

June 6, 1961

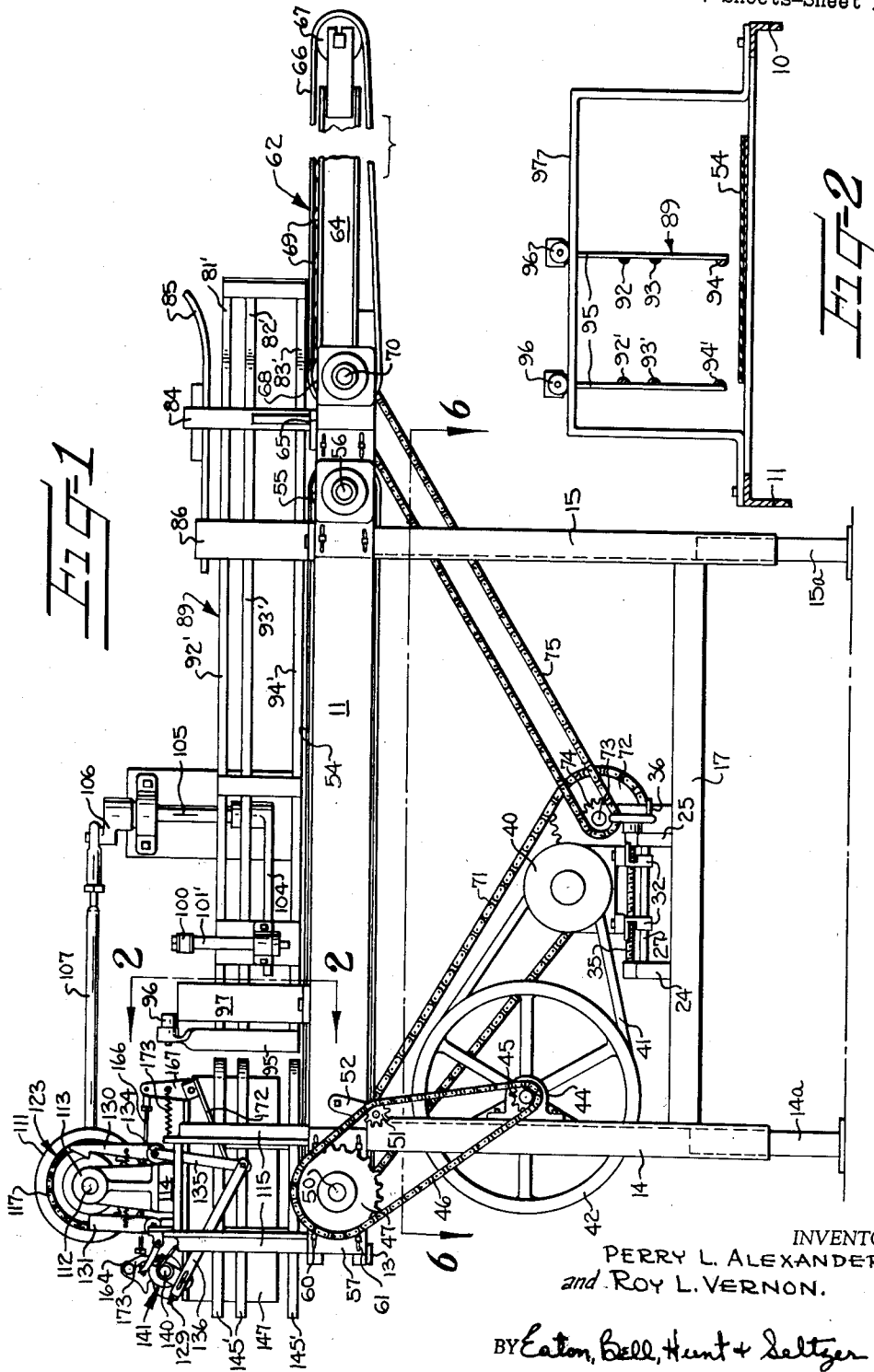
P. L. ALEXANDER, JR., ET AL

2,987,251

ARTICLE DIVERGER

Filed June 11, 1956

7 Sheets-Sheet 1



INVENTORS:
PERRY L. ALEXANDER, JR.
and ROY L. VERNON.

BY *Eaton, Bell, Hunt & Seltzer*

ATTORNEYS

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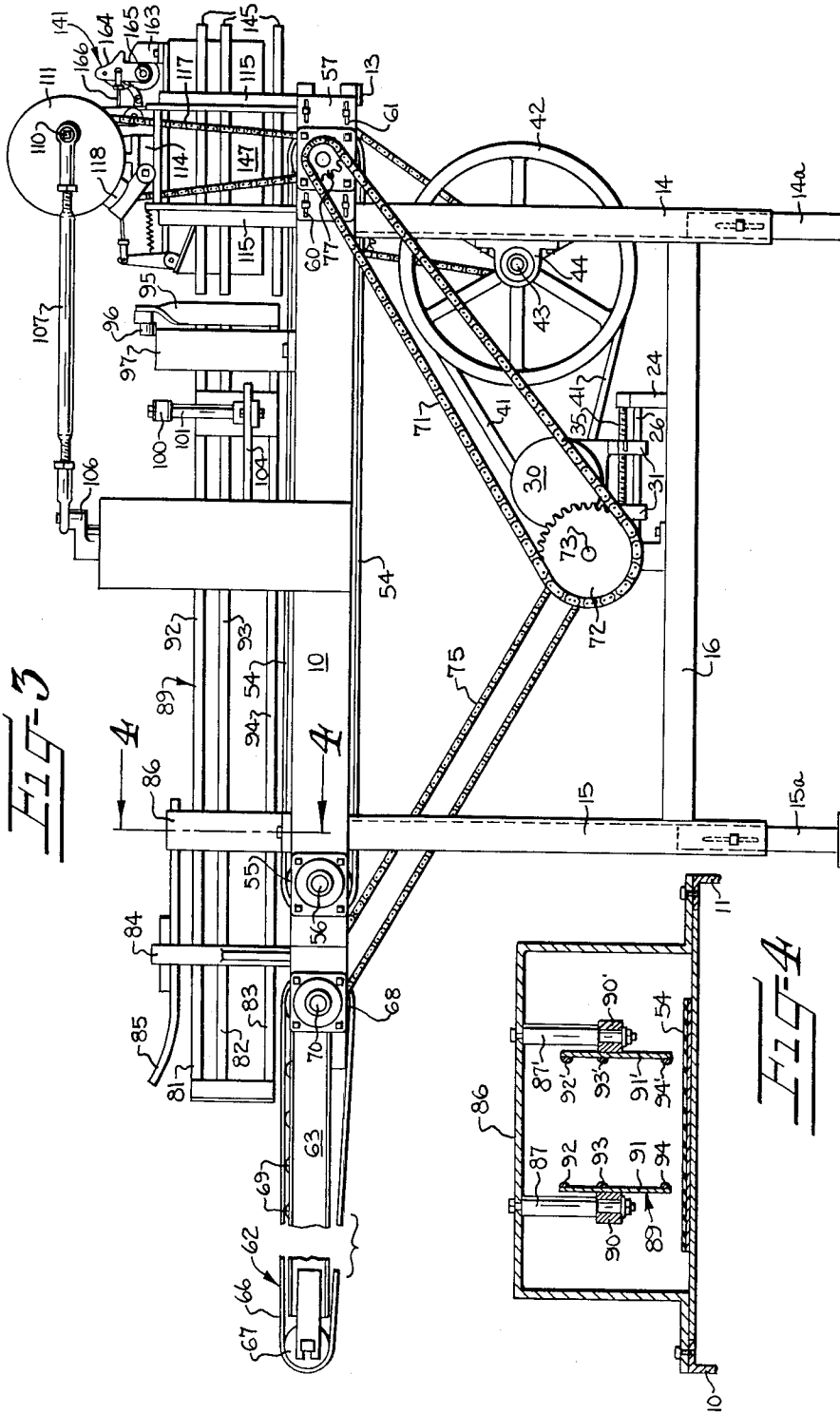
P. L. ALEXANDER, JR., ET AL

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ARTICLE DIVERGER

Filed June 11, 1956

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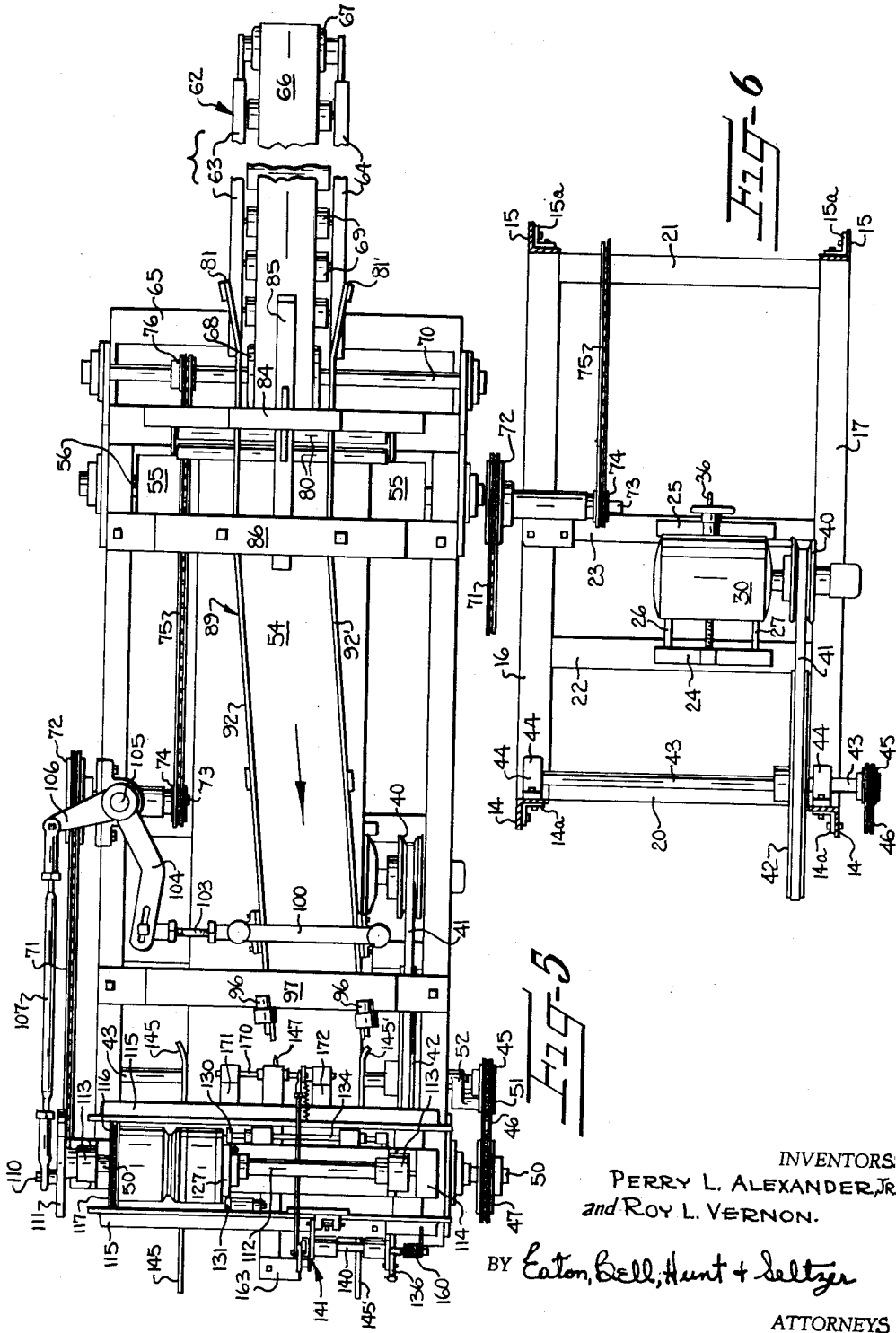
P. L. ALEXANDER, JR., ET AL

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Filed June 11, 1956

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P. L. ALEXANDER, JR., ET AL

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ARTICLE DIVERGER

Filed June 11, 1956

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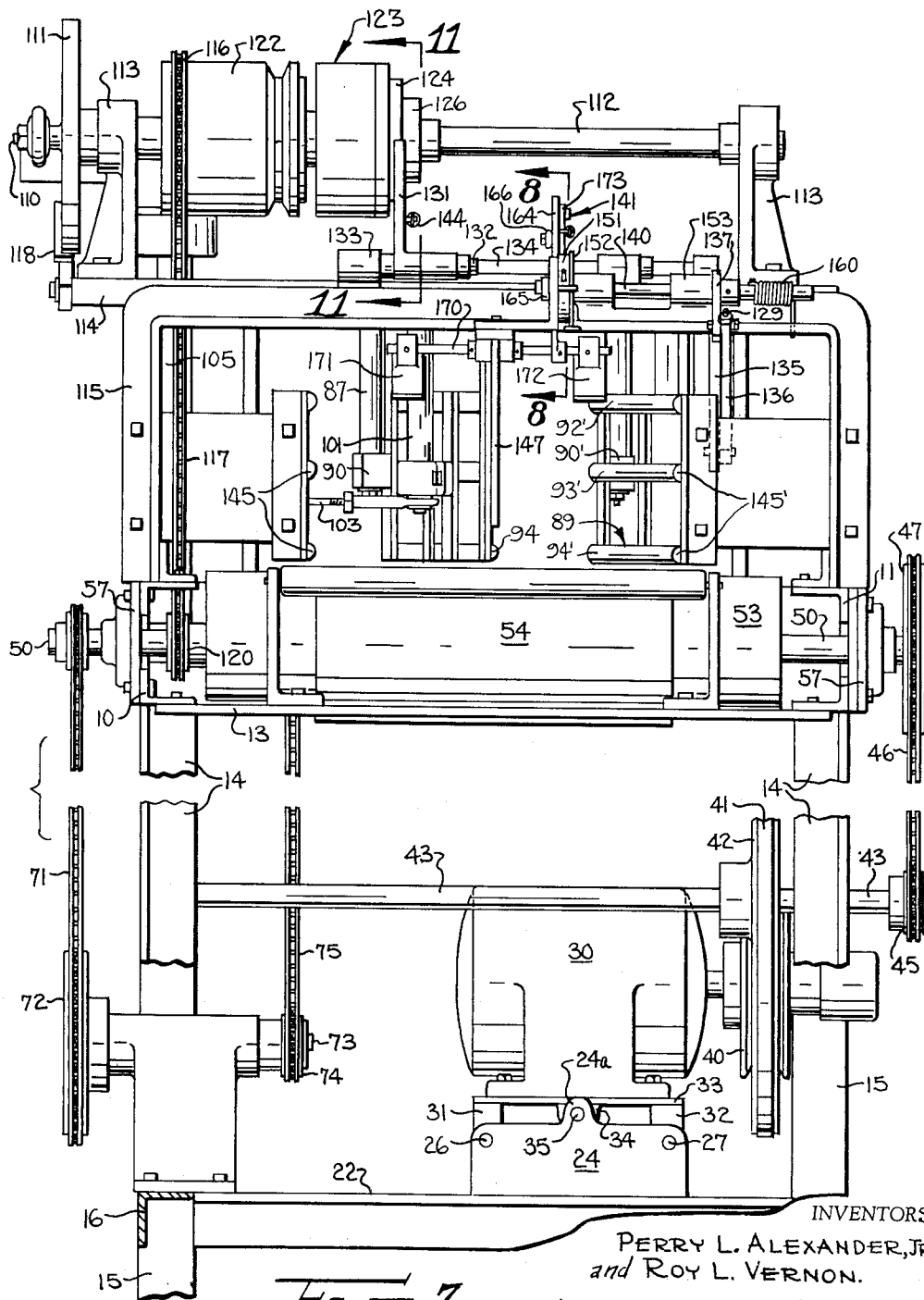


FIG-7

INVENTORS:
PERRY L. ALEXANDER, JR.
and ROY L. VERNON.

BY *Eaton, Bell Hunt + Seltzer*

ATTORNEYS

June 6, 1961

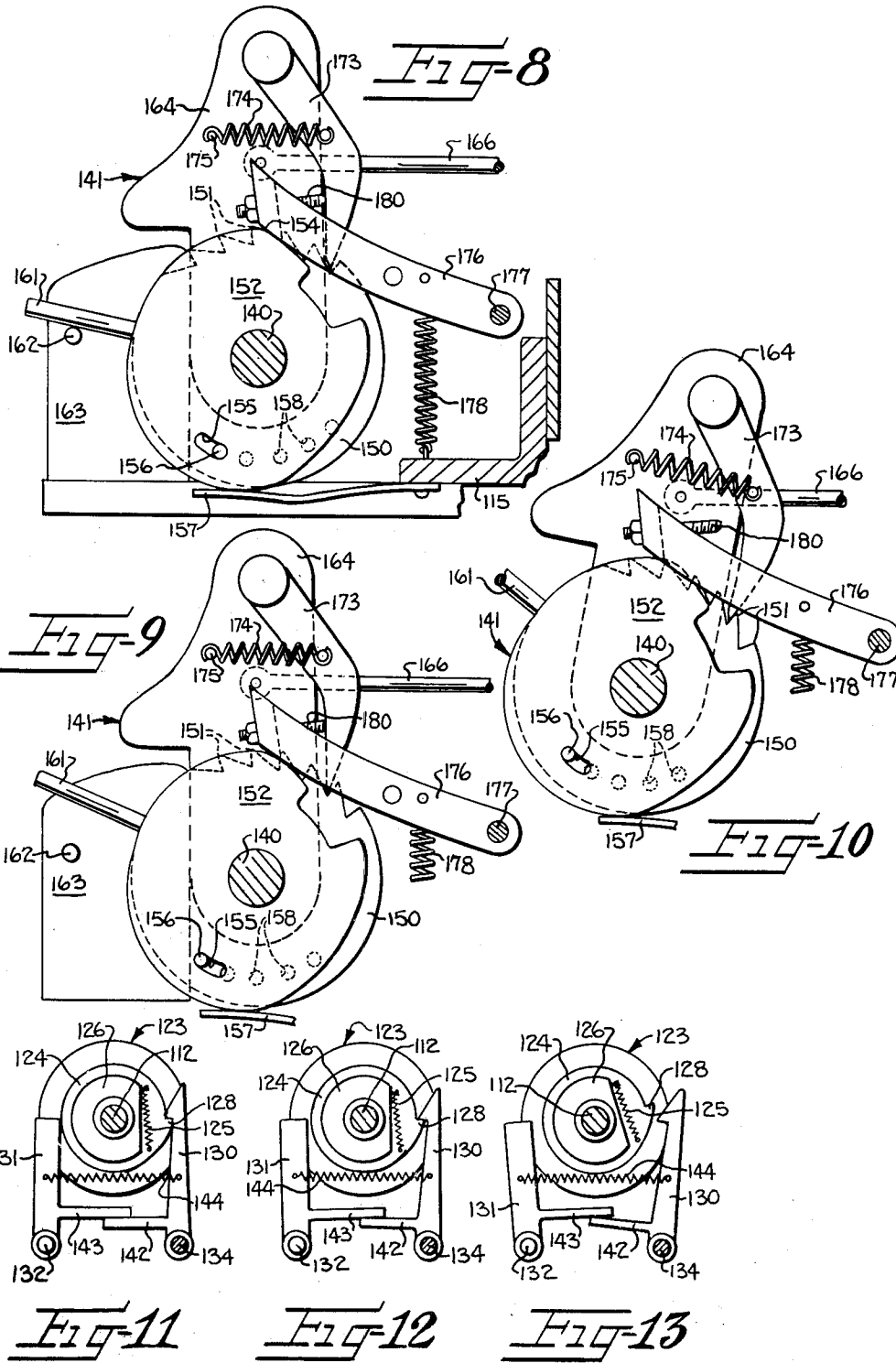
P. L. ALEXANDER, JR., ET AL

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ARTICLE DIVERGER

Filed June 11, 1956

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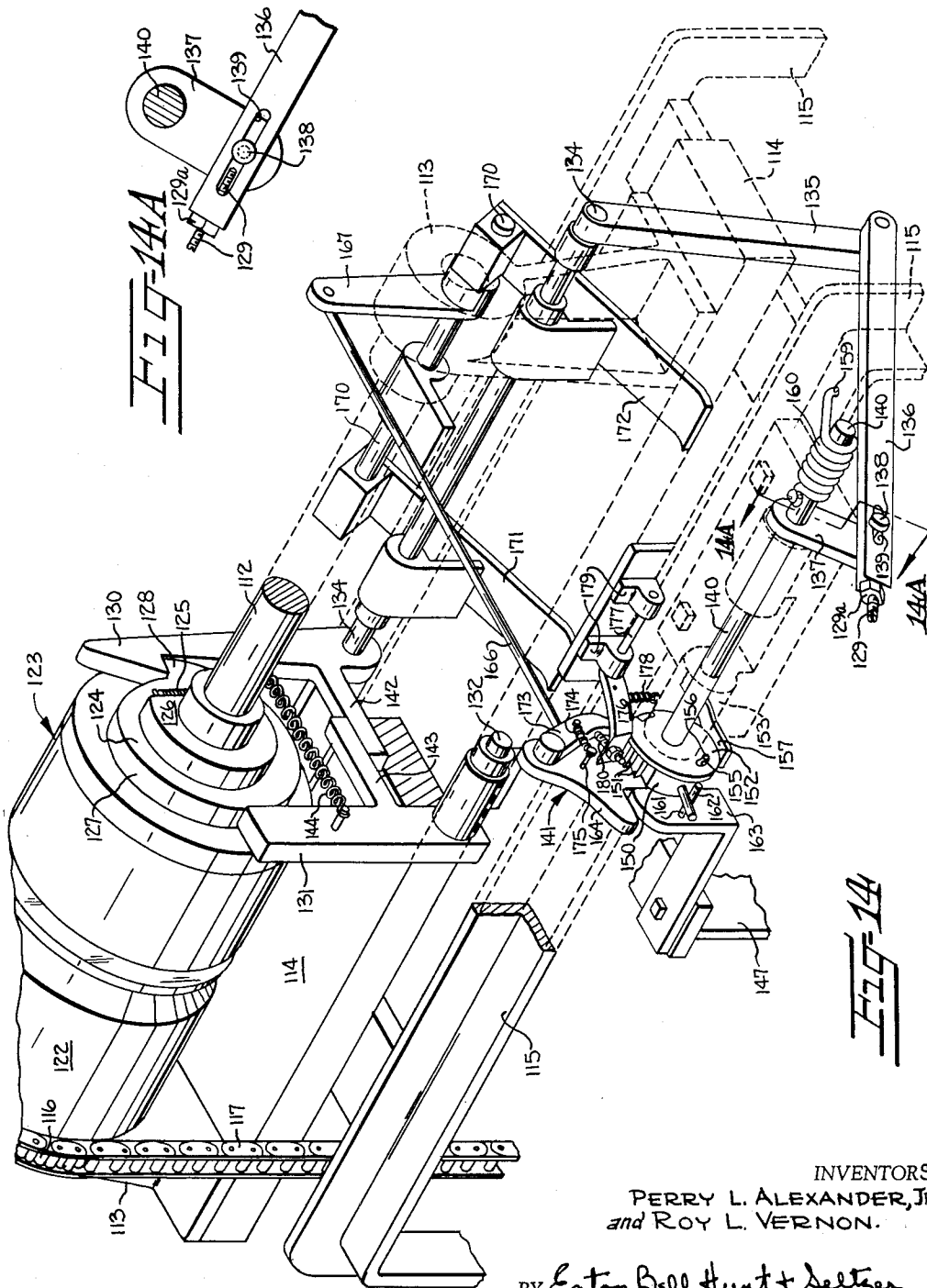
P. L. ALEXANDER, JR., ET AL

2,987,251

ARTICLE DIVERGER

Filed June 11, 1956

7 Sheets-Sheet 6



INVENTORS
PERRY L. ALEXANDER, JR.
and ROY L. VERNON.

BY *Eaton, Bell, Hunt + Seltzer*

ATTORNEYS

P. L. ALEXANDER, JR., ET AL

ARTICLE DIVERGER

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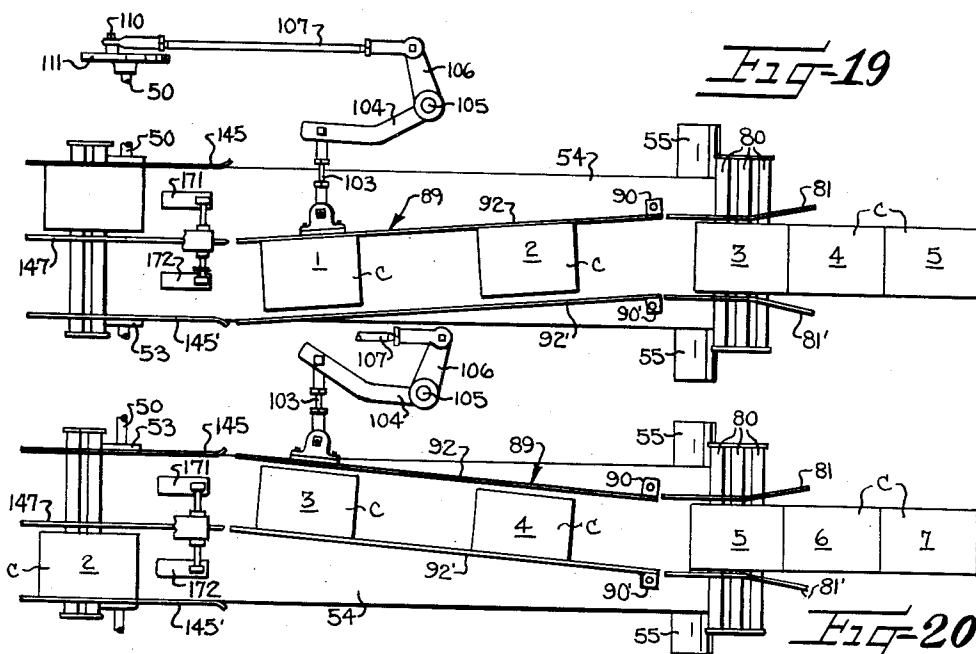
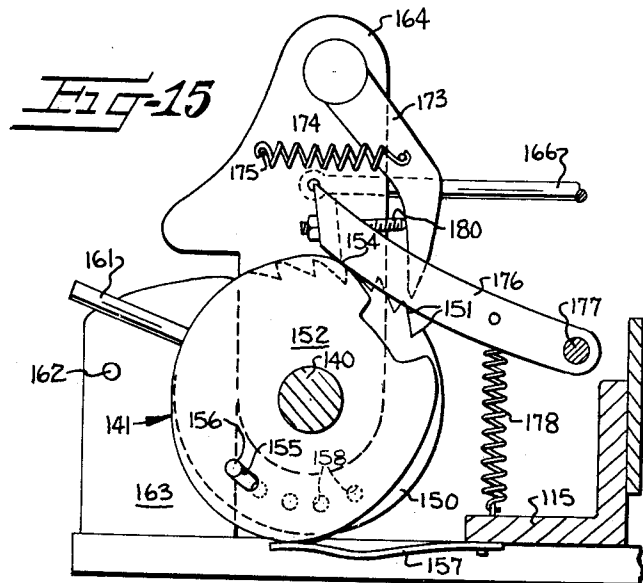
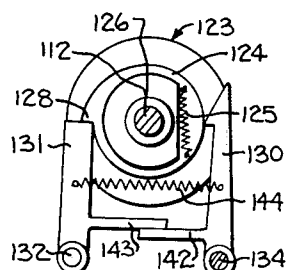
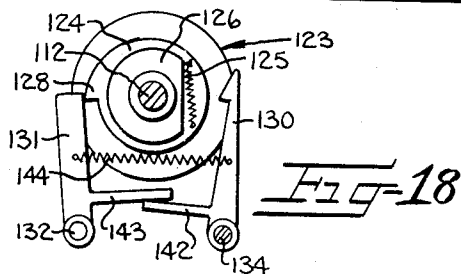
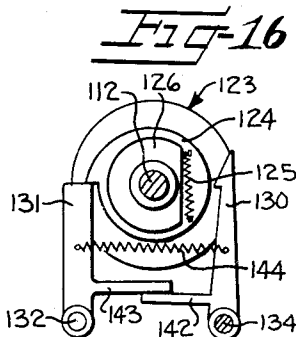


Fig-17 INVENTORS:
PERRY L. ALEXANDER, JR.
and ROY L. VERNON.
BY *Eaton, Bell, Hunt & Seltzer*

ATTORNEYS

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2,987,251

ARTICLE DIVERGER

Perry L. Alexander, Jr., and Roy L. Vernon, Charlotte, N.C., assignors to Decam Corporation, Charlotte, N.C., a corporation of North Carolina

Filed June 11, 1956, Ser. No. 590,561

10 Claims. (Cl. 235-98)

This invention relates to conveying mechanisms and more particularly to a conveying mechanism wherein a single row of articles in alinement are separated into a plurality of rows.

This invention has particular utility in the packaging field wherein it is desired to divide a single row of moving cartons into a plurality of rows to permit the cartons to be moved in side by side relation into a packing case for shipment. Needless to say, the operation of packing the cartons into a packing case is accomplished at a much faster rate when the articles are fed thereto in a plurality of rows having a width of substantially the width of the packing case.

It is therefore the primary object of this invention to provide a diverger mechanism which separates a single row of articles or cartons into a plurality of rows without interrupting the forward movement of the articles or cartons and wherein means are provided for controlling the number of articles or cartons placed in a given row prior to the mechanism directing the articles or cartons into an adjacent row. This latter feature of controlling the number of articles or cartons placed in each row is of particular importance wherein various sizes of packing cases are employed which would require varying numbers of articles or cartons to be fed thereto to fill the same.

Another object of the invention is to provide means positioned in the path of travel of each of the articles or cartons into the plurality of rows for engaging the top portion of the article or carton which engagement actuates a counting device which upon recording a predetermined number of articles or cartons being received in one of said plurality of rows will cause the articles to be directed into the adjacent row.

It is a more specific object of the invention to provide a diverger mechanism having a continuously moving conveyor belt, above the rear portion of which is positioned a pivotally mounted guide chute for directing a single row of cartons into a plurality of rows, and wherein means are positioned in the path of travel of each of the cartons for indicating when a predetermined number of cartons are positioned in a given row whereupon the pivotally mounted guide chute is shifted to direct cartons into another row.

Some of the objects of the invention having been stated, other objects will appear as the description proceeds, when taken in connection with the accompanying drawings, in which—

FIGURE 1 is a side elevation of the diverger mechanism;

FIGURE 2 is an enlarged vertical section taken on line 2-2 of FIGURE 1 and showing the pivotally mounted guide rails for guiding a single row of cartons and separating the same into a plurality of rows;

FIGURE 3 is a side elevation of the diverger mechanism looking at the opposite side from FIGURE 1 with parts broken away for purposes of clarity;

FIGURE 4 is an enlarged vertical section taken on line 4-4 of FIGURE 3 and clearly showing the manner in which the guide rails are mounted for pivotal movement to direct the articles or cartons into a plurality of rows;

FIGURE 5 is a top plan view of the diverger mechanism with the guide rails positioned for directing the cartons in a row positioned adjacent the left side of the mechanism;

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FIGURE 6 is a longitudinal sectional view taken on line 6-6 in FIGURE 1 and clearly showing the arrangement of the supporting structure and adjustable motor mount;

FIGURE 7 is an enlarged front view as seen from the left side of FIGURE 5;

FIGURE 8 is a greatly enlarged vertical section taken substantially along line 8-8 in FIGURE 7 and showing the relative position of the parts of the counting mechanism prior to a carton being received in one of the respective rows;

FIGURE 9 is a view similar to FIGURE 8 showing the relative position of the parts of the counting mechanism after a single carton has moved into one of the plurality of rows;

FIGURE 10 is a view similar to FIGURE 9 showing the relative position of the parts of the counting mechanism as the second carton is being received in the respective row;

FIGURE 11 is a vertical section taken substantially along line 11-11 in FIGURE 7 and showing the position of the clutch engaging elements when the counting device is in the position shown in FIGURE 8;

FIGURE 12 is a view similar to FIGURE 11 and showing the parts in a position corresponding to the position of the counting mechanism shown in FIGURE 9;

FIGURE 13 is a view similar to FIGURE 12 showing the clutch in fully released or disengaged position and corresponding to the position of the counting mechanism shown in FIGURE 15;

FIGURE 14 is an enlarged perspective view with parts broken away for purposes of clarity and showing the clutch and means for controlling the same, to direct the flow of cartons from one row into an adjacent row;

FIGURE 14-A is an enlarged fragmentary elevation taken on line 14-A-14-A in FIGURE 14;

FIGURE 15 is an enlarged vertical sectional view similar to FIGURE 10 and showing the counting device in fully released position immediately following the position in FIGURE 10 and corresponding to the position of the clutch shown in FIGURE 13;

FIGURE 16 is an enlarged vertical sectional view corresponding to FIGURE 11 but showing the single revolution clutch in an opposite position from FIGURE 11;

FIGURE 17 is an enlarged vertical sectional view similar to FIGURE 16 and corresponding to FIGURE 12 and showing the position of the clutch after one carton has been registered by the counting device;

FIGURE 18 is an enlarged vertical sectional view similar to FIGURE 17 and corresponding to FIGURE 13 and showing the clutch in fully released position just prior to moving to the position shown in FIGURE 11;

FIGURE 19 is a diagrammatic top plan view showing cartons Nos. 1 and 2 being directed into a row adjacent the left side of the diverger;

FIGURE 20 is a view similar to FIGURE 19 showing the parts in a different position and directing cartons Nos. 3 and 4 into a row adjacent the right side of the diverger.

Referring more particularly to the drawings, particularly FIGURES 1 to 7, the diverger mechanism is provided with a rectangular frame structure comprising opposed longitudinally extending upper side members 10 and 11 connected together by a plurality of cross braces 13 with a pair of front and rear legs 14, 15, respectively, extending downwardly therefrom and having adjustable lower portions 14a, 15a, respectively, for horizontally aligning the diverger mechanism with a machine such as a case packer to which the articles being separated into plurality of rows would normally be fed. Longitudinally extending lower side members 16, 17 are provided to brace the frame and have their opposite ends connecting

the pairs of legs. Front and rear cross members 20, 21 connect the lower side members 16, 17, respectively, for further bracing the supporting framework.

Intermediate cross members 22, 23 (FIGURE 6) are provided for further bracing the supporting framework and have their opposite ends connected to the lower side members 16, 17. A motor supporting platform comprising upright side plate members 24, 25 is suitably secured to the cross members 22, 23 as by welding. Opposite ends of motor guide rods 26, 27 connect the upright plates 24, 25 and a motor 30 is positioned thereon and adapted to be adjustably positioned for reasons shortly to be explained.

The motor 30 (FIGURES 1, 6 and 7) is fixedly secured to a pair of supporting plates 33 having lugs 31, 32 depending downwardly from their opposite ends which are penetrated by rods 27, 26, respectively. A lug 34 extends downwardly from the medial portion of each of the plates 33 and has a threaded bore for receiving a worm 35 having its opposite ends journaled in opposed upright lugs 24a extending from the upper medial portion of the side members 24, 25. The end of the worm 35 is provided with a handle 36 for rotating the same which rotation permits the motor 30 to be moved toward or away from the front of the machine, dependent upon which direction the handle is moved.

Movement of the motor 30 towards the front of the machine or to the left as viewed in FIGURE 6 increases the speed of the diverger, and movement of the motor in the opposite direction decreases the speed. To accomplish this change of speed, a spring loaded or adjustable pulley 40 is provided which drives a large pulley 42 by a pliable member or belt 41. As will be observed in FIGURE 6 upon the motor 30 being moved to the right, the pulley segments will be spread apart to reduce the effective diameter of the pulley and thus drive the pulley 42 at a slower speed. If it is desired to drive the pulley 42 at a faster speed, the motor 30 is shifted to the left on the worm 35 to permit the pulley segments to move closer together to increase the effective diameter of the pulley 40.

The pulley 42 is suitably secured to a transverse shaft 43 having opposite end portions suitably positioned in a pair of bearing blocks 44 positioned on opposite sides of the frame. As will be seen most clearly in FIGURES 6 and 7, the shaft 43 extends outwardly beyond the side member 17 and has a sprocket 45 suitably secured to the end thereof which drives a chain 46 which drives a larger sprocket 47 positioned on one end of a transverse shaft 50 suitably secured to the longitudinal members 10 and 11. An intermediate sprocket 51 is suitably secured to a bracket 52 extending downwardly from the longitudinal member 11 (FIGURE 1) for taking up the slack in the chain 46 to permit the same to operate in a smooth manner.

A cylinder or drum 53 having a width of substantially the distance between the side members 10, 11 is positioned on the shaft 50 and drives an endless pliable member or conveyor belt 54. A similar cylinder or drum 55 is transversely disposed at the rear end of the diverger adjacent the rear legs 15 and around which the other end of the conveyor belt 54 is guided in its path of travel. The drum or cylinder 55 is secured to a shaft 56 which has its opposite ends suitably journaled in the side members 10 and 11. To enable the conveyor belt 54 to be properly tensioned so that the same will operate smoothly and to reduce slippage between the driving drum or cylinder 53, the ends of the shaft 50 are positioned in plates 57 adapted to be adjusted longitudinally by means of bolts or suitable securing means penetrating upper and lower pairs of elongated slots 60, 61.

A carton feed conveyor, broadly indicated at 62, is connected to the rear end of the diverger for feeding a single row of cartons into the operating zone of the diverger. The feed conveyor 62 is provided with side

members 63, 64 having their forward ends suitably secured as by welding to a cross member 65 having its opposite ends suitably connected to the main frame members 10 and 11. A conveyor belt 66 is positioned between the side members 63, 64 and has its rear end guided by a drum or cylinder 67 rotatably mounted in the side members 63, 64. The forward end of the conveyor belt 66 is guided around a similar drum or cylinder 68 suitably mounted on and secured to a conveyor driving shaft 70. A plurality of freely rotatable rollers 69 are positioned between the drums 67, 68 to support the upper run of the conveyor belt 66 when under a load of cartons.

To impart rotation to the conveyor driving shaft 70, a chain 71 is provided which is driven by a small sprocket 77 (FIGURE 4) positioned on the shaft 50 at the front of the machine which chain extends rearwardly and drives a large sprocket 72 adjacent the motor 30. The sprocket 72 is mounted on the outer end of a stub shaft 73 which is suitably secured to the lower side frame member 16 (FIGURE 6). A small sprocket 74 is positioned on the inner end of the shaft 73 and drives a chain 75 which extends upwardly with its upper reach encircling a small sprocket 76 which is positioned on the feed conveyor shaft 70.

With this particular arrangement for imparting rotation to the feed conveyor driving shaft 70, it will be apparent that the shaft 70 will drive the conveyor belt 66 at a slower speed than the conveyor belt 54 is driven by the shaft 50. This feature is of particular importance to insure that the cartons being received on the conveyor belt 54 will be received in spaced relation shown in FIGURES 19 and 20 so as not to interfere with the means for separating the cartons into a plurality of adjacent rows to be explained shortly. To further insure that the cartons will be positioned on the conveyor belt 54 in spaced relation, a plurality of idler rollers 80 serving as spacers are positioned intermediate the conveyor belt 54 and the conveyor belt 66 as shown most clearly in FIGURES 19 and 20. With this arrangement, the leading carton will be engaged by the belt 54 and quickly moved forward prior to the successive carton being engaged by the belt 54.

To guide the cartons C from the conveyor belt 66 onto the conveyor belt 54, opposed upper guide rails 81, 81', intermediate guide rails 82, 82' and lower guide rails 83, 83' are provided to straddle the conveyor belt 66 and extend forwardly therefrom over the rear portion of the conveyor belt 54. An inverted U-shaped bracket 84 (FIGURES 1, 4 and 5) straddles the guide rails 81, 81', 82, 82', 83, 83' and is secured to the outer surface of the same with the lower ends of the U-shaped bracket being suitably secured to the main side members 10, 11.

A longitudinally extending upper guide member 85 having an upturned rear end portion is positioned between the guide rails to overlie the front and rear portions of the conveyor belts 66, 54 to insure that the cartons being received upon the conveyor belt 54 will be positioned with their bottom walls lying in a horizontal plane and to prevent the cartons from overturning or tipping forwardly which would interfere with the operation of the machine. The forward ends of the guide rails 81, 81', 82, 82', 83, 83' are suitably secured to a second inverted U-shaped member 86 having its opposite ends suitably secured to the main side frame members 10 and 11.

As seen most clearly in FIGURE 4, a pair of studs 87, 87' depend downwardly from the upper portion of the inverted U-shaped member 86 and have bearings or collars 90, 90' mounted for pivotal movement on their lower ends to which are secured plate members 91, 91' carrying a guiding chute 89 which comprises a second group of upper, intermediate and lower guide rails 92, 92', 93, 93' and 94, 94' respectively.

The forward ends of the guide rails 92, 92', 93, 93',

94, 94' are secured to a pair of opposing upright brackets 95 (FIGURES 1, 2, 3 and 5) having their lower ends spaced from the conveyor belt 54 to permit the brackets and the guide rails secured thereto to be shifted laterally at spaced intervals from one side of the machine to the other. To maintain the brackets 95 in spaced relation to the conveyor belt 54, the upper end of each of the brackets is provided with a roller 96 for engaging the upper surface of a third inverted U-shaped bracket 97 having its opposite ends suitably secured to the main frame side members 10 and 11. The rollers 86 overlie the upper surface of the inverted U-shaped member 97 a sufficient distance so as not to be disengaged from the same when the guide rails secured thereto are pivoted in their bearings or collars 90, 90' from the position shown in FIGURE 19 to the position shown in FIGURE 20.

To pivot the guide rails 92, 92', 93, 93' 94, 94' from one side of the machine to the other or from the position shown in FIGURE 19 to the position shown in FIGURE 20, a plate 100 overlies a front upper portion of the guide rails 92 from the ends of which depend rods 101 and 101' suitably secured to the sides of plates 102, 102' connected to the guide rails. An adjustable link 103 has its inner end (FIGURES 1 and 5) pivotally secured to the lower end of the upright rod 101 with its outer end secured to one end of a crank arm 104 which is fixedly secured to the lower end of an upright rod or shaft 105. To the upper end of the shaft or rod 105 is secured an arm 106 which is connected to one end of an adjustable link 107 which has its other end mounted on a bolt 110 secured to an eccentric 111.

As seen most clearly in FIGURE 7, the eccentric 111 is mounted on one end of a shaft 112 which has its end portions positioned in bearing blocks 113 which are connected to a supporting plate or platform 114 which is supported by a pair of inverted U-shaped members 115, which have their lower ends suitably secured to the main frame members 10, 11. A friction brake 118 engages the eccentric 111 to maintain the same stationary between movements to thus prevent the weight of the arm 107 from moving the same.

In order to impart an intermittent one-half revolution or rotation to the shaft 112, a gear 116, driven by an endless chain 117 is fixed to a hub member 122 of a half revolution clutch broadly designated at 123. The chain 117 is driven by a small sprocket 120 secured to the conveyor driving shaft 50. There are many different types of half revolution clutches which may be employed but the particular clutch shown is of a type disclosed in Patent No. 2,140,737 to Richard D. Dickens. Therefore, a complete illustration and description of the clutch 123 is deemed unnecessary.

However, it might be stated that the clutch 123 also includes an intermediate cam plate 124 which loosely encircles the shaft 112 and is effective in normally maintaining a fixed connection between the hub member 122 thereof and the shaft 112 when it is in operative position, to which it is urged by a tension spring 125 (FIGURES 11 to 14). One end of the tension spring 125 is connected to the outer face of the cam plate 124 and the other end thereof is connected to an outer hub plate 126 which is also, at times, rotatable relative to the shaft 112. The elements 122, 124, 125 and 126 are a form of the respective elements 7, 21, 25 and 23 shown in said Patent No. 2,140,737.

It will be noted in FIGURES 11 to 14 that the cam plate 124 is in the form of a cam surface 127 culminating in a raised portion or shoulder 128 with which a locking hook 130 and locking bar 131 alternately engages every one-half revolution of the cam plate 124. The locking hook 130 (FIGURE 14) has its lower end secured to one end of a rod or shaft 134 oscillatably mounted in suitable bearings positioned on the supporting platform 114. The locking bar 131 is mounted on

a stud shaft 132 which is positioned in a bearing 133 which is suitably secured to the supporting platform 114.

The outer end of the shaft 134 has a link 135 extending downwardly therefrom to the lower end of which is pivotally connected the rear end of an adjustable link 136 which is pivotally connected to a pin 138 secured to an arm 137 which is fixedly mounted on a shaft 140 on which is mounted a counting device broadly indicated by reference numeral 141. As shown in FIGURE 14-A the link 136 is provided with a slot 139 near its forward end in which the pin 138 provided with an enlarged head is positioned. An adjustment screw 129 is positioned in a threaded bore in the front end of the link 136 and is adapted to enter the slot 139 and be adjustably positioned with respect to the pin 138 to thereby vary the effective length of the link 136 and thus provide means for varying the movement of the locking hook and bar 130, 131 out of engagement with the clutch 123. A locking nut 129a is provided to maintain the screw 129 in the desired position.

As will be observed in FIGURE 14-A, the lower end of the adjustment screw 129 is positioned in spaced relation to the pin 138, which setting corresponds for successively directing two cartons into a given row. Now, upon the shaft 140 being moved counterclockwise (FIGURE 14) the link 136 will remain stationary until the pin 138 engages the end of adjustment screw. This lost motion arrangement between the link 136 and pin 138 permits the locking hook 130 to remain in engagement with the shoulder 128 on the clutch mechanism 123 until the second successive carton has been positioned in a given row.

The locking hook 130 and the locking bar 131 are provided with overlapping arms 142, 143 extending inwardly from their lower portions with the arm 142 on the hook 130 being positioned below the arm 143 as shown most clearly in FIGURES 11 to 14. A spring 144 has its opposite ends secured to the locking hook 130, and locking bar 131 for normally maintaining the same in the position shown in FIGURE 11 wherein they are substantially parallel with their upper ends the smallest distance apart from each other. The spring 144 insures that the locking hook 130 or locking bar 131 will alternately engage the raised portion or shoulder 128 on the cam plate 124 each one-half revolution of the cam plate 124.

Upon the locking hook shaft 134 being pivoted a slight amount in a clockwise direction, as viewed in FIGURE 14, by the linkage 135, 136, 137 when the shaft 140 is moved clockwise, the locking hook arm 142 will engage the lower surface of the locking bar arm 143 to release the locking bar 131 from engagement with the shoulder 128 on the cam plate 124 as illustrated in FIGURES 16 to 18. This particular arrangement of the locking hook arm 142 actuating the locking bar 131 eliminates the need of separate mechanism for actuating the locking bar 131 to disengage the same from the shoulder portion 128. It is, of course, apparent that the locking hook 130, shown in FIGURES 11 and 13, is disengaged from the shoulder portion 128 upon a predetermined clockwise movement being imparted to the locking hook shaft 134.

Suitably secured to the sides of the pair of inverted U-shaped members 15 at the front end of the diverger above the conveyor belt 54 is a pair of opposed guide rails 145 and 145' which are separated by a plate or intermediate guide rail 147 to form parallel passageways for receiving the rows of cartons fed thereto. It should be noted in FIGURE 7 that the plate 147 is secured to the upper portion of the pair of inverted U-shaped members 115 whereby the lower end of the plate 147 does not engage the upper surface of the conveyor belt 54.

The counting device 140 (FIGURES 14 and 15) comprises a counting gear or wheel 150 fixedly secured to the shaft 140 and having a plurality of teeth 151 thereon. The number of teeth 151 provided on the counting wheel

150 will be determined by the maximum number of cartons that are desired to be placed into each of the passageways in succession. As shown in the drawings, six teeth are provided for permitting a maximum of six cartons in succession to move into one of the passageways, after which the next six cartons are directed into the other passageway.

A cam plate 152 is loosely mounted on the shaft 140 in juxtaposition to the counting wheel 150 and is prevented from moving away therefrom by a bearing 153 engaging the outer side surface of the cam plate. The bearing 153 is suitably secured to the forwardmost inverted U-shaped member 115. The cam plate 152 is provided with a high point or raised portion 154 for reasons shortly to be explained and an opening or slot 155 through which extends a stud 156 which is threadably secured to the counting wheel 150. It should be noted that the slot 155 is dimensioned to permit the counting wheel 150 to be moved one tooth or one digit without imparting any movement to the cam plate 152, as will be observed by a comparison of FIGURES 8 and 9.

The parts in the drawings are arranged to permit only two cartons to be successively directed into a given row before the guide chute 89 is shifted. To permit a greater number of cartons to be successively positioned in a given row, a plurality of bores 158 are provided on the counting wheel 150 in which the stud 156 is selectively positioned. In FIGURES 8 to 10 and 15, four bores 158 are shown in dotted lines, successively representing, as viewed in a counterclockwise direction, the position of the stud 156 for feeding three, four, five and six cartons.

It is apparent that the cam plate will be moved counterclockwise when repositioning the stud 156 in one of the bores 158 to permit the stud to still penetrate the slot 155 and move the cam plate therewith in operation. It should be noted that counterclockwise movement of the cam plate 152 moves the high point 154 thereon closer to the rearmost positioned tooth 151 on the counting wheel 150.

A friction lever or brake 157 engages the lower portion of the cam 152 to maintain the cam in a stationary position except when being moved by the stud 156 engaging the side wall of the slot 155. A throw-back or resetting spring 160, as shown in FIGURE 14, surrounds the outer end of the shaft 140 and has its inner end secured to the shaft with its outer end positioned in an aperture 159 on the inverted U-shaped frame member 115. In placing the spring 160 on the shaft 140, its inner end is secured thereto, after which the spring is unwound to build up spring tension, after which its outer end is positioned in the aperture 159. Upon the shaft 140 being rotated a clockwise direction, as viewed in FIGURE 14, the spring 160 will be placed under a greater stress to rotate the shaft 140 in a counterclockwise direction upon the completion of the desired number of cartons entering one of the passageways to thus reset the shaft and the elements connected thereto to direct cartons into the other passageway. As will be noted in FIGURE 14, a rod 161 extends radially of the counting wheel 150 to act as a stop rod for the counterclockwise movement of the shaft 140 by engaging a fixed stud 162 extending horizontally from an L-shaped supporting plate 163 suitably secured to the intermediate guide rail 147.

An upright or arm lever 164 is pivotally mounted on the inner end of the shaft 140 in juxtaposition to the counting wheel 150 and is prevented from moving off the end of the shaft 140 by a collar 165 (FIGURE 7) which is fixedly secured to the shaft. The forward end of a rod 166 is pivotally connected to one side of the arm 164 remote from the counting wheel 150 and serves to impart a reciprocating movement to the arm 164. A link 167 (FIGURE 14) is fixedly secured to a shaft 170 and has its upper end connected to the rear end of the rod 166.

Fixedly secured to opposite ends of the shaft 170 (FIGURE 14) are carton-engaging levers or trip fingers 171, 172 which extend forwardly therefrom and normally biased downwardly by their weight. As will be observed in FIGURE 14, the lower end of the carton-engaging fingers 171, 172 are curved upwardly a slight amount so as to prevent any damage when the same engage the cartons passing thereunder. As will be observed in FIGURES 5, 19 and 20, the carton-engaging fingers 171, 172 are positioned in the medial portion of adjacent passageways whereby only one of the fingers at a time are engaged by the cartons during the alternate feeding of the cartons into each of the passageways.

Upon the cartons engaging one of the fingers 171, 172, it will be moved upwardly to impart a rearward movement or reciprocation to the rod 166 to thereby move the upright lever 164 rearwardly. To enable the upright lever 164 to move the counting wheel for each carton engaging the respective finger, a kicking pawl 173 is pivotally secured to the upper portion of the arm 164 remote from the rod 166 and depends downwardly therefrom and normally engages one of the teeth 151 on the counting wheel 150. To normally maintain the kicking pawl 173 in engagement with the counting wheel 150 a spring 174 is provided with its forward end being secured to a stud 175 on the arm 164 and its other end being suitably secured to the kicking pawl. It will therefore be apparent that, upon the upright arm 164 being moved rearwardly or to the right as viewed in FIGURE 14 by a carton-engaging one of the fingers 171, 172, the counting wheel 150 will be moved clockwise one tooth from the position shown in FIGURE 8 to FIGURE 9.

An L-shaped holding pawl 176 is pivotally mounted on a shaft 177 journaled in bearings 179 and serves to prevent the counting wheel 150 from moving in a counterclockwise direction when the kicking pawl 173 is moving from one tooth into engagement with a succeeding tooth. A vertically disposed spring 178 has its upper end secured to the holding pawl 176 to insure that the holding pawl will normally be in engagement with the teeth 151 of the counting wheel 150. An adjustment stud or release pin 180 is secured to the transverse portion or front end of the L-shaped holding pawl 176 and extends rearwardly, normally out of engagement with the front edge surface of the kicking pawl 173 until the kicking pawl has registered the predetermined number of successive cartons being directed into one of the passageways.

The release pin 180 serves to move the kicking pawl 173 out of engagement with the teeth 151 of the counting wheel 150 when the desired number of cartons have been positioned in one of the passageways prior to the directing of the cartons into the adjoining parallel passageway. This condition occurs as will be observed in FIGURE 15 when the high point 154 of the cam plate 152 engages the lower surface of the front end of the holding pawl 176 which elevates the same to move the release pin 180 rearwardly to exert an outward force on the kicking pawl 173, and move the kicking pawl out of engagement with the counting wheel 150.

The high point 154 of the cam plate 152 when the same engages the holding pawl 176 moves the holding pawl out of engagement with the teeth 151 of the counting wheel 150 just prior to the pin 180 moving the kicking pawl 173 out of engagement with the teeth to thus permit the throw-back spring 160 to rotate the counting wheel 150 in a counterclockwise direction to reset the counting wheel for another counting operation. It will be observed that the radially extending rod 161 on the counting wheel 150 acts as a stop for the counting wheel by engaging a stud or stop pin 162 to reset the counting wheel 150 with the kicking pawl 173 resting in engagement with the first tooth 151 as shown in FIGURE 8.

Operation of the diverger

75 When the diverger is in operation, a plurality of jammed

together cartons will be fed by the conveyor belt 66 onto the conveyor belt 54 in spaced apart relation. As stated previously, the conveyor belt 54 operates at a faster speed than the belt 66 to permit the feeding of the cartons into the carton passageways in spaced apart relation. To further insure that the cartons will be received on the conveyor belt 54 in spaced apart relation, freely rotatable rollers 80 are positioned between the two belts, as shown in FIGURES 19 and 20.

Now, upon carton No. 1 in FIGURE 19 engaging the trip finger 172 and moving the same upwardly, the lever 164 and the kicking pawl 173 will be moved rearwardly or to the right as viewed in FIGURE 8 by the linkage 166, 167 to move the counting wheel 150 one tooth or from the position shown in FIGURE 8 to the position shown in FIGURE 9. It is apparent that the weight of the trip fingers 171, 172 returns the lever 164 and pawl 173 to their initial position while moving the pawl into engagement with the second tooth on the counting wheel. It should be noted that, during this movement of the counting wheel 150, the cam plate 152 remains stationary since the stud 156 extending through the slot 155 therein only moves from one end of the slot to the other without imparting any movement to the cam plate. To insure that the cam plate 152 does not move by vibration of the machine, the friction brake 157 is positioned against the lower portion thereof.

During the movement of the counting wheel from the position shown in FIGURE 8 to that shown in FIGURE 9, the clutch locking hook 130 mounted on the shaft 134 will be moved by the linkage 135, 136, 137 connecting the shaft 140, from the position shown in FIGURE 11 to the position shown in FIGURE 12 wherein the hook 130 is partially retracted from the shoulder 128 on the cam plate 124.

Now, upon carton No. 2 (in FIGURE 19) engaging the trip finger 172, the kicking and holding pawls 173, 176 will be moved from the position shown in FIGURE 9 to the position shown in FIGURE 10 to move the counting wheel 150 one tooth. It should be noted that the cam plate 152 is moved with the counting wheel to position the high point 154 underneath the holding pawl to move the pawl out of engagement with the teeth on the counting wheel. Now, upon the return of the finger 172 to its lowermost position after the carton No. 2 has moved out of engagement beyond the same, the rod 166 will be moved forwardly to the position shown in FIGURE 15 to cause the release pin 180 to engage the kicking pawl 173 to thus move the kicking pawl out of engagement with the counting wheel, to thus fully release the counting wheel to permit it to be rotated by the throw-back spring 160 in a counterclockwise direction, thus resetting the counting device.

As will be apparent upon viewing FIGURE 15, the cam plate 152 momentarily remains stationary during the initial movement of the counting wheel 150 in a counterclockwise direction since the stud 156 carried by the counting wheel must move to the opposite side of the slot 155 before movement is imparted to the cam plate 152. Thus, the initial inactive condition of the cam plate is sufficient to maintain the holding pawl out of engagement with the teeth of the counting wheel to permit the throw-back spring 160 to quickly return the counting wheel to the zero or starting point shown in FIGURE 8 before the pawl 176 has time to again engage the teeth of the counting wheel.

The engagement of carton No. 2 with the finger 172 moves the locking hook 130 from the position shown in FIGURE 12 to the position shown in FIGURE 13 wherein the same is completely released from the half-revolution clutch to thus permit the clutch to move to the position shown in FIGURE 16 prior to the feeding of the cartons into the adjacent passageways.

The release of the locking hook 130 from the clutch 123 in FIGURE 13 permits the clutch to impart a half

revolution to the eccentric 111 which through the linkage 107, 106, 104, 103 moves the pivotally mounted guide chute 89 from the position shown in FIGURE 19 to the position shown in FIGURE 20.

Now, cartons Nos. 3 and 4 will engage the corresponding trip finger 171 to repeat the cycle of movement of the counting wheel and pawl as described for cartons Nos. 1 and 2. However, since the clutch has been displaced a half revolution, the locking bar 131 instead of the locking hook 130 will now engage the shoulder 128 on the cam plate 124. It will, therefore, be apparent that FIGURES 16 to 18 correspond with FIGURES 11 to 13 for the feeding of cartons Nos. 3 and 4 into their respective passageway.

Although the operation of the diverger has been described for alternately directing two cartons into each of the rows, any desired number of cartons may be successively directed into each row. In operational tests, the diverger has performed successfully in alternately directing only one carton in each row and up to a maximum of six. However, the diverger operates smoother when two cartons are successively directed into each row.

To adjust the diverger to alternately direct only one carton into each row, it is only necessary to screw the adjustment screw 129 down until it engages the pin 138. Now, when the shaft 140 is moved clockwise by the kicking pawl 173 engaging the first of the series of teeth 151 on the counting wheel, the locking hook 130 or the locking bar 131 will be completely disengaged from the clutch 123 to permit the guide chute 89 to be shifted. It should be noted however that the counting device 141 will not be reset to the initial starting position shown in FIGURE 8 until the second carton is registered on the counting wheel 150.

When it is desired to feed more than two successive cartons into each row, the stud 156 on the counting wheel is moved into the corresponding bore 158 on the counting wheel to thereby move the high point 154 on the cam plate 152 further away from the holding pawl 176. This permits the number of teeth to be moved by the kicking pawl to correspond with the number of successive cartons moved into a given row. Now, the adjustment screw 129 is moved away from the pin 138 to reduce the effective stroke of the link 136 whereby the locking hook or bar 130, 131, respectively, will not be disengaged from the shoulder 128, of the clutch 123, until the predetermined number of successive cartons are moved into a given row. It is apparent, that the screw 129 will be spaced an increasing distance away from the pin 138 to correspond with the greater number of cartons to be positioned in each row.

Accordingly, there has been described a novel carton diverger which separates a single row of spaced apart cartons into a plurality of rows and wherein novel means are provided for counting or registering the cartons going into each row which means also serves to intermittently actuate mechanism to move a pivotally mounted carton guide chute from one position to another to successively direct a predetermined number of cartons into each row.

In the drawings and specification there has been set forth a preferred embodiment of the invention and, although specific terms are employed, they are used in a generic and descriptive sense only and not for purposes of limitation, the scope of the invention being defined in the claims.

We claim:

1. A device for feeding a single stream of spaced apart cartons into a plurality of rows comprising an upright frame, a conveyor positioned in the upper portion of said frame, means for continuously driving said conveyor, a pivotally mounted guide chute positioned above said conveyor for maintaining the single stream of cartons in substantial alinement with each other, a pair of opposed stationary guide rails extending forwardly from said guide

chute and being positioned above said conveyor, an intermediate guide rail positioned between said pair of stationary guide rails to define a pair of passageways for receiving the cartons directed thereto by the guide chute, carton engaging means positioned in the path of travel of each of the cartons in the front portion of each of said passageways, counting means operatively connected to said carton engaging means for being actuated by the same, means for shifting said guide chute from in front of one passageway to in front of the other passageway upon a predetermined number of cartons being positioned in one of said passageways, said means for shifting said guide chute comprising a clutch normally maintained in disengaged position, linkage operatively connecting said clutch with said guide chute, and means operatively connecting said counting means with said clutch for permitting the clutch to be moved into engaged position upon a predetermined number of cartons being registered by said counting device.

2. A device for feeding a single stream of spaced apart cartons into a plurality of rows comprising an upright frame having front and rear legs, an endless conveyor belt positioned in the upper portion of said frame, means for continuously driving said endless conveyor belt, a pivotally mounted guide chute positioned above said endless conveyor belt for maintaining the single stream of cartons in substantial alinement with each other, stationary guide rails extending forwardly from said guide chute and being positioned above said endless conveyor belt to define a pair of parallel passageways for receiving the cartons directed thereto by the guide chute, carton engaging means positioned adjacent the entrance of said passageways in the path of travel of each of the cartons, counting means including a spring loaded shaft operatively connected to said carton engaging means for being actuated by the same, means operatively connected to said counting means for shifting said guide chute from in front of one passageway to the other passageway upon a predetermined number of cartons being positioned in one of said passageways, said means for shifting said guide chute comprising a shaft, a hub rotatably mounted on said shaft, a clutch on said shaft adjacent said hub and normally maintained in disengaged position, and means connecting said counting means with said clutch for permitting the clutch to move into engaged position upon a predetermined number of cartons being registered by said counting device in one of said passageways.

3. A device according to claim 2 wherein said means connecting said counting means with the clutch comprises linkage connected to one end of said spring loaded shaft, an oscillatably mounted shaft, the other end of the linkage being connected to one end of said oscillatably mounted shaft, a locking hook positioned on the other end of said oscillatably mounted shaft and normally holding the clutch in disengaged position, an opposed locking bar positioned substantially parallel to said locking hook and adapted to hold the clutch in alternation with the locking hook, a resilient member connecting the locking hook and locking bar to normally prevent the clutch from being released, and overlapping transverse arms extending inwardly from the locking hook and locking bar with the locking hook arm being positioned below the locking bar arm whereby upon the spring loaded shaft being moved clockwise a predetermined amount the oscillatably mounted shaft will be rotated clockwise to move the locking hook and locking bar out of engagement with the clutch.

4. A device according to claim 3 wherein adjustment means are provided for said linkage to vary the effective stroke of the same to synchronize the disengagement of the clutch with the last of a predetermined number of cartons being positioned in one of the passageways.

5. A device for separating a single row of spaced apart articles into a plurality of rows comprising a continu-

ously moving conveyor for moving the articles in one direction, a guide chute positioned above said conveyor and having its rear end pivotally mounted to permit the guide chute to be shifted laterally from one side of the conveyor to the other, an inverted U-shaped member straddling the rear portion of said conveyor, the rear end portions of said guide chute being pivotally suspended from said inverted U-shaped member in spaced relation to said conveyor, a second inverted U-shaped member straddling said conveyor and overlying a medial portion of said guide chute, upright members connected to a medial portion of opposing sides of said guide chute and extending above the guide chute, rollers mounted on said upright members and engaging the upper surface of said second inverted U-shaped member to suspend the front portion of the guide chute in spaced relation to the conveyor, stationary guide rails positioned above the forward portion of said conveyor and defining a pair of passageways for receiving the articles directed therinto by the guide chute, article engaging fingers extending downwardly adjacent the rear end of said stationary guide rails and in the path of travel of said articles whereby articles entering each passageway engage one of the fingers, counting means for registering each movement of the fingers, and means controlled by said counting means upon a predetermined number of articles being registered for shifting the guide chute from in front of one passageway to in front of the other passageway.

6. A device for separating a single row of spaced apart articles into a plurality of rows comprising a continuously moving conveyor for moving the articles in one direction, a pivotally mounted guide chute positioned above said conveyor adapted to be pivoted laterally from one side of the conveyor to the other, stationary guide rails positioned above said conveyor and extending forwardly from said guide chute and defining a pair of passageways for receiving the articles directed therinto by the guide chute, article engaging fingers extending downwardly adjacent the entrance to each of said pair of passageways and being positioned in the path of travel of said articles therinto to be engaged by the same, counting means for registering each movement of the fingers, said counting means comprising a spring loaded shaft, a counting wheel secured to said shaft and having a plurality of teeth thereon for registering the articles engaging said fingers, a kicking pawl operatively connected to said fingers and adapted to engage the teeth of said counting wheel for moving the counting wheel in a clockwise direction in opposition to the spring tension on said shaft, a holding pawl for engaging the teeth of said counting wheel to prevent the counting wheel from rotating counterclockwise when the kicking pawl is being moved from one tooth to a successive tooth, a cam for raising said holding pawl out of engagement with the teeth on the counting wheel upon a predetermined number of articles being registered, and means provided on said holding pawl for engaging said kicking pawl to also move the kicking pawl out of engagement with the teeth of the counting wheel upon the holding pawl being raised by said cam to permit the spring loaded shaft to rotate counterclockwise to its initial starting position upon the predetermined number of articles being registered in one of said passageways, a clutch normally maintained in disengaged position, means connecting said clutch with said guide chute, and means controlled by said counting means upon a predetermined number of articles being registered for permitting the clutch to move into engaged position to shift the guide chute from the front of one passageway to the front of the other passageway.

7. A device according to claim 6 wherein means are provided for adjustably positioning the cam to vary the number of successive teeth engaged by the kicking pawl prior to the counting device being reset to its initial starting position.

8. A device for separating a single row of spaced apart articles into a plurality of rows comprising a continuously moving conveyor for moving the articles in one direction, a guide chute positioned above said conveyor and having its rear end pivotally mounted to permit the guide chute to be shifted laterally from one side of the conveyor to the other, stationary guide rails positioned above the forward portion of said conveyor and defining a pair of passageways for receiving the articles directed therinto by the guide chute, article engaging fingers extending downwardly adjacent the rear end of said stationary guide rails and in the path of travel of said articles whereby articles entering each passageway engage one of the fingers, counting means for registering each movement of the fingers and comprising a spring loaded shaft, a counting wheel secured to said shaft and having a plurality of teeth thereon for registering the articles engaging said fingers, a kicking pawl operatively connected to said fingers and adapted to engage the teeth of said counting wheel for moving the counting wheel in a clockwise direction in opposition to the spring tension on said shaft, a holding pawl for engaging the teeth of said counting wheel to prevent the counting wheel from rotating counterclockwise when the kicking pawl is being moved from one tooth to a successive tooth, a cam for raising said holding pawl out of engagement with the teeth on the counting wheel upon a predetermined number of articles being registered, and means provided on said holding pawl for engaging said kicking pawl to also move the kicking pawl out of engagement with the teeth of the counting wheel upon the holding pawl being raised by said cam to permit the spring loaded shaft to rotate counterclockwise to its initial starting position upon the predetermined number of articles being registered in one of said passageways, and means controlled by said counting means upon a predetermined number of articles being registered for shifting the guide chute from in front of one passageway to in front of the other passageway.

9. A device according to claim 8 wherein means are provided for adjustably positioning the cam to vary the number of successive teeth engaged by the kicking pawl prior to the counting device being reset to its initial starting position.

10. A device for separating a single row of spaced

apart articles into a plurality of rows comprising a continuously moving conveyor for moving the articles in one direction, a pivotally mounted guide chute positioned above said conveyor adapted to be pivoted laterally from one side of the conveyor to the other, stationary guide rails positioned above said conveyor and extending forwardly from said guide chute and defining a pair of passageways for receiving the articles directed therinto by the guide chute, article engaging fingers extending downwardly adjacent the entrance to each of said pair of passageways and being positioned in the path of travel of said articles therinto to be engaged by the same, counting means for registering each movement of the fingers, a clutch normally maintained in disengaged position, means connecting said clutch with said guide chute comprising a shaft, said clutch being mounted on said shaft and adapted to intermittently engage the shaft to rotate the same, an eccentric mounted on one end of said shaft and linkage connecting said eccentric to said guide chute whereby upon said shaft being engaged by said clutch, said guide chute will move laterally from one side of the conveyor to the other, and means controlled by said counting means upon a predetermined number of articles being registered for permitting the clutch to move into engaged position to shift the guide chute from the front of one passageway to the front of the other passageway.

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