March 9, 1954 D. SCHULTZ 2,671,550

SLICING DEVICE

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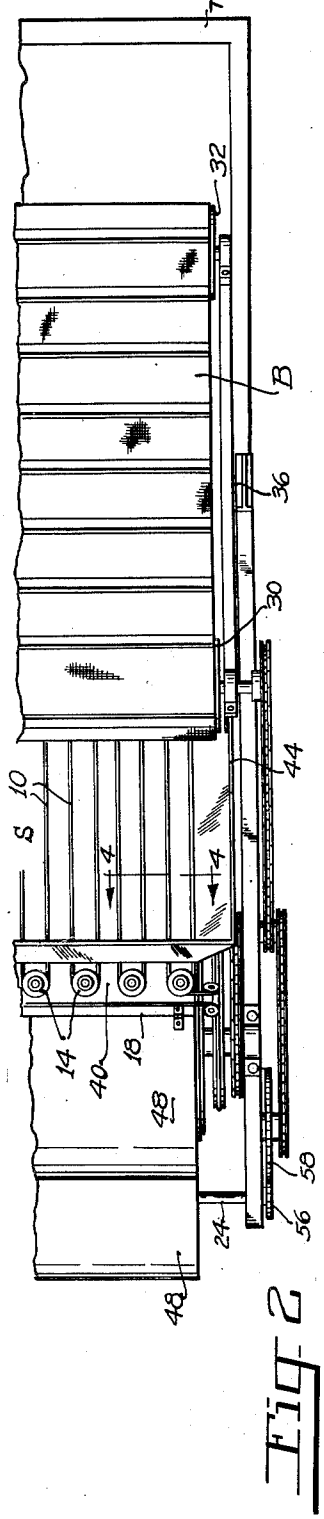


Fig. 2

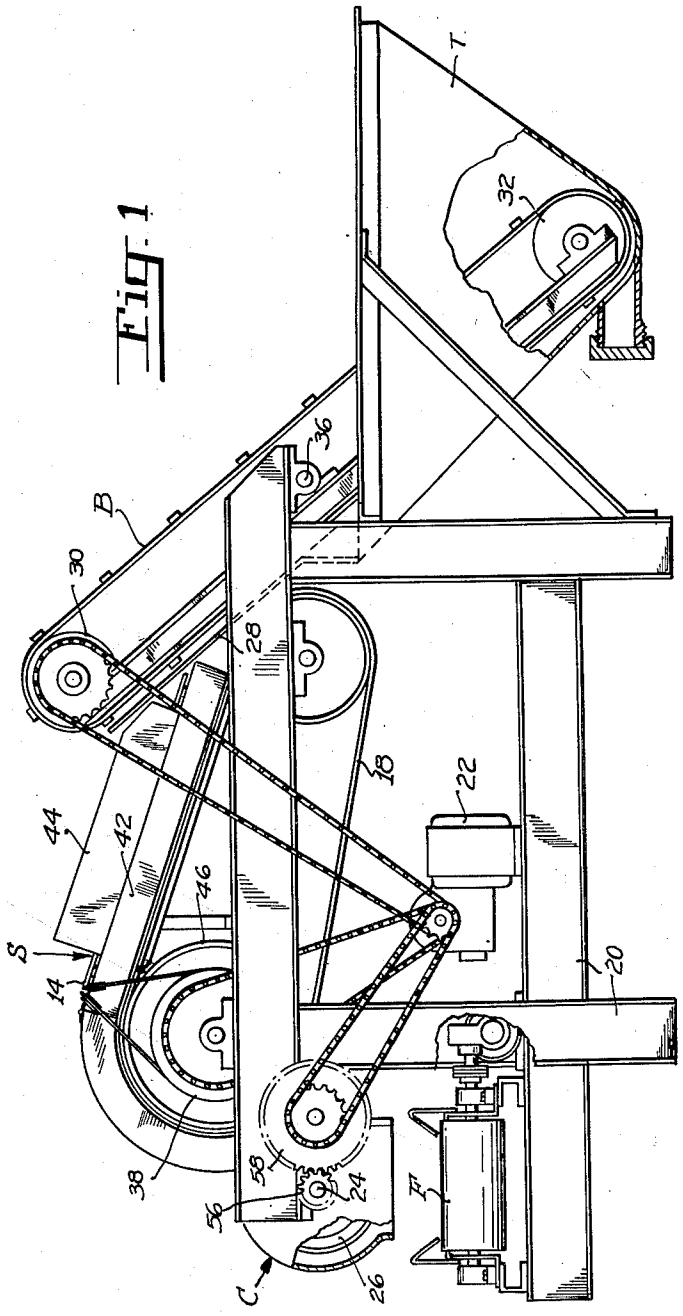


Fig. 1

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Fig. 4

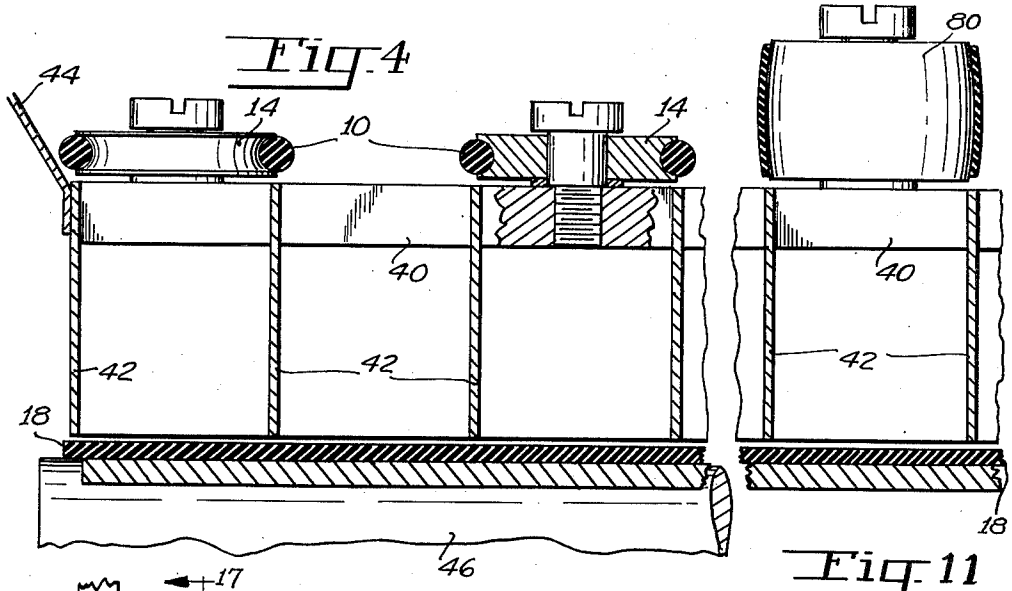


Fig. 11

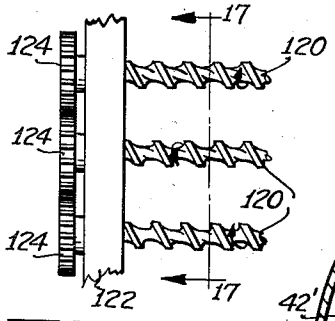
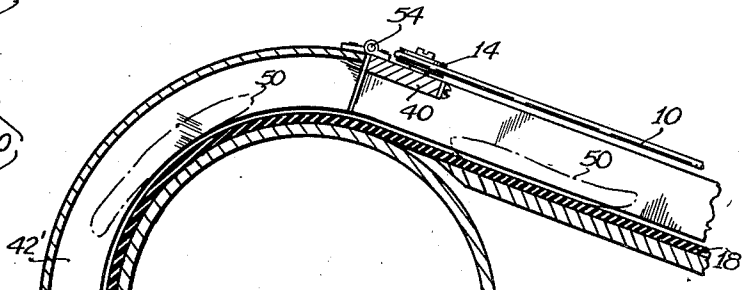


Fig. 16



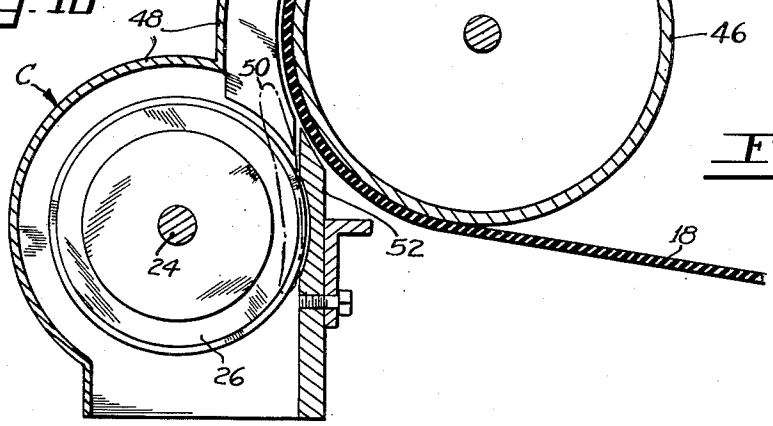


Fig. 3

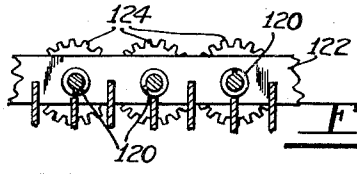


Fig. 17

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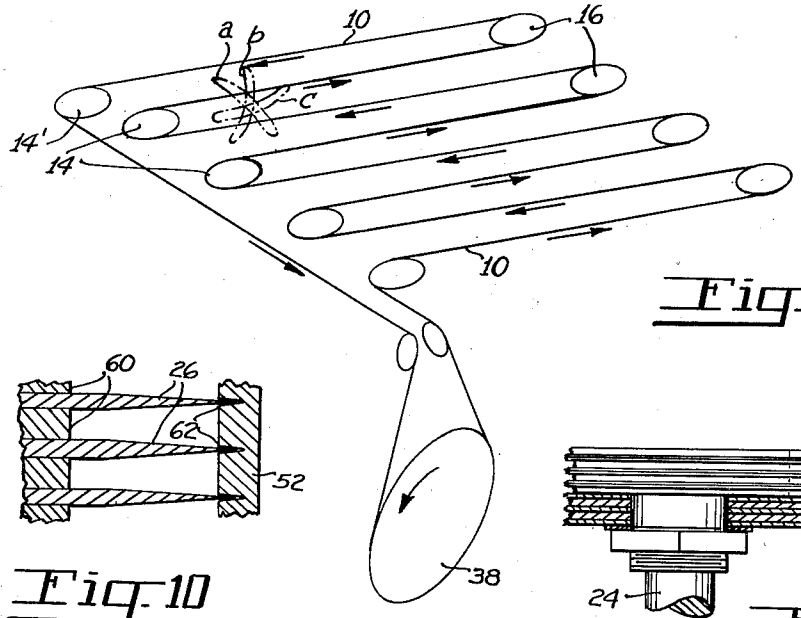


Fig. 5

Fig. 10

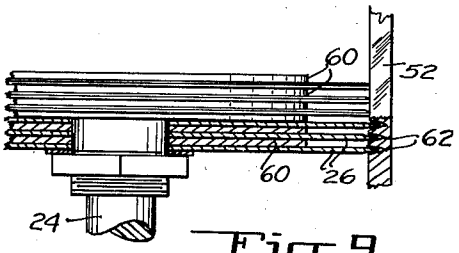
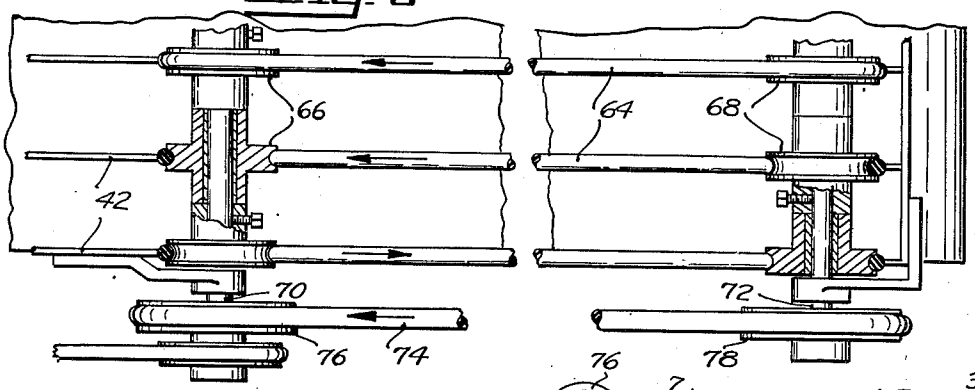


Fig. 9

Fig. 8



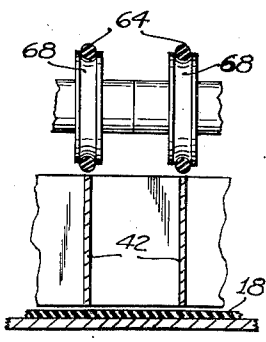


Fig. 7

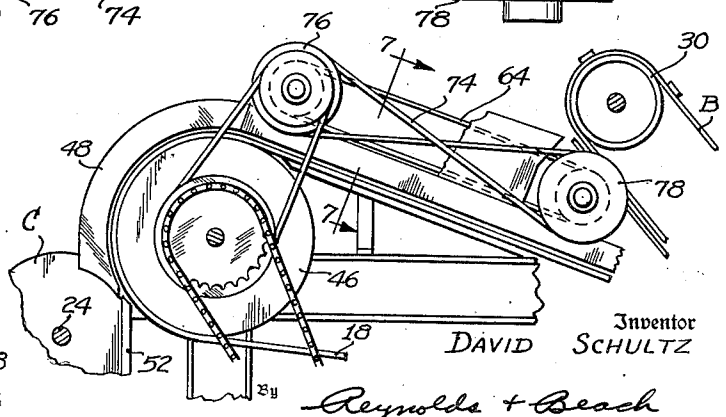


Fig. 6

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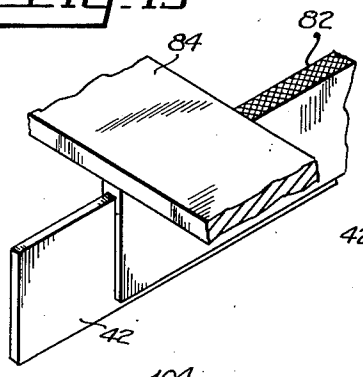
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SLICING DEVICE

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Fig. 15



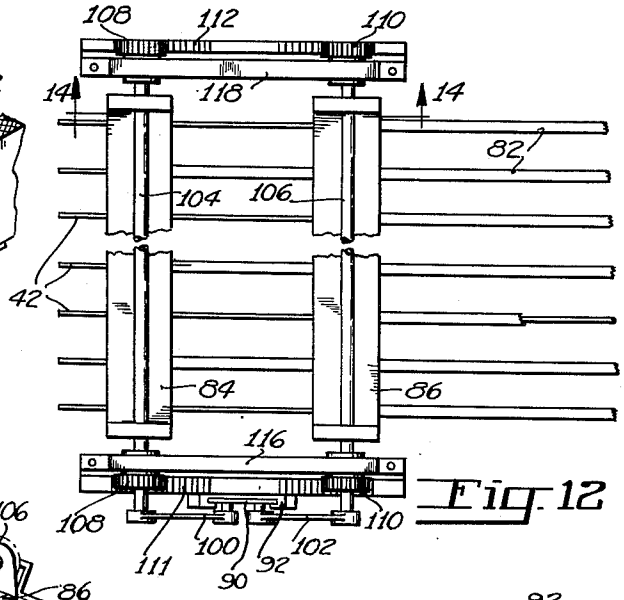


Fig. 12

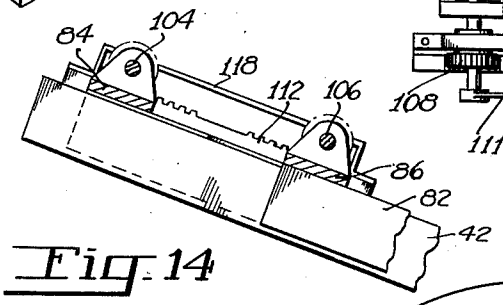


Fig. 14

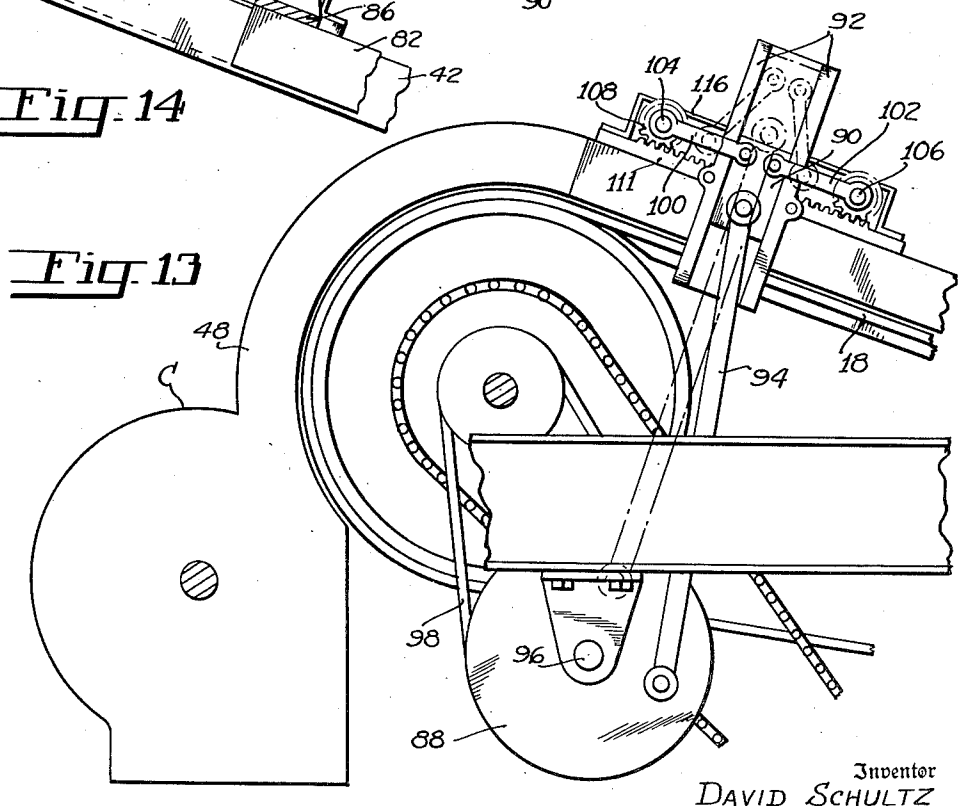


Fig. 13

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UNITED STATES PATENT OFFICE

2,671,550

SLICING DEVICE

David Schultz, Seattle, Wash.

Application September 10, 1947, Serial No. 773,212

7 Claims. (Cl. 198—30)

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This invention relates to improvements in bean slicing machines, or related devices employed in cutting string beans lengthwise preparatory to packing them in cans or cartons, for cold storage or other purposes. String beans sliced longitudinally into thin strips may generally be packed more readily and compactly than beans cut transversely into short sections. Moreover, tenderization of the beans by cooking them is thereby facilitated in this way, so that large beans which otherwise would be tough and stringy and which, therefore, would often be discarded as culls, may compare favorably with the smaller, more tender beans. Consequently, the advantages of packing longitudinally sliced beans have caused this style to be adopted by many packers of food.

Commonly, the stem and string ends of the bean are first clipped off, the beans blanched, and then passed endwise through a slicing mechanism comprising parallel rotating cutting disks bearing against a rotating roll or drum, the beans passing between such disks and roll. In order to orient the beans for conveying them in the proper spatial relationship or alignment to the cutting mechanism, it is common to employ an endless conveyor belt onto which the beans are deposited by dropping them between closely spaced partitions extending lengthwise of the belt. Because the beans are long relative to the partition spacing, their general alignment is determined by that of the partitions, and in travelling on the belt to the cutting station, they automatically become presented endwise to the cutting disks.

The beans are first deposited in a heap with haphazard orientation over the partitions by means of a dewatering conveyor belt moving out of a wash tank containing a supply of beans. Heretofore the operation of sifting the beans, or causing them to drop into the spaces between fixed partitions onto the conveyor belt to be carried to the cutting station, was a manual process requiring swinging all the beans until their individual alignment permitted them to drop between partitions. This required the constant attention of an operator in order to maintain an even distribution of beans deposited on the belt for delivery at more or less constant rate to the slicing mechanism, and the work was tedious. Another related problem presented in former machines centered around the slicing mechanism itself wherein there was difficulty with clogging of the mechanism by bean shreds becoming packed between the several slicer disks,

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adding another impediment to the uniform uninterrupted output rate of the machine.

Objects of the present invention concern improving the operation and reliability of bean slicing machines, such that their output may be more rapid and uniform, and they will not require the constant attention of an operator as before. Specifically it is an object to improve the operation of the slicing mechanism and to provide automatic sifting or aligning means by which the former manual operation may be eliminated.

Other objects, and various features and operational aspects of my improved machine, will become apparent upon considering the following description based on the accompanying drawings.

Figure 1 is a side elevation view of one form of my machine, and Figure 2 is a fragmentary plan view of the same machine.

Figure 3 is a fragmentary longitudinal sectional view of the machine showing in cross section the slicing mechanism and the end of the conveyor belt feeding beans into such mechanism.

Figure 4 is a fragmentary detail view of one species of device for sifting the beans to cause them to drop in general alignment onto the carrier belt, the view being taken in section along the line 4—4 of Figure 2. Figure 5 is a schematic diagram illustrating the principle employed in this sifting device in causing the beans to drop into alignment on the conveyor belt.

Figure 6 is a fragmentary side elevation view of a modified machine illustrating a different form of the same species of sifting device. Figure 7 is a fragmentary cross-sectional view of the same, taken along the line 7—7 of Figure 6, and Figure 8 is a fragmentary plan view of the same.

Figure 9 is a fragmentary plan view of the improved slicing mechanism shown in Figure 3, and Figure 10 shows a modified form of the cutting disks illustrated in Figure 9.

Figure 11 illustrates a still different form of the same species of sifting device, closely related to the form shown in Figure 4.

Figure 12 is a fragmentary plan view, and Figure 13 a fragmentary side elevation view of an alternative form of the machine having a different species of sifting device employing reciprocable parallel bars for sifting the beans; Figure 14 is a fragmentary view in cross section of part of the driving mechanism for the bars, taken along the line 14—14 of Figure 12;

and Figure 15 is a fragmentary perspective view of a portion of support and guide mechanism for the bars.

Figures 16 and 17 are fragmentary plan and end elevation views, respectively, of a third species of sifting mechanism cooperable with the conveyor belt delivering beans to the slicing mechanism.

In all forms of the machine illustrated, beans to be sliced are dumped into a wash tank T containing water, as shown in Figure 1, from which they are extracted at a substantially uniform rate by a dewatering belt B, which carries them upwardly and deposits them onto the dynamic sifting mechanism S, with its line of motion as shown. Such mechanism includes a series of parallel spaced strip means, adjacent ones thereof being movable oppositely lengthwise of a belt 18 on which the beans are deposited from the sifting mechanism in general alignment with the belt. By such belt the beans are carried upwardly (the belt being sloped for convenience in allowing any remaining water to drain from them down the belt) to the end of the belt run over which they pass endwise into the slicing mechanism C. The beans thus sliced drop onto a final conveyor F which transports them away from the machine. From the time the beans enter the tank T until they are transported away by the conveyor F, they need not be touched by hand, which saves operating personnel and adds to the sanitary aspects of the process.

As shown in Figure 1, the machine comprises a frame 20 supporting the several elements already referred to, and others including a geared drive motor 22 interconnected by chain and sprocket drives severally to the dewatering belt B, to the endless transport belt 14 of the bean aligning mechanism, and to the shaft 24 carrying slicing disks 26. Belt B may be constructed of screen mesh to enable water to drain from the beans while they are carried upwardly from the wash tank. A drain plate 28 serves to catch the dropping water and return it to the tank. A suitable framework is provided to support the pulleys 30 and 32 carrying the belt B, including a pair of inclined sections of channel iron 34 extending between pulleys on either side thereof. The angle irons 34 may be supported to tilt about a horizontal axis by pivot means such as shaft 36, enabling the entire belt assembly to be swung into substantially horizontal position after the sifting mechanism is removed, when it is desired to take the dewatering belt out of the tank T, or to disassemble the apparatus.

The action of the belt in the tank keeps the beans agitated to facilitate cleaning them, and because of the uniformly spaced cleats carried by the belt, beans are extracted from the tank positively at a substantially uniform rate. Upon reaching the upper end of the dewatering belt B the beans are dropped onto the sifting device, including a latticework or grid of strip means overlying the conveyor belt 18. In the machine of Figure 1, the strip means of such grid comprises the runs or stretches of endless round belt 10 wound in sinuous manner about groups of sheaves, 14 and 16, as illustrated diagrammatically in Figure 5. The sheaves of these groups are arranged in rows at the respective ends of the upper stretch of the conveyor belt 18. Beneath and in registry with the several stretches of belt 10 are partitions 42 overlying the belt 18.

The runs or stretches of belt 10 are parallel to the line of movement of the conveyor or transport belt 18, alternate runs travelling in opposite directions as a result of the serpentine manner in which the belt is wound on the pulleys 14 and 16. For convenience, the pulleys 14 are positioned in rows—except for the last pulley 14' in one row which is offset to provide clearance for the returning stretch of belt—on a horizontal supporting plate 40 extending transversely of the machine across the upper end of the conveyor belt 18. The row of sheaves 16 at the other end of the conveyor belt 18 are similarly supported. From the pulley 14' the belt passes over a guide pulley and around a main pulley 38 connected to the geared drive motor 22 by suitable chain and sprocket means, and thence over another guide pulley and back to the adjacent pulley 14.

Beneath the parallel runs or stretches of belt 10, overlying the conveyor belt 18, the series of partitions 42 forming parallel channels or troughs define pockets into which drop beans passing the belt 10. The spacing of the partitions is much less than the lengths of beans to be sliced, in order that the beans dropping through the latticework of belt run 10 will be carried by belt 18 through such pocket in general alignment with the direction of its movement. If desired, a further partition may be added between each pair of adjacent belt stretches to divide the spaces into still narrower channels. Preferably, however, the belt stretches should not be closer than half the length of a long bean.

In Figure 5 the action of the belt 10 is demonstrated in sifting the beans onto the transport belt 18 with the desired orientation. Since the beans are deposited by the dewatering belt B onto the latticework of the sifting belt runs in haphazard or random orientation, only a fraction of the beans will immediately be in the proper alignment to drop into the spaces between the partitions 42. Others will at first become suspended on the latticework with varying orientation. For example, a bean may assume position *a* in Figure 5. In position *a* the bean rests on two adjacent runs of belt 10. However, because of the opposite motion of these runs, the position of the bean will soon shift from *a* to *b*, and finally to *c*. It will be evident, therefore, that this bean, or any beans not immediately dropping between the partitions, will be swung by the opposite movement of the sifting elements on which its ends rest until it is oriented generally parallel with the runs of belt 10 in common with other beans.

Consequently, as fast as the beans are deposited on the belt system 10 they are sifted into the spaces between partitions 42 and are thereafter maintained by the partitions substantially in alignment with their direction of movement effected by transport belt 18. Different alignment may be desired with other types of machines for cutting different vegetables or other objects, and, in this respect, the sifting mechanism is not necessarily limited to the arrangement shown, in its alignment relation to the conveyor belt. Suitable retaining plates 44 are provided at the sides of the conveyor belt 18 to prevent beans dropping over the edge should they accumulate, or bounce sidewise, before dropping into the spaces between partitions. The upper end of the conveyor belt 18 and the pulley 46 over which it travels, as well as the cutting mechanism, are covered by a hood 48 which keeps the mechanism clean and incidentally assists in guiding beans 50 into the cutting zone, for which latter purpose the hood supports curved parallel

partitions 42' comprising continuations of partitions 42, preserving the desired alignment of the beans until actually cut between the cutting disks 26 and a coacting cutting block 52.

The entire cutting mechanism, including the hood 48, may be lifted upwardly away from the end of the transport belt 18 by pivoting it about a hinge joint 54 secured to the supporting plate 14. To permit this movement, pinion gear 56, comprising part of the disk drive mechanism, is readily disengageable from the drive gear 58 connected to the geared drive motor 22 by chain and sprocket mechanism, the pinion gear 26 being secured on shaft 24 to rotate the cutting disk assembly.

A principal feature of my improved cutting mechanism includes the use of washers or spacer disks 60 between the cutting disks 26. In addition, improved cutting action is obtained by employing an elongated stationary backing or cutting block 52, in place of a roll which was formerly used. This block has parallel grooves 62 spaced at intervals equal to the spacing of the cutting disks 26, to receive their cutting edges. The upper edge of the block 52 is beveled, is positioned close to the peripheral surface of the belt 18 as it rounds the pulley 40, and extends widthwise of the belt, to deflect beans from the belt into the space between the cutting disks and the block 52. By filling the central portion of the cutting roll with the washers 60 accumulation of bean shreds between the cutting disks is avoided, which otherwise must be removed from time to time to maintain the apparatus in proper operation. In Figure 10 the cutting edges of the disks 26 are tapered very gradually radially substantially from the peripheral edge of the washers 60 to the outer edge of the cutting disks. Cut bean shreds slip between the disks and fall more freely therefrom when this construction is used than in the workable but less practical disk construction of Figure 9, wherein the cutting edge tapers abruptly. Another useful purpose served by the washers 60 is to give mechanical support to the relatively thin cutting disks to preserve their spacing and alignment.

In Figures 6 to 8 inclusive, I have illustrated an alternate sifting belt arrangement in which a plurality of separate belts are employed for the sifting device, each forming one of the belt runs or stretches supporting the beans. In this case, the belts 64 are carried by spaced groups of pulleys 66 and 68 respectively rotated by shafts 70 and 72, driven pulleys being arranged alternately with idler pulleys on any single shaft. The idler pulleys rotate freely about such shaft, and by employing a crossed drive belt 74 between drive pulleys 76 and 78, interconnecting the shafts, the alternate belts 64 are caused to run in opposite directions.

In both of the preceding alternate forms of the belt mechanism round belts are illustrated. However, it will be understood that V-belts, diamond belts, or belts of other cross-sectional shapes may be employed to accomplish the same general results. For instance, in Figure 11 the belt shown is flat and thin, the narrow, upper edges of the belt eliminating any likelihood of the beans becoming balanced on a belt edge to prevent them from falling into the spaces between partitions 42. This type of belt may be used in the continuous, serpentine belt arrangement wound about pulleys 80 in the same manner as in Figure 5. Alternatively, such a belt type may be used for the separate belts arranged and driven as shown in Figure 6, previously described.

It is pointed out that a flat belt of the type shown in Figure 11 could feasibly serve doubly, both for sifting the beans, to cause them to drop into alignment on the conveyor belt 18, and as substitutes for the partitions 42. In such case the belt would be thin and wide, the lower edge of the belt lying in close proximity to the upper surface of the carrier belt 18, making it possible to dispense altogether with the stationary partitions 42.

In lieu of belts I may employ reciprocative parallel slide bars 82, alternate bars being driven for reciprocation in opposite directions. In this case, the bars, aligned with the line of movement of the carrier belt 18 may be supported and guided for lengthwise reciprocation in such parallel relationship by being grooved to straddle the partitions 42, alternate bars being driven by cross pieces 84 and 86, respectively, secured to such bars at one end. Drive mechanism by which the cross pieces 84 and 86, and hence the bars, are reciprocated may comprise a crank disk 88, a crosshead 90 reciprocable between parallel guiding strips 92, and a connecting rod 94 interconnecting the crosshead and a crank pin mounted on the side of the disk 88. Such disk is rotated by a shaft 96 driven by a belt 98 connected to the geared motor 22 through suitable chain and sprocket drive mechanism.

As the crosshead 90 is reciprocated between the guides 92 the adjacent ends of a pair of links 100 and 102 interconnecting the crosshead and shafts 104, 106, respectively, journaled in the ends of crosspieces 84, 86, are raised and lowered, thereby intermittently drawing toward each other and spreading apart the cross pieces 84 and 86. The length of such stroke is enough to swing beans resting on the slides 82 sufficiently to align the beans with the transport belt 18, preferably being about equal to the spacing between the bars. Pinion gears 108 and 110 are carried at the ends of each of shafts 104 and 106, respectively, which are engageable with stationary gear racks 112 and 114 positioned adjacent to the ends of the crosspieces parallel to the bars 82. Consequently, while only one end of the shafts 104 and 106 are connected to the links 100 and 102, because of the rotation of the pinions in their respective gear racks and the coupling of shafts 104, 106, the opposite ends of such shafts, and hence, of the crosspieces, are caused to move synchronously with the directly driven ends. Figure 14 shows the detailed manner in which the shafts 104 and 106 are received in the upturned ends of the crosspieces. It also illustrates the use of guides 116, 118 allowing traversing movement of shafts 104, 106 while restraining them from movement vertically thereby preventing disengagement of the pinions from the gear rack. Preferably, the upper surfaces of the bars 82 carry knobs or pins, or are knurled in order to increase the gripping action of the slides on the beans to assist in swinging them as the bars are reciprocated.

In still another alternative form of sifting mechanism, elongated screws are employed in place of the belt or bars of the preceding embodiments of my invention. This is illustrated in Figures 16 and 17, in which the beans are deposited on a grid formed of parallel, high pitch screws 120. The screws are suitably journaled at their ends in cross members 122 and may be driven by a series of intermeshing gears interconnecting the screws. In the case illustrated the screws are all convoluted in the same sense,

so that when they are rotated in opposite directions by the intermeshing gears 124 and 126 the portions of the beans contacting them will be moved oppositely to swing the beans. However, it will be appreciated that alternate screws convoluted oppositely will achieve the same effect if rotated all in the same directions. Screws having an outer diameter of three quarters of an inch may be spaced at center line intervals comparable to the spacing of the belts and slide bars in the respective forms previously described.

While in the illustrated embodiment the cutting mechanism, the conveyor belts, and the sifting mechanism are driven from a common source of power, namely, the geared drive motor 22, in some cases it may be desirable to employ independent drive means for one or more of the several moving parts. It may be desirable for speed of the dewatering belt D to be less than the speed of the conveyor belt feeding the beans to the cutting mechanism because the beans are all moved lengthwise in the latter instance. Moreover, in reciprocating the bars 82 to sift or shake the beans into the spaces between partitions, a faster rate may be permissible or desirable when beans run smaller, than when larger beans are processed. Moreover, other mechanisms for swinging the beans to cause them to drop between the partitions, and other arrangements of the partitions, may be employed within the principles set forth herein, the methods indicated being the preferred examples. For instance, instead of having oppositely moving members as the sole supports for the beans during sifting, it will be possible to space a greater distance apart members all moving in the same direction and to add a high partition midway between them, which is substantially as high as the level of the moving members, to operate with them in supporting the beans. Thus, the sifting mechanism may comprise alternate moving members and stationary members, so that only one end of a bean may be moved, by the moving member, in swinging the bean into the proper orientation. These and other variations and additions will be evident to those skilled in this art, and the invention is thus to be interpreted without limitation to the particular forms of construction herein illustrated for explanatory purposes.

I claim as my invention:

1. In combination, generally planar conveyor means, and bean orienting means operable to align and deposit beans in generally parallel relation on said conveyor means, said orienting means including a grid composed of spaced parallel strip means generally parallel to the movement of said conveyor means, the spacing of said strip means being appreciably less than the length of beans to be sliced, and sheaves rotatable about axes disposed transversely of the plane of said conveyor means, engaging said strip means and moving adjacent strip means in opposite directions lengthwise.

2. The combination defined in claim 1, in which the strip means comprise moving belt stretches.

3. The combination defined in claim 2, in which the belt stretches constitute succeeding sections of a continuous belt, the sheaves are arranged in two groups spaced apart lengthwise of the conveyor means, and the belt is passed in a sinuous pattern between and about the sheaves of such groups.

4. The combination defined in claim 1, in which the strip means comprise stretches of flat belt.

5. The combination defined in claim 1, in which the strip means comprise moving belt stretches arranged in pairs, the two belt stretches of each pair being disposed in adjacent relationship and being integrated into a single continuous belt.

6. In a machine for slicing string beans or similar articles, conveyor means operable to carry beans deposited thereon to a slicing station, and bean orienting means operable to align and deposit beans in generally parallel relation on said conveyor means for presentation endwise at said slicing station, said orienting means including a grid composed of spaced parallel moving belt runs generally parallel to the movement of said conveyor means, the spacing of said belt runs being appreciably less than the length of beans to be sliced, and means operable to support and drive alternate belt runs in opposite directions.

7. In combination, generally planar conveyor means and bean orienting means operable to align and deposit beans in generally parallel relation on said conveyor means, said orienting means including a grid composed of spaced parallel moving belt runs generally parallel to movement of said conveyor means, the spacing of said belt runs being appreciably less than the length of beans to be sliced, and means operable to support and drive alternate belt runs in opposite directions.

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