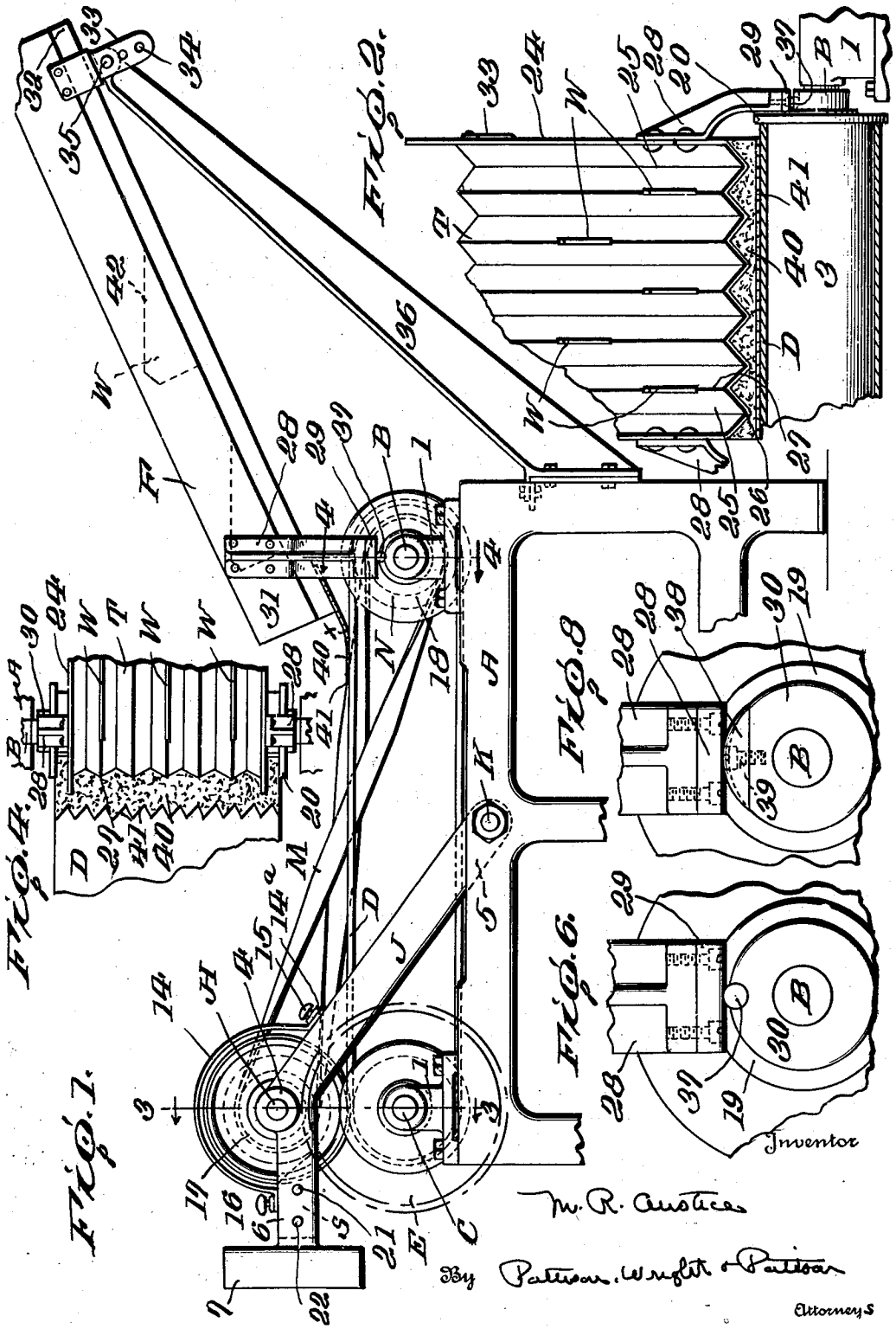
May 30, 1939. M. R. ANSTICE 2,160,693

BEAN-SLICING MACHINE

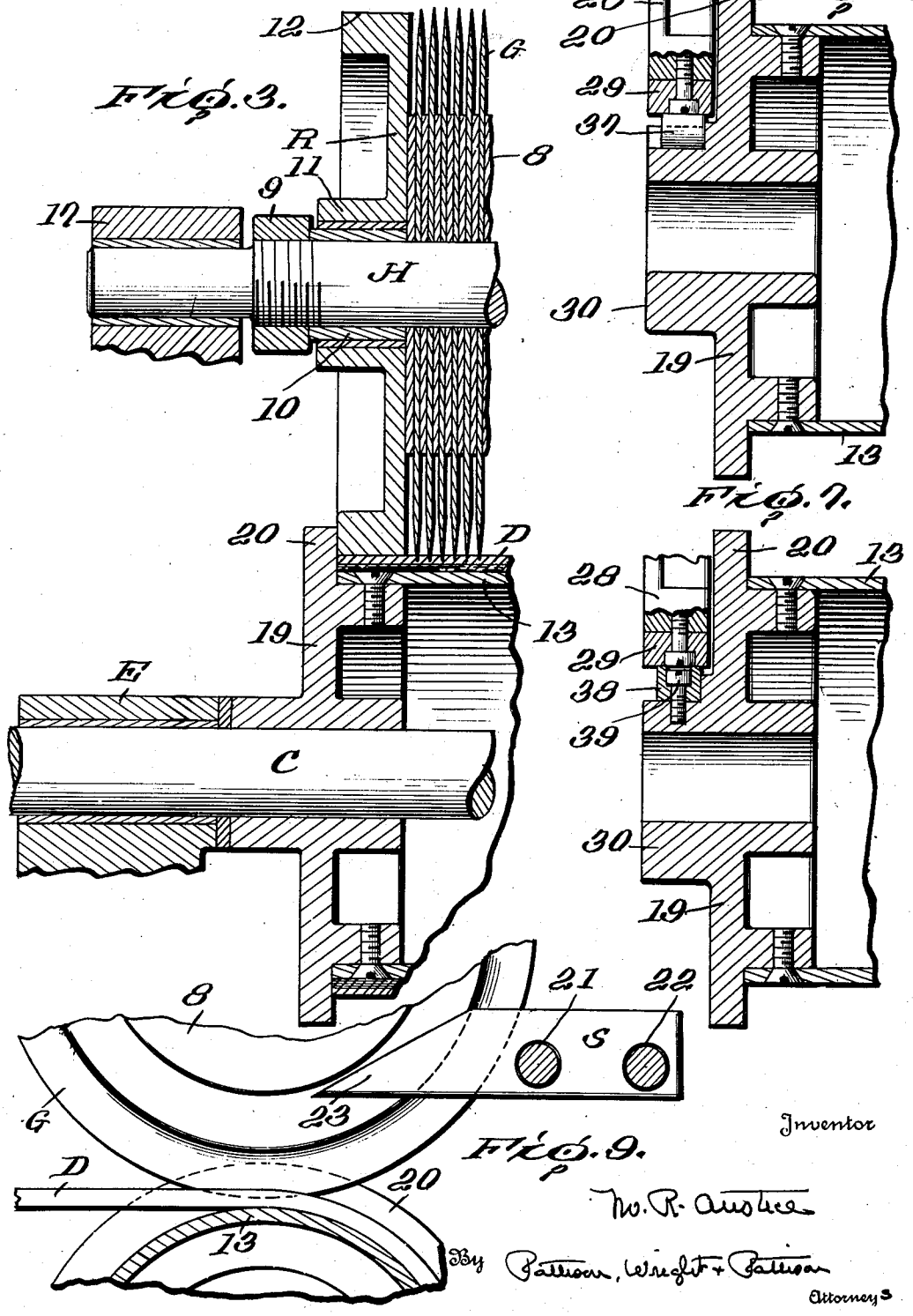
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BEAN-SLICING MACHINE

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BEAN-SLICING MACHINE

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10 Claims. (Cl. 146—98)

It is a recognized fact that many persons prefer green beans or vegetables of a similar character when they are cut along their lengths rather than transversely thereof, and the present invention pertains to a slicing machine for accomplishing this result.

The present machine is primarily intended for use by canners, although it is suitable for use by anyone who finds it necessary or desirable to slice a large number of such vegetables along their lengths.

Beans or other vegetables when cut into long strips are referred to often as being cut into "shoestrings" or being "Julienne".

The invention includes as a part a novel arrangement for rapidly and automatically feeding the beans end-first to a conveyor for delivery in this manner to the slicing knives.

In the machine a series of knives cooperate with a conveyor in the slicing of the beans, and one of the novel features of construction of the present improved machine is the provision of an arrangement which predetermines the engagement of the knives with the conveyor and will assure that the beans are cleanly cut or severed throughout their entire thickness yet at the same time assure that the conveyor is not destroyed or injured by the slicing knives.

There are other specific objects, and novel features of construction which result in the provision of an improved machine all of which will appear in detail from a reading of the following description in the light of the accompanying drawings.

In the drawings:

Fig. 1 is a view in side elevation of a machine embodying the present invention.

Figure 2 is a fragmentary end view of the feed pan and its apron, the conveyor being shown in vertical section.

Fig. 3 is a fragmentary vertical sectional view taken on the line 3—3 of Fig. 1 looking in the direction indicated by arrow.

Fig. 4 is a fragmentary top plan view of the lower end of the feed pan.

Fig. 5 is a vertical sectional view taken on the line 4—4 of Fig. 1 looking in the direction indicated by arrow.

Fig. 6 is an end view of the construction appearing in Fig. 4.

Fig. 7 is a fragmentary vertical sectional view illustrating a modified form of cam adapted for use in agitating the feed pan.

Fig. 8 is a fragmentary end view of the construction appearing in Fig. 7.

Fig. 9 is an enlarged fragmentary detail view, partly in vertical section illustrating one of the fingers making up the comb utilized in connection with the cutting knives.

Having reference now to the drawings which illustrate a machine embodying the present invention, A represents a base or pedestal preferably of an open framework type and rectangular in configuration.

At one end of the base a shaft B is rotatably supported in suitable bearing blocks 1 and at the other end of the base a shaft C is rotatably supported in suitable similar bearing blocks. These shafts extend transverse the base and each of them carries a drum or roller which is rotatable with its respective shaft and over which is trained an endless belt conveyor D. The shaft C is provided with a pulley E which is intended for belt drive connection with any suitable source of power.

The belt D appears in section in Fig. 2 of the drawings at that point where it passes over the drum or roller 3 which is carried by and rotates with the shaft B. This belt is preferably made of rubber or of fabric impregnated with rubber. Belts composed of other material and suitable for use with the machine can probably be found, but it is essential that the belt or conveyor be such that the cutting knives of the machine actually enter or penetrate the belt so as to assure that vegetables which pass between the knives and the belt are cleanly and completely severed, as will hereinafter more fully appear.

Through the instrumentality of the pulley E the belt conveyor is rotated in a counter-clockwise direction. At the left hand end of the machine and of the conveyor and hence at the delivery end of the conveyor, the machine is provided with a knife assembly. This knife assembly is made up of a shaft H which extends transverse the conveyor and is rotatably supported in the upper ends 4 of the arms J which have their lower ends 5 pivotally connected as at K to the pedestal or base A at a point intermediate its length. These arms extend upwardly at each side of the conveyor and have horizontally disposed extensions 6 which are connected by a transversely extending weight 7.

A plurality of circular knives G are loosely mounted upon the rotatable shaft H and are arranged in spaced parallel relationship. The spacing of the knives is obtained by spacers 8 positioned between each knife blade. These spacers are loosely mounted on the shaft H. At each of its ends beyond the knives the shaft is provided

with nuts 9 which are adapted to tighten the sleeve bushings 10 against the knives and their spacers so that the knives are tightly clamped in proper relationship with one another. By tightening the nuts 9 and clamping the knives as described the knives will rotate with the shaft H.

At each end of the shaft and beyond the circular knives there is positioned a roller R each of which has a hub 11 which is freely rotatable upon the aforementioned sleeves 10. Thus the rollers are free to rotate independent of the rotation of the shaft H. These rollers have faces 12 of substantial area which, as will be seen from reference to Fig. 3 of the drawings, engage the belt D at the point where it passes over the drum or roller 3 of the shaft C.

The circular knives have a diameter slightly greater than the diameter of the rollers with the result that as the rollers rotate freely upon the moving conveyor the knife blades will at all times enter or penetrate the conveyor belt a predetermined distance, and this will be true irrespective of any variations in the thickness of the conveyor belt.

It has been found that conveyor belts are not always of uniform thickness throughout their lengths, but the present improved construction is such that definite predetermined contact between the knives and the belt is obtained irrespective of variations in the belt thickness. Although in the drawings a belt having vulcanized ends is illustrated, belts which have their ends joined by metallic fasteners or by non-metallic lacing may be used and when belts of this kind are used it is necessary that the fastening means be covered with belt material or the like so as to protect the lacings from the knives and also to protect the knives from the fastening means when they are of a metallic nature. This protective covering of course increases the thickness of the belt materially at the belt ends but due to the roller arrangement heretofore described it will be seen that the rollers will follow the contour of the thickened belt and that the knives will penetrate the protecting cover over the belt fastening means a distance equivalent to the penetration of the knives throughout the remaining portions and length of the conveyor belt.

The provision of definite and positive means for assuring a predetermined penetration of the conveyor by the knives is of the utmost importance to prevent the knives from rapidly cutting up and completely destroying a conveyor belt.

The weight 7 plus the weight of the knife assembly itself will assure that the rollers at all times follow the contour of the surface of the conveyor and that the knife blades are held downwardly under sufficient force or tension to assure that they completely and cleanly cut the beans which are delivered to them for slicing.

Due to the fact that the knife assembly is pivotally mounted it will be seen that the knives and the rollers yieldably engage the conveyor belt with the result that should any foreign substance such as a block of wood or the like reach the conveyor and be carried to the knives, the knives can lift or swing upwardly and ride over this foreign object. This is a desirable and important feature as it protects the knives against breakage and injury.

As a protection to the knives themselves and to the operators of the machine, a removable cover 14 is provided which is positioned above the knives and has quick detachable connection as at 15 and 16 with the arms J and their extension portion 6.

It has been found necessary to control the depth of the beans on the conveyor in their delivery to the slicing knives. If the vegetables or beans are brought to the knives in too great a depth on the conveyor an undesirable wedging action takes place between the knife blades and the efficient operation of the knives is destroyed. To control the depth or thickness of the bed of beans on the conveyor I utilize the lower end or edge 14a of the knife cover. All beans reaching the knives must pass under this edge of the cover and the cover edge will of course level off the bed of beans and permit the bed to be only of a thickness equal to the distance between the conveyor belt and the lower edge of the knife cover.

The shaft H is provided with a pulley 17 which has a belt drive connection M with a pulley 18 carried by the shaft B. It is to be noted that the belt connection is such as to revolve the shaft H and the knives G in a clockwise direction which is a direction reverse to the direction of movement of the conveyor belt.

The driving connection for the knives is such that the knives will be revolved at a greater speed than the speed of movement of the conveyor belt. This feature of differential speed is not of utmost importance but has been found desirable. In actual practice it has been found that when the machine is first put into use it is practically impossible to rotate the knives at a greater speed than the movement of the conveyor belt due to the frictional contact between the knives and the belt. However, after the machine has been in use for a considerable length of time it has been found that the knives actually cut grooves of a predetermined depth into the conveyor belt and that as these grooves become more definitely perceptible and more definitely cut the frictional engagement between the knives and the belt is reduced and eventually it becomes so negligible that it is possible to speed up the rotation of the knives in respect to the movement of the conveyor belt.

It would of course be possible to pre-groove the belt or conveyor so that the knives could be rotated at a greater speed than the speed of travel of the conveyor. I find it preferable however not to use a pre-grooved belt as I have found that the frictional contact between the knives and the belt tends to keep the knives sharp. Actual experimentation has proven that in cutting their own grooves in the belt the equivalent of a honing action takes place on the knives, which is of course desirable. It is to be understood however that if a pre-grooved belt were used and that when a plain surface belt is used which eventually becomes grooved due to the knife action, the rollers assure a predetermined penetration of the knives into the conveyor belt grooves.

Each of the rollers 3 and 13 at their ends are provided with end face members or discs 19 which are of a greater diameter than the rollers or drums, with the result that they form flanges 20 extending outwardly beyond the drum faces and between which the belt conveyer passes. These end flanges guard against displacement of the conveyor in an end-wise direction from the drum or rollers. The most important function however of the flanges at the ends of the drum is in serving as a guide means with respect to axial movement of the rollers R on the

shaft H. Due to these flanges the rollers are definitely limited in respect to axial movement and will assure that each knife will continuously contact the belt conveyor at the same or approximately the same point so that the knives will eventually cut grooves in the conveyor and to assure that each knife will remain in alignment with its respective groove.

A series of fingers S are loosely supported on the rods or shafts 22 which are arranged in spaced parallel relationship and carried by the extension arm portions 6 of the main pivotally mounted arms J. There is a finger provided for extension into the space between each of the knives and each of the fingers is provided with an extending portion 23 positioned between a pair of knives. In the event a sliced portion of string bean is picked up or wedged between a pair of knives it will be combed from the knives by a finger and caused to drop downwardly upon the conveyor belt for discharge and collection.

Inasmuch as the machine is for the purpose of slicing green beans or vegetables of a somewhat similar configuration in a direction lengthwise of the vegetable, it is of course essential that the bean or vegetable be delivered to the conveyor and to the knives in an end-first manner. To accomplish this a vegetable feed pan F mounted and constructed in a particular manner is provided.

The pan F has side walls 24 and a corrugated bottom designated as an entirety by T. The pan bottom is made up of a series of V-shaped troughs or grooves 25 which give to the pan bottom a contour characterized by alternate low spots 26 and high spots 27.

This pan is arranged at an inclination to the conveyor belt and has its lower end 31 positioned slightly above the right hand or receiving end of the conveyor. An apron X is attached to the under side of the bottom of the pan at its lower end and has a portion 40 which drags upon the conveyor belt. This apron extends across the entire width of the lower open end of the pan and has its end 40 scalloped as at 41.

The feed pan is arranged at an inclination to the conveyor so that vegetables fed to the upper end of the pan will move by gravity down the pan to the conveyor. A pair of brackets 28 at each side of the conveyor carry at their lower ends detachable and replaceable shoes 29 which ride on the hubs 30 of the discs 19 at the opposite ends of the drum or roller 13 and support the lower end 31 of the feed pan slightly above the receiving end of the conveyor. The opposite and high end 32 of the pan is provided with downwardly extending brackets 33 each of which is provided with a series of aligned openings 34 which provide selective pivotal engagement of the brackets with the pins 35 carried in the upper ends of the pedestal arms 36.

To assure movement of the vegetables down the pan it has been found desirable to shake or agitate the pan, and this is done by cam pins 37 positioned in the hubs 30. By reference to Figs. 5 and 6 of the drawings it will be seen that this cam is in the form of a pin which is positioned in a suitable hole bored close to the outer peripheral edge of the hub 30. The degree of lift and fall of the pan can be varied by using cam pins of different diameters. It will be obvious from the drawings that the pins cannot become displaced in a direction at right angles to their axis and displacement of the pins axially is prevented by peening over the outer ends of the orifice behind the pins.

An alternate form of cam is illustrated in Figs. 7 and 8 of the drawings where it will be seen that in place of a pin cam half moon cams 38 are used which are removably secured to the hubs by means of screw-bolts 39 or the like. When this form of cam is used the degree of lift and fall of the feed pan can be altered through the exchange of cams having different cam faces.

It has been found that it is not desirable to let the beans drop from the pan onto the conveyor belt. It is much more preferable to feed the beans as they come endwise down the pan troughs smoothly onto the conveyor, and this is accomplished by the provision of an apron X which has attachment to the lower end of the pan and has a portion 40 which drags on the conveyor. This apron is preferably made of rubber or some like suitable and flexible smooth water proof material and serves to ease the beans onto the conveyor belt. To further assure the delivery of the beans endwise to the apron the portion 40 of the belt has its extreme end portion scalloped as indicated at 41 which gives the belt a chance to first engage the ends of the beans and pull them endwise off of the apron. Use of the apron is not essential however as acceptable feeding can be produced without it.

To assure that the pan itself delivers all of the beans in an endwise manner a plurality of triangular members W are provided. These members are placed on the high points 27 of tops of the V's constituting the bottom of the pan and have their top edges 42 exposed in substantially a horizontal plane. Adjacent the lower end of the pan a triangle is placed on alternate high spots 27 and intermediate the length of the pan additional triangular members are placed on the high points or tops of V's which were skipped at the lower end of the pan. This is the preferable position of triangular members but need not be followed exactly to accomplish the desired purpose. In operation it has been found that should a bean start down the pan crosswise, that is to say that the length of the bean is at right angles to the troughs in the pan bottom, the bean will strike one of the triangles which will of course tend to lift the bean and the pressure of beans behind will tend to force the bean outwardly upon the triangular member. A bean will practically never become perfectly balanced upon the horizontally disposed top edge 42 of a triangular member and consequently will topple off of the member and fall to the right or to the left of the member into proper endwise position within one of the troughs in the pan bottom.

The above described manner of guarding against a bean traversing the pan in a crosswise direction has been found to work very satisfactorily. The triangular members are so spaced that they are sufficiently close together as to prevent a bean which is positioned crosswise of the pan from passing between them. Any bean which is positioned crosswise of the pan will assuredly engage one of the triangular members which will shift the bean as described and place it in an endwise position in one of the troughs in the pan bottom.

It is to be recognized that the machine need not be built in exact accordance and agreement with the apparatus illustrated in the accompanying drawings, as departures from that structure

can be made without departing from the spirit of the invention as set forth in the hereinafter appended claims.

As an instance of an alteration which might be desirable to make the apparatus fit in better with the particular equipment which the canner has already installed, would be a reversal of the machine. By reversal of the machine is meant that the respective positions of the knife assembly and the feed pan would be interchanged. Were this done the direction of rotation of the conveyor belt and rotation of the circular cutting knives would of course have to be reversed.

Neither is it necessary that the bean turners W be of the exact and specific construction illustrated in the drawings. These members might be replaced by vertically extending pins, although it is believed that they would not operate as satisfactorily as would obstructions made in the form of those illustrated at W in the drawings.

It is also to be recognized and understood that agitation of the feed pan need not be accomplished in the exact and specific manner illustrated and described. It is only necessary to provide sufficient movement of the feed pan to assure that the beans will traverse the length of the pan for delivery to the conveyor and also to assist the obstructions W in turning or moving the beans so that they will lie lengthwise of the troughs in the bottom of the pan.

From the foregoing it will be seen that the machine illustrated and described provides an apparatus whereby beans, carrots or other vegetables, fruits or food-stuffs having configurations somewhat similar to that of a bean can be rapidly, efficiently and cheaply sliced into "shoestring" or strip form.

In the foregoing description the operation of the machine has been described primarily in connection with green beans, but it is of course to be understood that neither the machine nor the invention is limited to green beans but is directed to any vegetable, fruit or food having a configuration at all similar to a bean and which it is desired to slice in its long direction into strips.

I claim:

1. In an apparatus of the character described, a conveyor and means to operate the same, a series of spaced-apart knives arranged above and having engagement with said conveyor, the cutting edges of said knives disposed in alignment with the direction of movement of said conveyor, a feed mechanism for feeding beans in an end-first manner to said conveyor and to the direction of movement of said conveyor, said mechanism comprising a feed pan arranged at an inclination to said conveyor and having its lower end above and in separated relationship with respect to said conveyor, a flexible apron attached to said feed pan and having contact with the conveyor, means to agitate said feed pan, the bottom of said feed pan provided with corrugations disposed in alignment with the direction of movement of the conveyor, and means in said feed pan to cause the beans to move down the corrugations in an end-first manner, whereby the beans first engage the apron in an end-first manner and pass across the same and engage the conveyor in an end-first manner for delivery in this manner to the knives.

2. In an apparatus of the character described, a conveyor and means for operating the same, a series of spaced-apart circular knives above said conveyor and having their cutting edges disposed in alignment with the direction of movement of said conveyor, means to assure a predetermined engagement of the knives with the conveyor, a feed mechanism for feeding beans or the like in an end-first manner to the conveyor with the long axis of the beans in alignment with the direction of movement of the conveyor, said feed mechanism comprising a pan having its bottom formed with a series of parallel troughs extending in alignment with the direction of movement of the conveyor, said pan arranged at an inclination to the conveyor, means to support the lower end of said pan in spaced realtionship to the conveyor, an apron having attachment with the pan and engaging the conveyor, triangular shaped members in said pan and positioned intermediate the troughs thereof, said members having horizontally disposed surfaces aligned with respect to the length of said troughs, means to agitate said pan to cause beans to move down the same, and the horizontal surfaces of said triangular members adapted to engage beans tending to move down said pan with the length of the bean disposed transversely to the length of the troughs.

3. A construction such as defined in claim 2, wherein the end of the apron having engagement with the conveyor is scalloped to enable the conveyor to first engage the bean heads and pull them endwise, for the purpose set forth.

4. In a machine for longitudinally slicing string beans and the like, comprising a conveyor, a series of knives arranged in spaced parallel relationship and having their lower edges in engagement with said conveyor, an inclined trough having its lower end adjacent the said conveyor for conveying said beans endwise to the conveyor, the bottom of the trough having longitudinally extending corrugations in parallel relationship with the cutting edges of said knives, means to aggitate said trough, and means in the bottom of said trough for causing the beans to be turned end first and fed in said turned position to the conveyor and to the said knives.

5. In a machine for slicing string beans and the like, a conveyor, a series of spaced knives having their cutting edges arranged in alignment with the direction of movement of said conveyor and having their lower edges in engagement with said conveyor, an inclined trough having its lower end adjacent the said conveyor, means for agitating the said trough, the said trough provided in its bottom with a plurality of relatively short projecting members arranged in staggered relation for turning the beans endwise, said trough feeding the beans to the conveyor and the conveyor feeding them to said knives.

6. A construction such as defined in claim 1, wherein the end of the apron having engagement with the conveyor is scalloped to cause the leading ends only of the beans to first engage the conveyor, whereby said conveyor pulls said beans endwise from the apron, for the purpose set forth.

7. In a machine for slicing string beans and the like, a conveyor, a series of spaced knives having their cutting edges arranged in alignment with the direction of movement of said conveyor and having their lower edges in engagement with said conveyor, a mechanism for feeding the beans in an end-first manner to the conveyor with the long axes of the beans in alignment with the direction of movement of the conveyor, said feed mechanism comprising an inclined trough having its lower end adjacent said conveyor, the bottom of said trough provided with a plurality of longitudinally extending grooves in parallel relation-

ship with the cutting edges of said knives, a plurality of projecting members adjacent the lower end of said trough arranged in staggered relationship and disposed between said grooves, means to agitate said trough, and said projecting members engaging those beans traveling down the trough in any but an endwise direction and turning said beans endwise into said grooves for endwise delivery to said conveyor.

8. In a machine for slicing string beans and the like, a conveyor, a series of spaced knives having their cutting edges arranged in alignment with the direction of movement of said conveyor and having their lower edges in engagement with said conveyor, a mechanism for feeding the beans in an end-first manner to the conveyor with the long axes of the beans in alignment with the direction of movement of the conveyor, said feed mechanism comprising an inclined trough having its lower end adjacent said conveyor, the bottom of said trough provided with a plurality of longitudinally extending grooves in parallel relationship with the cutting edges of said knives, a plurality of projecting members adjacent the lower end of said trough and arranged in rows transverse thereof, the members in one row being disposed between every other groove and the members in the other row being disposed between the remaining grooves, means to agitate said trough, and said projecting members engaging those beans traveling down the trough in any but an endwise direction and turning said beans endwise into said grooves for endwise delivery to said conveyor.

9. A construction such as defined in claim 7, wherein the projecting members are of a triangular shape and have their upper edges disposed in a horizontal plane and extending parallel to the length of said grooves.

10. In a machine for slicing string beans and the like, a conveyor, a series of spaced knives having their cutting edges arranged in alignment with the direction of movement of said conveyor and having their lower edges in engagement with said conveyor, an inclined trough for feeding the beans in an end-first manner to the conveyor with the long axes of the beans in alignment with the direction of movement of the conveyor, said trough having its lower end adjacent the conveyor, the bottom of said trough provided with a plurality of longitudinally extending grooves arranged in parallel relationship with the cutting edges of said knives, a plurality of upwardly projecting members arranged in staggered relationship in said trough and disposed between the aforesaid grooves, means to agitate said trough, and said projecting members engaging those beans traveling down the trough in any but an endwise direction and turning said beans endwise into said grooves for endwise delivery to said conveyor.

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