Sept. 12, 1944. C. T. WALTER 2,358,283

MATERIAL HANDLING MECHANISM AND METHOD

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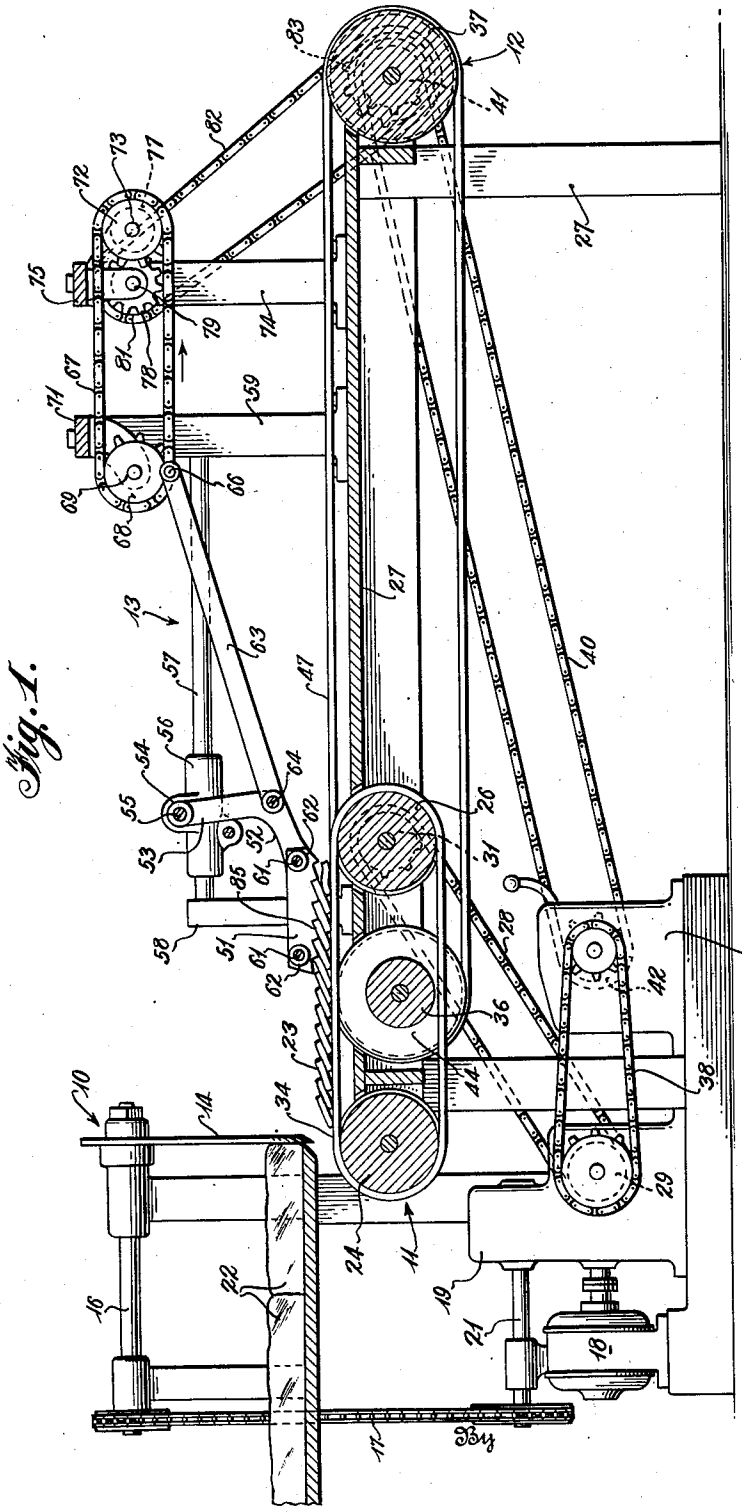

Fig. 1.

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Fig. 2.

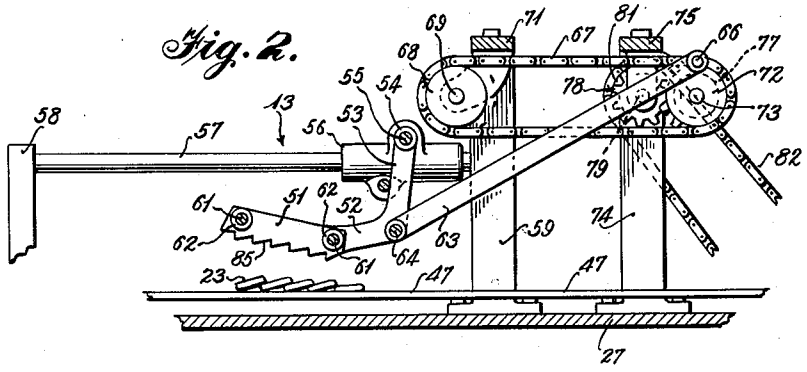

Fig. 4.

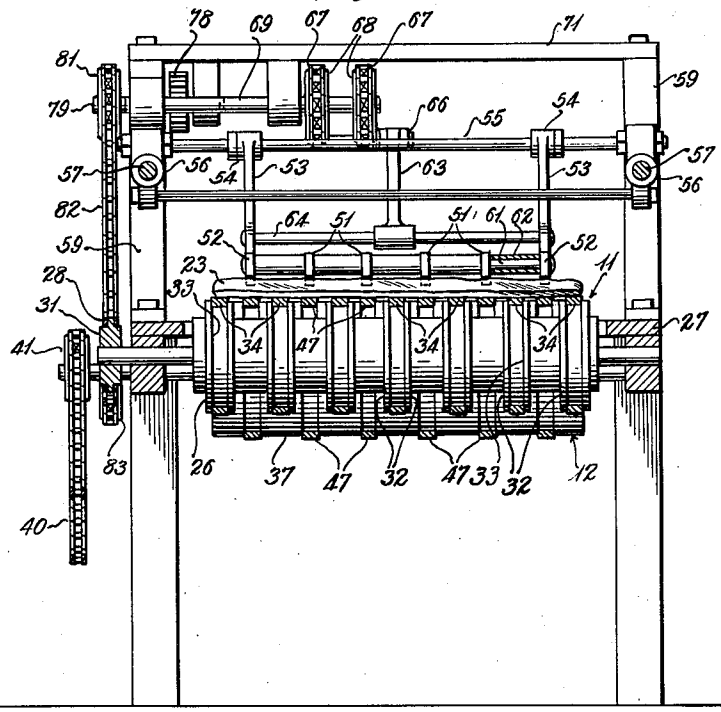

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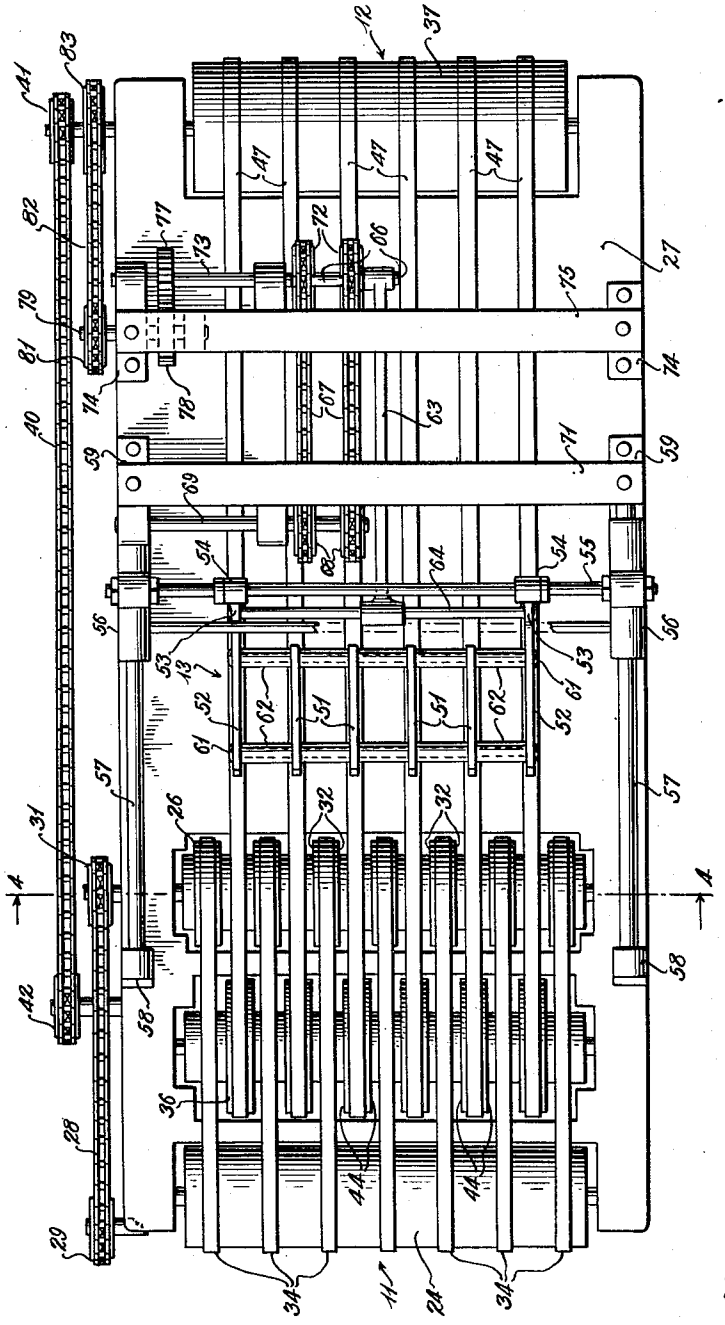
Fig. 3.



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MATERIAL HANDLING MECHANISM AND METHOD

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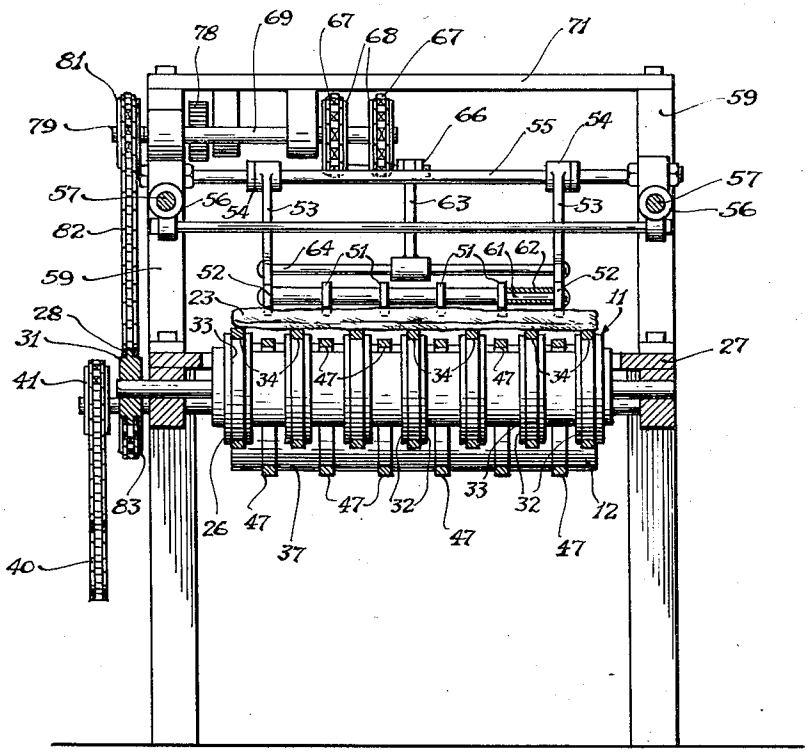

Fig. 5

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2,358,283

MATERIAL HANDLING MECHANISM AND METHOD

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14 Claims. (Cl. 198—34)

This invention relates to a material slicing and handling mechanism and method, and more particularly to an apparatus and method for slicing material and dividing the sliced material into units containing one or more slices.

The apparatus and method of the present invention has particular utility in slicing and packaging bacon and will be described with respect thereto although other materials may be operated upon. In the slicing of bacon it is usually preferred to arrange the sliced material in overlapping or shingled formation in units containing several slices although the present invention also contemplates forming units in which the slices are in non-overlapping relation. Each unit should contain the same number of slices so as to be of approximately the same weight as the other units. The present invention involves a novel mechanism and novel method for accomplishing this result.

An object of the present invention is, therefore, to provide an improved method and apparatus of slicing material and dividing the sliced material into units containing the same number of slices.

Another object of the invention is to provide an improved apparatus and method of dividing sliced material arranged in shingled formation into a plurality of units containing the same number of slices so as to be of approximately the same weight.

A further object of the invention is to provide an improved method and apparatus by which sliced material upon one conveyor is transferred to another conveyor in units containing a predetermined number of slices.

A still further object of the invention is to provide an improved apparatus for slicing and handling bacon in which the sliced bacon arranged in shingled formation is divided into spaced units containing the same number of slices.

Other objects and advantages of the invention will appear in the following description of a preferred embodiment thereof given in connection with the attached drawings, of which

Fig. 1 is a vertical section through an apparatus in accordance with the present invention;

Fig. 2 is a fragmentary view similar to Fig. 1, showing a different position of certain parts;

Fig. 3 is a plan view of the conveying and unit forming apparatus;

Fig. 4 is a fragmentary section taken on the line 4—4 of Fig. 3; and

Figure 5 is a fragmentary section similar to Fig. 4 showing a modification of the conveyor system wherein one group of conveyors is shown disposed at a different level with respect to the other group of conveyors.

The apparatus of the present invention, as shown in Fig. 1, includes a slicing machine indicated generally at 10, a first conveyor indicated generally at 11, a second conveyor indicated generally at 12, and a transferring mechanism indicated generally at 13. The slicing machine may be of any suitable type, for example, one including a rotating knife 14 mounted on a shaft 16, driven by a chain 17 from a motor 18 through a speed reducer 19 and shaft 21. Bacon or other material 22 may be fed to the knife 14 by any suitable means (not shown) so that rotation of the knife 14 severs slices 23 from the bacon 22 and deposits the same upon the conveyor 11.

The conveyor 11 may comprise a pair of rolls 24 and 26 journaled in the frame 27 of the conveying mechanism. The roll 26 may be driven from the speed reducer through a sprocket chain 28, sprocket 29 (Fig. 3) on the speed reducer and sprocket 31 on the shaft of the roll 26. The roll 26, as shown most clearly in Fig. 4, is preferably provided with a plurality of axially spaced deep grooves 32 and a plurality of shallow grooves 33 alternating with the deeper grooves 32. The grooves 33 each receive one of a plurality of endless flexible bands 34, the bands being arranged in spaced relationship axially of the roll. The roll 24 may also be provided with shallow grooves to receive the bands 34, but need not be provided with deep grooves corresponding to the grooves 32 of roll 26. It is apparent that the roll 24 will be driven from the roll 26 through the bands 34. The roll 26 should be driven in timed relation with the knife 14 so that the slices of material 23 are properly deposited upon the bands 34, such as in the overlapping or shingled relation shown in Fig. 1.

The conveyor 12 may include a pair of rolls 36 and 37 journaled in the frame 27 of the conveyor mechanism. The roll 37 may be driven from the motor 18 through the speed reducer 19, chain drive 38, variable speed mechanism 39 and a sprocket chain 40 engaging a sprocket 41 (Fig. 3) on the shaft of the roll 37 and a sprocket 42 (Fig. 3) on the variable speed mechanism 39. The roll 36 of the conveyor 12 may be similar in construction to the roll 26 of the conveyor 11 and be provided with alternate deep and shallow grooves. The shallow grooves are adapted to receive endless bands 47 also received in shallow grooves on the roll 37. The rolls 36 and 37 are preferably, although not necessarily, of larger diameter than the rolls 24 and 26 of the conveyor 11 and the roll

36 of conveyor 12 is positioned between the rolls 24 and 26 of conveyor 11. The endless bands 34 of conveyor 11 pass through the deep grooves 44 (Fig. 1) of the roll 36 without contact therewith and in a similar manner the endless bands 47 of the conveyor 12 pass through the deep grooves 32 of roll 26 without contact with the walls thereof. It will be noted that the upper flights of the bands 47 of conveyor 12 are for a portion of their length positioned between adjacent upper flights of the bands 34 of conveyor 11 so that the bands of one conveyor are interleaved between the bands of the other coveyor. The bands of both conveyors are preferably of smooth material and are preferably made of corrosion resistant metal such as Monel metal although other flexible materials may be employed.

The bands 47 of the conveyor 12 should preferably travel at a greater rate than the bands 34 of conveyor 11. Thus the bands 47 will ordinarily be operated at at least twice the speed of the bands 34, and may be operated at a speed several times greater than the speed of the bands 34. The upper flights of the bands 47 of the conveyor 12 are preferably positioned just slightly below the upper bands 34 of the conveyor 11 (see Fig. 5) so that material being conveyed on the bands 34 is not normally picked up by the bands 47. However, if pressure is applied to the material upon the bands 34 immediately above the bands 47, this material is pressed into contact with the bands 47 as illustrated in Fig. 4 and will be carried thereby away from the bands 34.

The necessary pressure upon the material for causing the same to be picked up by the bands 47 may be provided by the transfer mechanism 13. The transfer mechanism may include a plurality of spaced pressing members including intermediate members 51 and outer members 52 positioned directly above and extending parallel to corresponding bands 47. The outer members 52 may have rearwardly and upwardly extending portions 53 pivoted at 54 on a bar 55 extending transversely of the machine and rigidly secured to longitudinally sliding members 56. The sliding members 56 slide on bars 57 carried by standards 58 and 59 secured to the frame 27 of the conveying mechanism. The intermediate pressing members 51 may be secured to the outer pressing members 52 by means of laterally extending rods 61 and spacer 62. The pressing members 51 and 52 and the sliding members 56 are operated through a connecting rod 63 pivotally connected to a rod 64 extending between the extension 53 of the pressing members 52. The connecting rod 63 at its other end is pivotally connected to a stub shaft 66 carried by a pair of spaced chains 67 engaging sprockets 68 on a shaft 69 journaled in bearings carried by a bracket 59 and a cross member 71 extending between the brackets 59. The chains 67 also engage sprockets 72 on a shaft 73 journaled in bearings carried by brackets 74 secured to the frame 27 and a cross member 75 extending between the tops of the brackets 74. The shaft 73 is provided with a gear 77 meshing with a gear 78 carried by a shaft 79 also provided with a sprocket 81 driven through a chain 82 engaging a sprocket 83 upon the shaft of the roll 37.

It is apparent that movement of the chains 67 in the direction of the arrow in Fig. 1 will cause the sliding members 56 to be reciprocated on the rods 57 by the connecting rod 63. As the sliding members 56 are moved toward the right in Fig. 1 it is also apparent that the pressing elements 51 and 52 will first be pivoted downwardly toward the corresponding upper flights of bands 47 and then carried bodily to the right. Preferably the speed of the chains 67 is substantially the same as that of the bands 47 so that the pressing members 51 and 52 travel to the right at the same speed as the conveyor bands 47. The pressing members 51 and 52 press the material being advanced by the bands 34 against the bands 47 and cause the same to be carried to the right in Fig. 1 at a more rapid rate thus separating a unit comprising several slices of material and placing it on the bands 47 of the conveyor 12. When the pressing members reach the end of their travel toward the right in Fig. 1 movement of the connecting rod toward the left in Fig. 1 first raises the pressing members 51 and 52 out of contact with the unit of sliced material upon the bands 47 as illustrated in Fig. 2 and then returns the pressing members to the left where reversal of direction of the connecting rods causes the pressing members to again assume the position in Fig. 1 to separate another unit from the material upon the bands 34. The lower surfaces of the pressing members 51 and 52 may be smooth or may be provided with serrations or notches 85, shown in Fig. 2, in order to assist in separating the units from the remaining sliced material.

In the operation of the mechanism of the present invention, the knife 14 is rotated from the motor 17 through the speed reducer 19, shaft 21, chain 17, and shaft 16. Each rotation of the knife 14 severs a slice 23 from the bacon or other material 22 continuously fed to the knife by mechanism not shown. Slices 23 drop on the bands 34 of the conveyor 11 and are carried toward the right in Fig. 1. By adjusting the speed of the conveyor bands 34 with relation to the knife 14, slices may be caused to have any desired overlap, as shown in Fig. 1, or may be placed flat upon the conveyor bands 34 adjacent each other. The bands 34 of conveyor 11 are interleaved with the bands 47 of the conveyor 12, and are preferably positioned at a slightly higher lever than the bands 47. Thus slices carried by the bands 34 do not normally tend to engage the bands 47.

When the sliding members 56 carrying the pressing members 51 and 52 have been moved to their left position in Fig. 1 and the connecting rod reverses its direction, the pressing members are pressed against the material on the conveyor bands 34 so as to force the material into contact with the conveyor bands 47. The pressing members 51 then travel to the right at substantially the same speed as the upper flights of the band 47. Since the conveyor bands 47 travel at a greater speed than the conveyor bands 34, a unit of material comprising a plurality of slices is separated from the remaining slices and carried to the right at a more rapid rate on the conveyor bands 47. When the connecting rod again reverses its direction the pressing members 51 and 52 are lifted out of contact with the slices making up the unit of material and returned to the left, this operation being repeated indefinitely.

By varying the speed of the conveyor 12 and chain 67 by means of the variable or change speed device 39, the number of slices included in a unit of material may be varied at will. Thus the variable speed device 39 may have a plurality of predetermined speed ratios so that changing the speed ratio to the next highest speed will add another slice to the units formed during the

operation of the device. By correlating the speed ratios of the change speed device 39 with the speed of rotation of the knife 14 the various speed ratios in the change speed device 39 may be made to exactly correspond to a given number of slices in a unit thereby enabling the operator to quickly adjust the device to provide for any desired number of slices. Since the chains 67 and the conveyor 12 have a common drive, the speed of the presser units 51 and 52 toward the right can be made equal the speed of the conveyor bands 47 and this relation can be maintained irrespective of adjustment of the variable speed device 39. The units composed of a number of slices formed by the mechanism illustrated may be delivered by the conveyor 12 in spaced relation to a weighing and wrapping machine, or to any other apparatus.

It will be further apparent that the interleaved conveyor structure disclosed can be employed to assist in dividing the sliced material into units without employing the pressing members 51 and 52 and the operating mechanism therefor. By eliminating the pressing members and driving mechanism therefor an operator may employ his hands to press any desired number of slices at the right end of the sliced material upon the conveyor bands 34 against the conveyor bands 47 so that the selected number of slices are carried away from the conveyor 11 by the bands 47 of the conveyor 12. It has been found that an operator can thus repeatedly and uniformly divide the sliced material into equal units even when the knife and conveyors are operating at a relatively high rate of speed and this manner of forming units has also been found extremely efficient. The embodiment of the invention disclosed is particularly adapted for employment with flexible or deformable materials. It will be apparent, however, that the bands 34 may be sufficiently flexible to allow rigid pieces of material to be pressed against the bands 47 or that the roll 26 may be resilently suported to allow the bands 34 and roll 26 to be depressed and allow rigid material to be pressed into contact with the bands 47.

While I have disclosed the preferred embodiments of my invention it is understood that the details thereof may be varied within the scope of the following claims.

I claim:

1. In a material handling apparatus, a pair of conveyors each having a receiving end and a discharge end and a plurality of laterally spaced conveying elements, the conveying elements at the discharge end of one of said conveyors being interleaved with the conveying elements at the receiving end of the other of said conveyors, means to deliver pieces of material in a substantially uniform arrangement upon the receiving end of said one conveyor, means for moving the conveying elements of said one conveyor, means for moving the conveying elements of said other conveyor at a greater rate than that of the elements of said one conveyor, a transfer mechanism disposed over said interleaved conveying elements and having members positioned above the conveying elements of said other conveyor, and means for moving said members downwardly toward said elements of said other conveyor to engage material upon said first conveyor and then in the direction of travel of said elements of said other conveyor to transfer material from said first conveyor to said second conveyor in units each including a substantially equal number of said pieces.

2. In a material handling apparatus, a pair of conveyors each having a receiving end and a discharge end and a plurality of laterally spaced conveying elements, the conveying elements at the discharge end of one of said conveyors being interleaved with the conveying elements at the receiving end of the other of said conveyors, means to deliver pieces of material in a substantially uniform arrangement upon the receiving end of said one conveyor, means for moving the conveying elements of said one conveyor, means for moving the conveying elements of said other conveyor at a greater rate than that of the elements of said one conveyor, a transfer mechanism disposed over said interleaved conveying elements and having members positioned above the conveying elements of said other conveyor, and means for moving said members downwardly toward said elements of said other conveyor to engage material upon said one conveyor and then in the direction of travel of said elements of said other conveyor to transfer material from said one conveyor to said other conveyor in units each including a substantially equal number of said pieces, and means for varying the rate of movement of said elements of said other conveyor and of said members relative to the rate of movement of the elements of said one conveyor in order to vary the number of pieces in said units.

3. An apparatus for separating material made up of a plurality of individual pieces of approximately the same size and shape into spaced units, each including substantially the same number of pieces, which comprises, a first conveying means including a plurality of laterally spaced bands, means for driving said bands at a substantially uniform rate, means for depositing said pieces upon said bands in a substantially uniform arrangement, a second conveying means including a plurality of laterally spaced bands having the receiving ends thereof interleaved with the discharge ends of said first mentioned bands, means for driving the bands of said second conveying means at a greater rate than said first mentioned bands, and means disposed adjacent said interleaved bands for intermittently clamping a selected number of said pieces against said bands of said second conveying means in order to cause said second conveying means to separate and move said units away from the remaining pieces, said clamping means including a plurality of clamping members movable toward and away from said bands of said second conveying means and reciprocable in a direction parallel with said last named bands and means for advancing said members toward said last named bands at the interleaved portion of said conveying means.

4. An apparatus for separating material made up of a plurality of individual pieces of approximately the same size and shape into spaced units, each including substantially the same number of pieces, which comprises, a first conveyor having laterally spaced supporting portions, means to drive said conveyor, means for depositing said pieces upon said portions in a substantially uniform arrangement, a second conveyor having laterally spaced supporting portions interleaved with said laterally spaced portions of said first conveyor, means for driving said portions of said second conveyor at a greater rate than said portions of said first conveyor, and means disposed

adjacent said interleaved portions for intermittently clamping a selected number of said pieces against said portions of said second conveyor to separate said units from the remaining pieces by causing said conveyor to carry said units away from the remainder of said pieces.

5. An apparatus for separating material made up of a plurality of individual pieces of approximately the same size and shape, into spaced units, each including substantially the same number of pieces, which comprises, a first conveyor having laterally spaced supporting portions, means to drive said conveyor, means for depositing said pieces upon said portions in a substantially uniform arrangement, a second conveyor having laterally spaced supporting portions interleaved with said laterally spaced portions of said first conveyor, means for driving said portions of said second conveyor at a greater rate than the portions of said first conveyor, and means disposed adjacent said interleaved portions for intermittently clamping a selected number of said pieces against said portions of said second conveyor to separate said units from the remaining pieces by causing said conveyor to carry said units away from the remainder of said pieces, said clamping means including a plurality of pressing elements each positioned above one of said portions of said second conveyor and means for reciprocating said members parallel to the direction of movement of said second conveyor and alternately lowering and raising said members to intermittently transfer a selected number of said pieces from said first conveyor to said second conveyor.

6. An apparatus for separating material made up of a plurality of individual pieces of approximately the same size and shape, into spaced units, each including substantially the same number of pieces, which comprises, a first conveyor having laterally spaced supporting portions, means to drive said conveyor, means for depositing said pieces upon said portions in a substantially uniform arrangement, a second conveyor having laterally spaced supporting portions interleaved with said laterally spaced portions of said first conveyor, means for driving said portions of said second conveyor at a greater rate than the portions of said first conveyor, and means disposed adjacent said interleaved portions for intermittently clamping a selected number of said pieces against said portions of said second conveyor to separate said units from the remaining pieces by causing said conveyor to carry said units away from the remainder of said pieces, said clamping means including a plurality of pressing elements each positioned above one of said portions of said second conveyor and means for reciprocating said members parallel to the direction of movement of said second conveyor and alternately lowering and raising said members to intermittently transfer a selected number of said pieces from said first conveyor to said second conveyor, and means for varying the rate of reciprocation of said members relative to the movement of said first conveyor to vary the number of pieces contained in said units.

7. An apparatus for dividing sliced material and the like into units containing substantially the same number of slices, which comprises, a first conveyor to receive the sliced material and having laterally spaced supporting portions, means to drive said conveyor, a second conveyor having laterally spaced supporting portions interleaved with said laterally spaced portions of said first conveyor, means for driving said portions of said second conveyor at a greater rate than the portions of said first conveyor, and means disposed adjacent said interleaved portions for intermittently clamping a selected number of slices against said portions of said second conveyor to separate a unit of slices from the remaining slices by causing said second conveyor to carry said units away from the remainder of said slices.

8. An apparatus for dividing sliced material and the like into units containing substantially the same number of slices, which comprises, a first conveyor to receive the sliced material and having laterally spaced supporting portions, means to drive said conveyor, a second conveyor having laterally spaced portions interleaved with said laterally spaced portions of said first conveyor, means for driving said portions of said second conveyor at a greater rate than the portions of said first conveyor, means for intermittently clamping a selected number of slices against said portions of said second conveyor to separate a unit of slices from the remaining slices by causing said second conveyor to carry said units away from the remainder of said slices, said clamping means including a plurality of spaced pressing elements corresponding to said portions of said second conveyor and means for intermittently forcing said pressing elements towards said portions of said second conveyor and causing the same to move with said portions at substantially the same rate as said portions.

9. An apparatus for separating material made up of a plurality of individual pieces of approximately the same size and shape into spaced units each including substantially the same number of pieces, which comprises, a first conveyor including a plurality of laterally spaced bands, means for driving said bands at a substantially uniform rate, means for depositing said pieces upon said bands in a substantially uniform arrangement, a second conveyor including a plurality of laterally spaced bands having the receiving ends thereof interleaved with the discharge ends of said first mentioned bands, means for driving the bands of said second conveyor at a greater rate than said first mentioned bands, and means disposed adjacent said interleaved portions for intermittently clamping a selected number of said pieces against said bands of said second conveyor in order to cause said second conveyor to separate and move said units away from the remaining pieces.

10. An apparatus for separating material made up of a plurality of individual pieces of approximately the same size and shape into spaced units, each unit including substantially the same number of pieces, which comprises: means to convey pieces deposited thereon at a substantially uniform speed and in a substantially uniform direction; means to drive said conveying means; a second conveying means traveling in a path having a portion thereof in common with a portion of the path traveled by said first named conveying means such that a group of the pieces may be carried by said first conveying means over said second conveying means while passing along said common portion; means to drive said second conveying means at a faster rate of speed than said first named conveying means; means to press a selected number of pieces of said group against said second conveying means, said pressing means being also movable forwardly with said second conveying means at substantially the same speed

thereof, whereby when the pieces are pressed against said second conveying means at said common portion of the path of the two conveying means, the pieces pressed against and carried on the second conveying means will be separated from the pieces moving with the first conveying means because of the faster movement of said second named conveying means.

11. An apparatus for separating material made up of a plurality of individual pieces of approximately the same size and shape into spaced units, each unit including substantially the same number of pieces, which comprises: conveying means including a plurality of spaced endless bands traveling in a substantially uniform direction for conveying pieces of material deposited thereon at a substantially uniform speed; means to drive said conveying means; a second conveying means adapted to receive groups of said pieces from said first named conveying means, said second conveying means including a plurality of spaced endless bands, said second named group of endless bands traveling in a substantially uniform direction and being interleaved throughout a portion of the path of their travel with a portion of the path traveled by said first named group of spaced endless bands such that a group of the pieces may be carried by said first conveying means over said second conveying means while passing along said portion; means to drive said second named conveying means at a faster rate of speed than said first named conveying means; means to press a selected number of pieces of said group against said second conveying means, said pressing means being also movable forwardly with said second conveying means at substantially the same speed thereof, whereby, when the pieces are pressed against said second conveying means at the said interleaved portion of the bands forming the two conveying means, the pieces pressed against and carried on the second conveying means will be separated from the pieces moving with the bands forming the first conveying means because of the faster movement of said second named conveying means.

12. An apparatus for separating material made up of a plurality of individual pieces of approximately the same size and shape into spaced units, each unit including substantially the same number of pieces which comprises: conveying means including a plurality of spaced endless bands traveling in a substantially uniform direction for conveying pieces of material deposited thereon at a substantially uniform speed; means to drive said conveying means; a second conveying means adapted to receive groups of said pieces from said first named conveying means, said second conveying means including a plurality of spaced endless bands, said second named group of endless bands traveling in a substantially uniform direction and being interleaved throughout a portion of the path of their travel with a portion of the path traveled by said first named group of spaced endless bands such that a group of the pieces may be carried by said first conveying means over said second conveying means while passing along said portion; means to drive said second named conveying means at a faster rate of speed than said first named conveying means; the surface of said first named conveying means being disposed above the surface of said second named and faster moving conveying means; means disposed adjacent said interleaved portions of the conveying means for positively engaging pieces passing across said portion against said second named conveying means, said engaging means being movable forwardly with the faster moving conveying means and at substantially the same speed whereby, when the pieces are pressed against said second conveying means at the said interleaved portion of the bands forming the two conveying means, the pieces pressed against and carried on the second conveying means will be separated from the pieces moving with the bands forming the first conveying means because of the faster movement of said second named conveying means.

13. The method of separating materials made up of a plurality of individual pieces of approximately the same size and shape into spaced units, each unit including substantially the same number of pieces, which comprises: conveying pieces deposited upon a first conveying means at a substantially uniform speed over a portion of a second conveying means traveling in a path having a portion substantially in common with a portion of the path of said first conveying means and traveling at a greater speed than said first conveying means, and pressing selected numbers of said pieces against said second conveying means to cause said numbers of pieces to be moved away from and separated from the pieces on said first conveying means by the greater speed of travel of said second conveying means.

14. The method of separating materials made up of a plurality of individual pieces of approximately the same size and shape into spaced units, each unit including substantially the same number of pieces, which comprises: conveying pieces deposited upon a first conveying means having a plurality of laterally spaced endless bands traveling at a substantially uniform speed over a portion of a second conveying means having a plurality of laterally spaced endless bands interleaved with the endless bands of said first conveying means and traveling at a greater speed than the bands of said first conveying means, and pressing selected numbers of said pieces against the bands of said second conveying means with sufficient pressure to cause said numbers of pieces to be moved away from and separated from pieces on said first conveying means by the greater speed of travel of said second conveying means.

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