

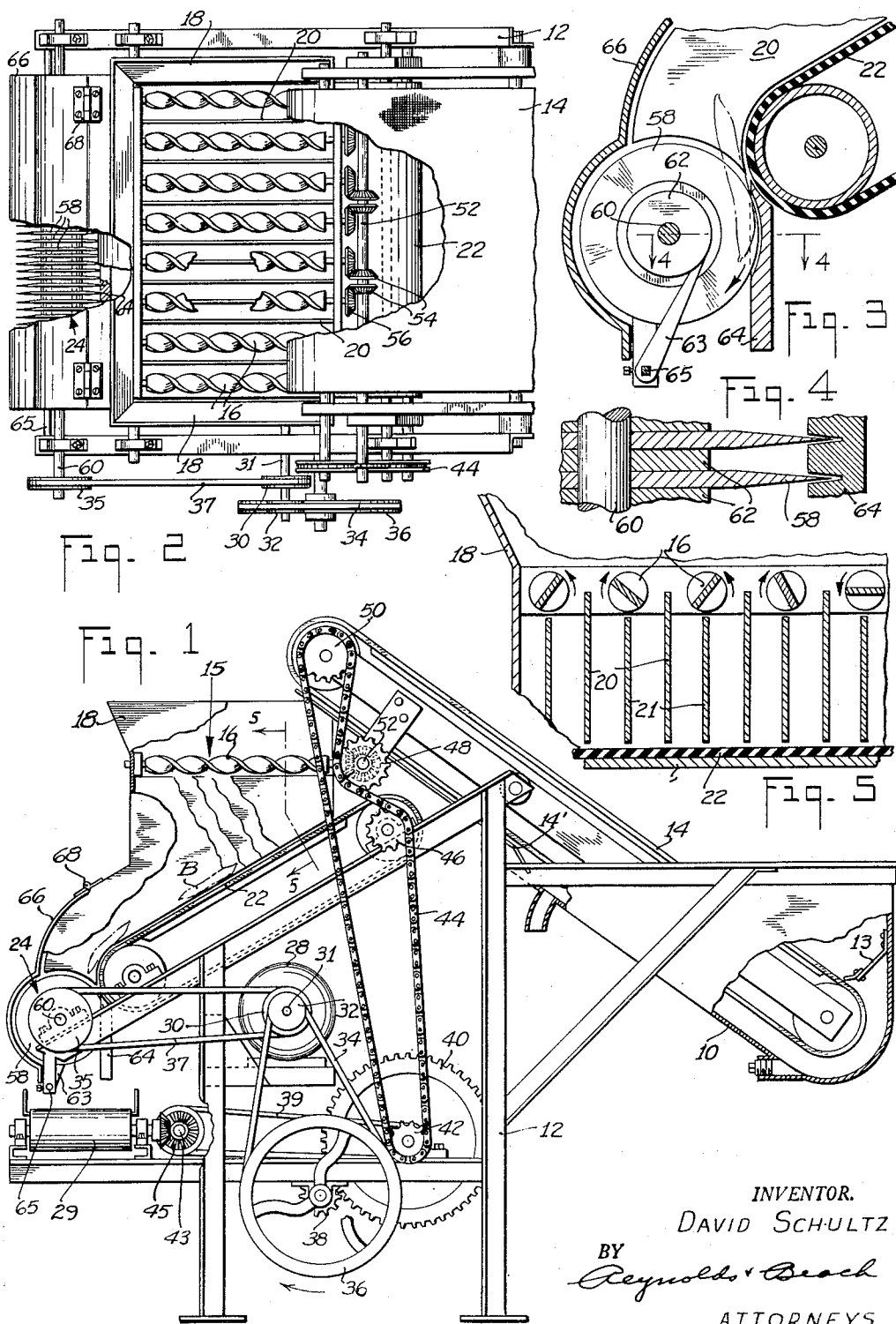
Aug. 14, 1956

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2,758,697

SLICING DEVICE

Filed Aug. 4, 1951



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SLICING DEVICE

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Application August 4, 1951, Serial No. 240,421

5 Claims. (Cl. 198—30)

This invention relates to automatic vegetable slicing machines and is primarily concerned with the slicing of string beans lengthwise into thin strips or shreds for packing purposes. My copending application, Serial No. 773,212, filed September 10, 1947, and now Patent No. 2,671,550, describes a similar type of slicing machine. Since the development of that former machine certain improvements and discoveries have been made which together with certain subject matter disclosed in said copending application, constitute the basis of the present application. One of the broad objects of the present invention is to devise improved mechanism operable positively to align the string beans and present them oriented accurately endwise to the slicing means; and, in the same connection, to devise improvements which minimize clogging or jamming of the beans and resulting work stoppages in the machine.

As in my earlier machine, the preferred aligning mechanism herein illustrated comprises a sifter grid made up of oppositely acting, generally parallel, elongated, bean supporting elements which swing the string beans deposited on them, generally endwise until they drop between such elements and between underlying vertical partitions, on a feed conveyor. The vertical partitions underlying the respective sifter elements define parallel guides which maintain the beans aligned during their endwise advance on the conveyor to the slicing means. A bean slicing machine according to the present application includes the following improvement features: narrow inter-partition spaces or passages obtained by use of parallel partitions mounted intermediate between the respective partitions which generally underlie individual sifting elements, which intermediate partitions preferably extend somewhat above the upper edges of those beneath the sifter elements; combining a generally horizontal sifter grid and the partition structure with a bean receiving conveyor belt located substantially beneath the sifter grid and inclined downward at an appreciable acute angle in the direction of conveyor feed. The use of intermediate partitions as mentioned enables obtaining more accurate alignment of the beans, hence more nearly perfect endwise slicing action, yet without necessitating unduly close spacing between adjacent sifter elements as to impair their operation. The use of a generally horizontal sifting grid and downwardly inclined feed conveyor prevents excessive cumulative piling up of beans thereon, hence blockages.

As the terms "horizontal" or "substantially horizontal," etc., are herein used with reference to the sifting grid it is to be understood that they also include inclinations of the grid from the horizontal by small angles as well, as much as 5 to 10 degrees inclination being permissible.

These and other advantages of the present machine, including various illustrated details of construction will become further apparent from the following description based on the accompanying drawings.

Figure 1 is a side elevation view of a slicing machine embodying the invention.

Figure 2 is a plan view, with parts broken away, showing certain details of the aligning and slicing apparatus, Figure 3 is an enlarged sectional side view showing details of a preferred slicing mechanism; and Figure 4 is a fragmentary sectional detail view of the illustrative slicing means, taken on the line 4—4 of Figure 3.

Figure 5 is a fragmentary sectional end view of the bean aligning apparatus, taken on the line 5—5 of Figure 1.

Before the beans are carried by the machine to the aligning and slicing mechanism, they are first discharged into a trough 10 which may contain water if desired. The trough is shown supported directly from the machine frame 12. From this trough the beans are lifted at a more or less uniform rate, determined by the working capacity of the machine, by an inclined endless conveyor belt 14, the lower extremity of which is immersed in the trough to pick up the beans. If the trough is filled with water the beans are more evenly distributed over such belt. A transverse partition 13 carried by the inner end wall of the trough, opposite from the entering conveyor belt, contact, or projects substantially into contact with, the upper side of the submersed conveyor belt to retain the beans dropped into the trough from settling to the bottom beneath the belt. In the illustrated case the slowly moving conveyor belt 14 is formed of screen material, with an underlying drain board 14' the lower end of which overlies the trough. The conveyor rises from the trough at an angle of approximately 45 degrees. Consequently, as beans are elevated from the trough, any water carried with them drains back readily into the trough, and the beans dropping over the upper end of the belt onto the sifting grid 15 are comparatively free of rinsing water.

The illustrated sifting grid 15 comprises a row of parallel oppositely rotated helical screw elements 16 which swing the beans deposited upon them end for end until they drop into the spaces between such elements. As shown, the elements 16 are formed by helically twisting flat metal strips or bars about their longitudinal central axes. Such screw elements have high ribs between which the beans are supported for swinging end for end by rotation of adjacent screw elements in the sifting grid, driven by mechanism to be described. Side board or plates 18 project above the sides of the sifting grid to retain thereon the beans deposited by the conveyor belt 14. These same sides continue downwardly to define the outer walls of a multiple partitioned chute through which the beans are guided in dropping onto a feed conveyor 22 which delivers the beans to the slicing means 24.

A feature of the present invention and one which contributes substantially to the successful operation of my machine, free from interruptions by beans lodging in the aligning and feeding mechanism, is the arrangement of the sifting grid and the underlying feed conveyor. Accordingly, the grid is disposed in a substantially horizontal plane and the feed conveyor 22 at a location substantially below the sifting grid and sloped downwardly at an appreciable angle in the direction of feed, toward the slicing means 24. This appears most clearly in Figure 1, wherein the conveyor 22 is shown tilted at an angle of approximately 30 degrees downward. At the nearest receiving location of the feed conveyor to the sifting grid the vertical spacing therebetween is sufficient to prevent beans piling up on the conveyor to the level of the grid 15 and cause obstruction. Moreover, as the pile of beans increases in height over an initial supporting area thereon, moving from beneath one end of the grid to the other, the dropping off or downward slope of the conveyor permits accommodation of a higher pile and thereby prevents the pile rising to the level of the grid at any time.

A further feature of the invention resides in the use, in conjunction with the sifting grid 15, of spaced, parallel bean-guiding partitions extending vertically. Certain of such partitions 20 are disposed between the screw elements 16 of such sifting grid 15, extending from above the plane of the lower side of such elements down close to the feed conveyor 22. Partitions 21, arranged alternately directly between partitions 20, are located beneath the sifting elements 16. The spacing between adjacent parallel partitions is thereby made appropriately small to insure accurate alignment of the string beans B (Figure 1) with the direction of conveyor feed movement, but without requiring the sifting element overlying the alternate partitions 21 to be so closely spaced as to render them ineffective in swinging the beans in the described manner. A single thin partition 20 in each of the spaces between adjacent partitions 21 is preferred, rather than two or more spaced partitions, because beans will then have but slight tendency to become balanced on the upper edges thereof to prevent them from dropping into the spaces between adjacent partitions.

It will be noted in connection with Figure 5 that the intermediate partitions 21 extend upwardly approximately to the plane of the rotation axes of the several sifting elements, a feature which has been found to be of practical desirability. The partitions 20 and 21 extend close enough to the belt 22 (Figure 5) that there is no likelihood of beans becoming lodged between their lower edges and the surface of the conveyor belt. This spacing is maintained by a supporting plate 26 over which the upper stretch of conveyor belt 22 slides to prevent the belt sagging. All the partitions extend substantially to the lower extremity or output end of the conveyor feed belt 22, to guide the beans against swinging out of proper orientation while approaching the slicing mechanism 24.

Such slicing mechanism preferably comprises a plurality of spaced cutter disks 58 rotated at high speed by a common drive shaft 60 (Figure 2). The coaxially aligned disks 58 extend in a series lengthwise of shaft 60 the full width of the conveyor belt 22, shaft 60 preferably being mounted parallel to the pulley over which the lower or discharge end of conveyor belt 22 rotates.

The gradually tapered cutting edges of the disks 58 enter cooperable narrow recesses in the upright backing plate 64, between which and the cutting disks the beans drop endwise from the conveyor belt 22. The grooved backing plate 64 and the entering gradually tapered disk peripheries produce the desired clean-cutting action, shredding the beans uniformly in the direction of their length. Spacing between the successive disks is determined by a plurality of washers 62 encircling the shaft 60.

The washers 62, whose aligned outer peripheries lie radially just within the start of the marginal taper of the disks 58, prevent bean shreds entering the narrow spaces between adjacent cutting disks and clogging the cutter mechanism by enwrapping the shaft 60. Further assurance against such an occurrence is provided by the scrapers 63 entering the spaces between successive disks and bearing tangentially against the peripheries of the spacers, which underlie the cutter rotor. By reason of the tangential and downwardly inclined disposition of the scrapers they act to clean the cutter assembly constantly as it rotates. In such location any pieces of beans which tend to pack between adjacent cutter discs are positively but not roughly dislodged by the scrapers and drop free without interfering with subsequent bean pieces. The scrapers 63 may be carried, as illustrated, by a common rocker bar 65, by which the scrapers may be swung conjointly into and out of contact with the spacers 62, and removed for cleaning.

The guard flap 66, pivoted at 68 to the chute housing, protectively covers the outer side of the cutter assembly away from the slicing plate 64. The plate 64 and the lower edge of the guard 66 constitutes an outlet chute

through which the bean shreds drop onto an output conveyor 29 for transportation away.

A single prime mover, such as electric motor 28, may be used to drive all of the moving parts of the apparatus, including the elevating conveyor 14, the rotated sifting elements 16, the feed conveyor 22, the slicing mechanism 24 and the output conveyor 29. As illustrated, the motor 28 has a drive shaft 31 which carries two pulleys, 30 and 32. A belt 34 interconnects the pulley 32 and a driven pulley 36 which rotates a drive pinion 38 meshing with a driven gear 40. The latter drives a sprocket 42 which in turn drives the chain 44 meshing with the respective sprockets 46, 48, and 50. Sprocket 46 drives the conveyor belt 22, sprocket 48 drives the sifting mechanism and sprocket 50 drives the elevating conveyor 14. Sifting mechanism drive sprocket 48 deflects the chain 44 part way around the respective sprockets 50 and 46, on either side of sprocket 48, in the manner illustrated, to provide positive driving engagement of the chain with these sprockets at all times. The sprocket 48 drives a shaft 52 carrying a plurality of bevel gears 54 meshing with coaxing bevel gears 56 driving the individual screw elements 16 of the sifting mechanism 15. In the illustrated case the bevel gears are alternately reversed in direction of rotation in order to rotate the elements oppositely to swing beans deposited thereon, although it will be evident that the elements would be rotated in the same direction if their screw threads were alternately reversed in sense. Other similar types of sifting mechanisms are illustrated in my said copending application.

Pulley 30 on the motor shaft 31 drives the cutter shaft pulley 35 through a belt 37 in the manner indicated. A belt 39 interconnects pulleys on the shafts 42 and 43, respectively, to drive the output conveyor 29, the latter shaft, 43, rotating a bevel gear drive 45, driving a conveyor pulley.

I claim as my invention:

1. Bean aligning mechanism comprising a plurality of spaced generally parallel upright partitions, and a sifting grid including a plurality of sifting elements overlying alternate ones of said partitions, adjacent sifting elements acting oppositely and swinging beans engaged therewith into positions generally parallel to said partitions to drop between one of said alternate partitions and a partition between such alternate partition and an adjacent alternate partition.

2. The bean aligning mechanism defined in claim 1, in which the sifting elements are disposed substantially in a generally horizontal plane.

3. The bean aligning mechanism defined in claim 2, in which the partitions between the alternate partitions are arranged with their upper edges disposed substantially coplanar with the sifting elements.

4. Bean aligning mechanism comprising a sifting grid including a plurality of spaced parallel screw elements, means operable to rotate adjacent ones of said elements to effect movement in opposite directions of bean portions engaged therewith, a plurality of spaced vertical partitions generally underlying individual sifting elements, respectively, and a plurality of parallel vertical partitions disposed intermediately of said first partitions and between said screw elements, defining narrowly spaced parallel guides for beans dropping between said screw elements.

5. Bean aligning mechanism comprising a sifting grid including a plurality of spaced parallel screw elements, means operable to rotate adjacent ones of said elements to effect movement in opposite directions of bean portions engaged therewith, and a plurality of spaced vertical partitions generally underlying individual sifting elements, respectively.

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