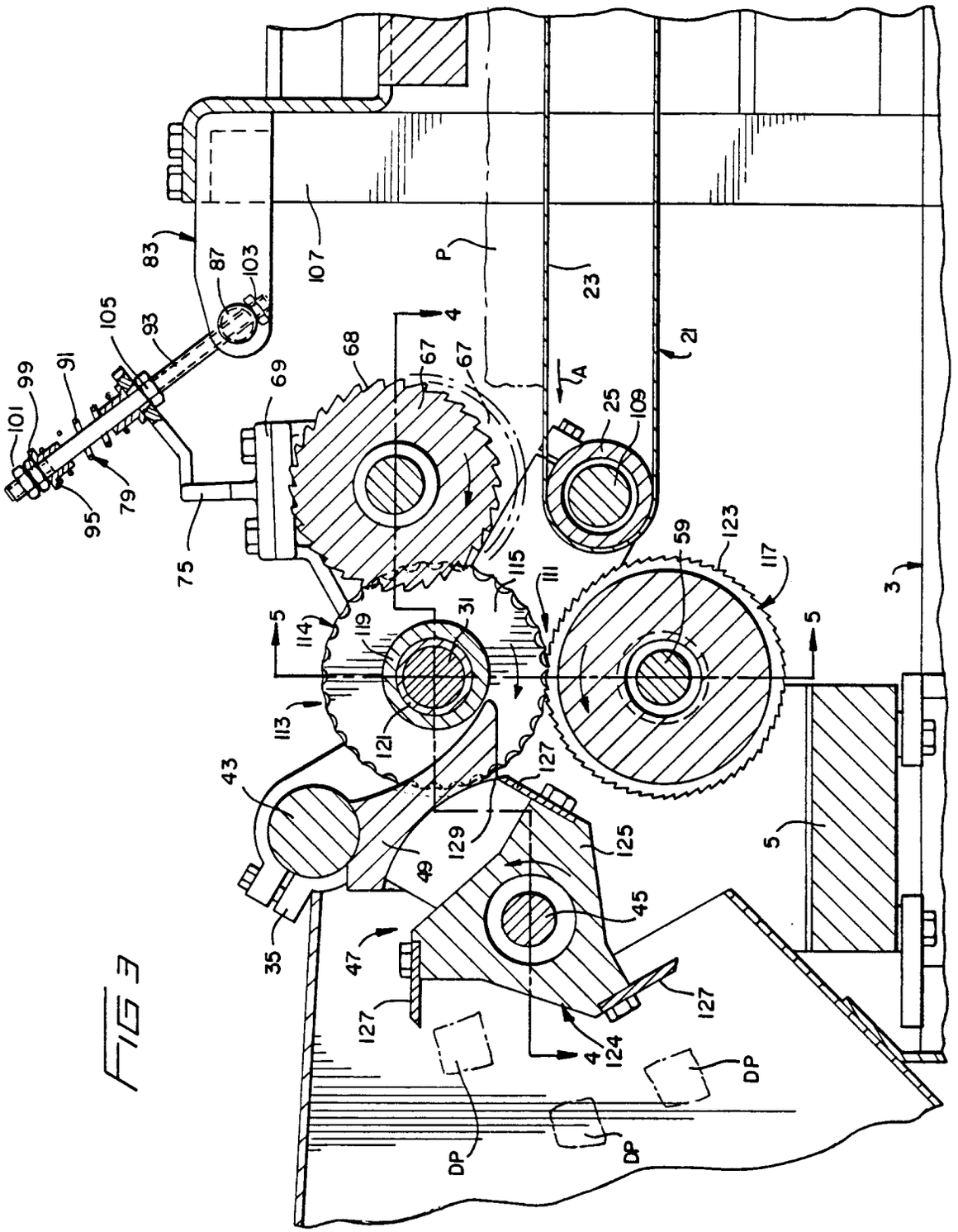
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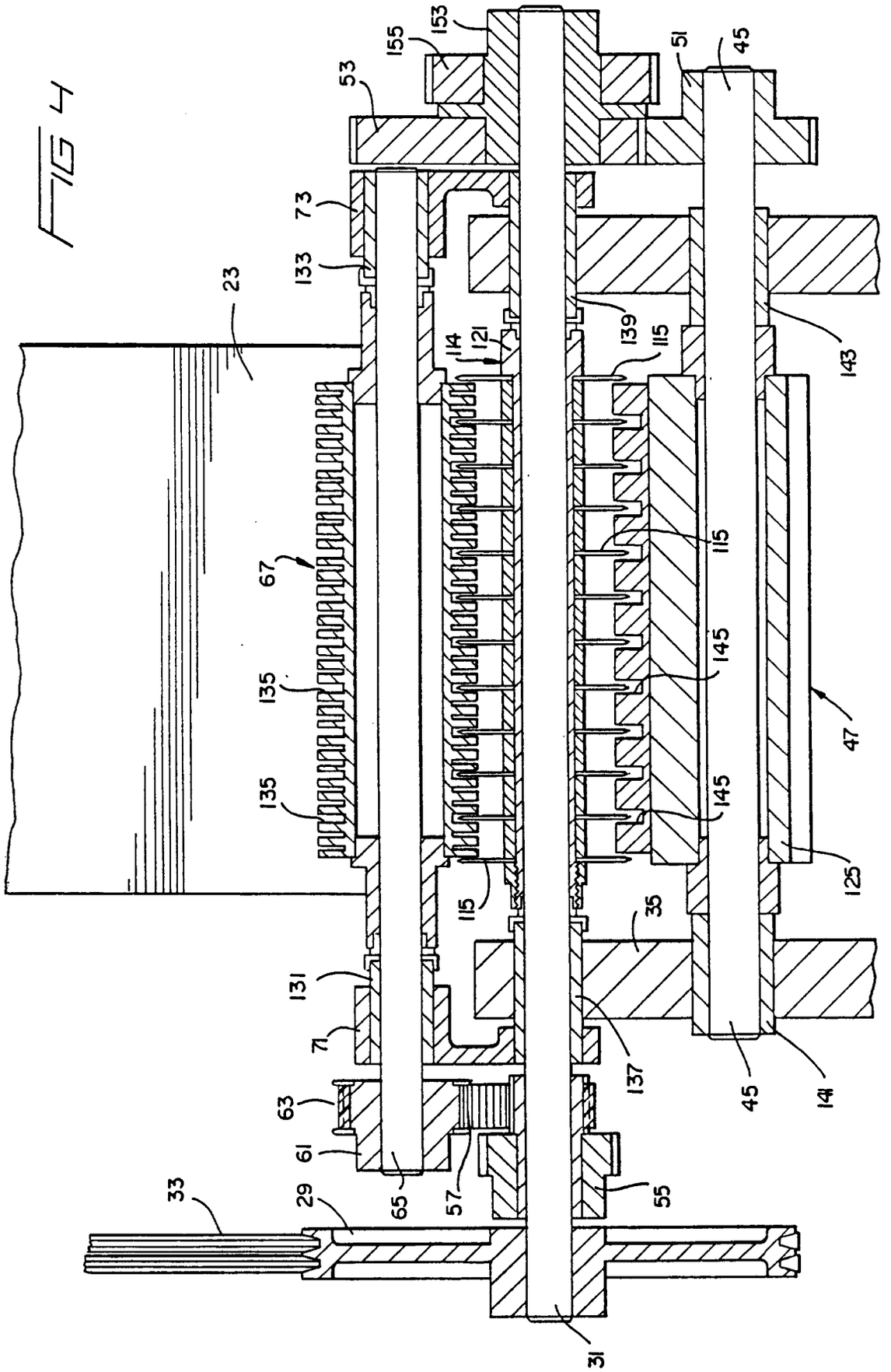
FIG 3

FIG 4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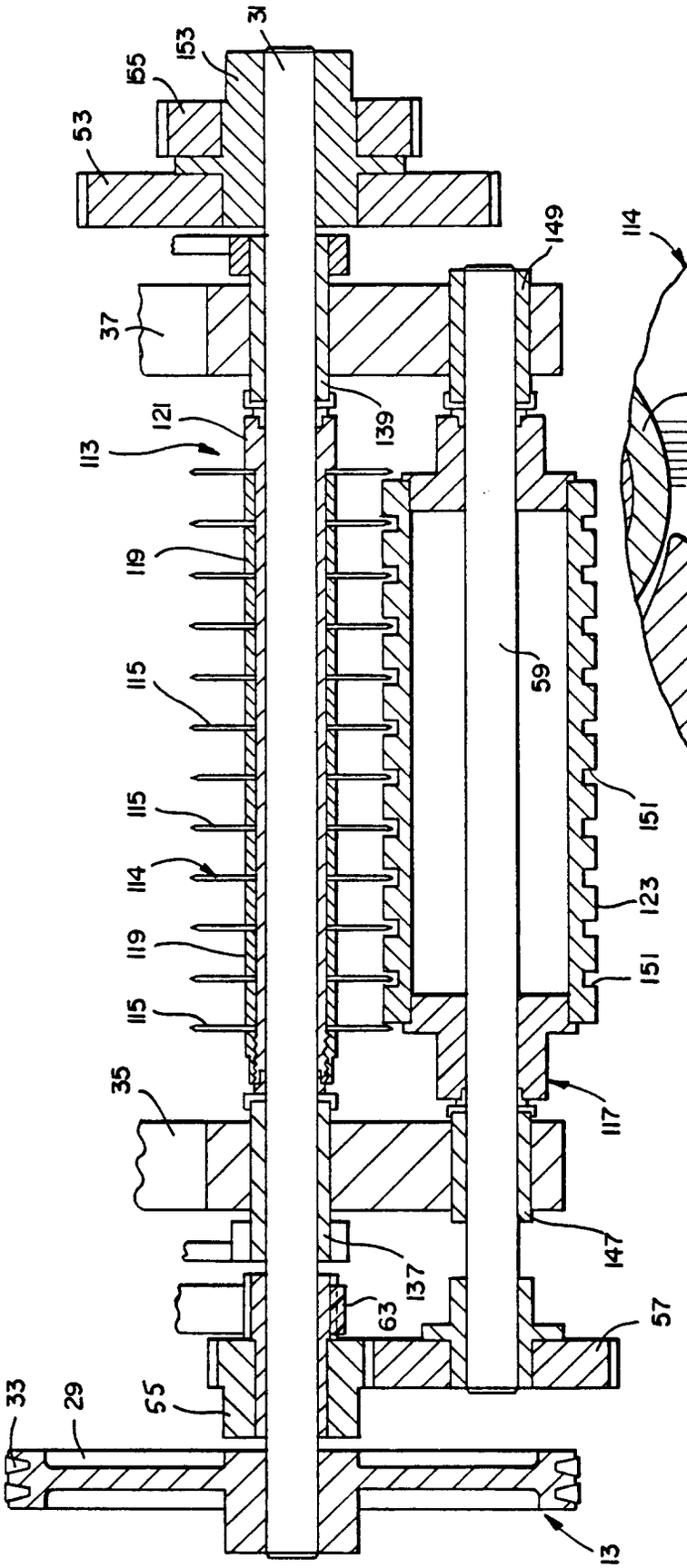
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FIG 5

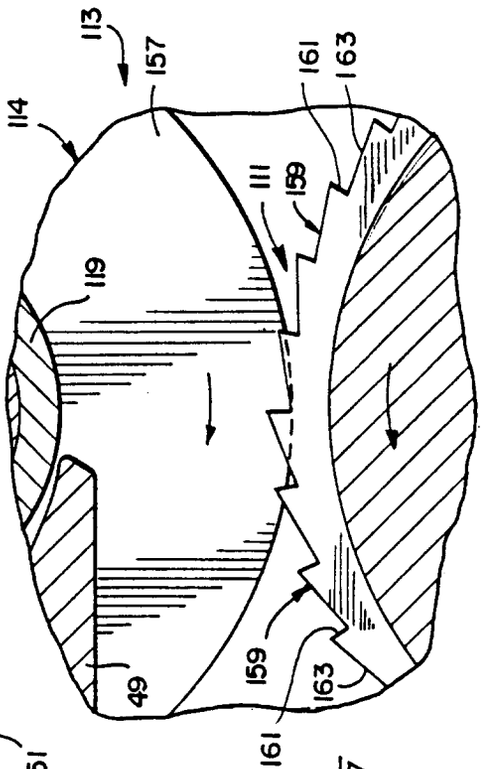
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FIG 6