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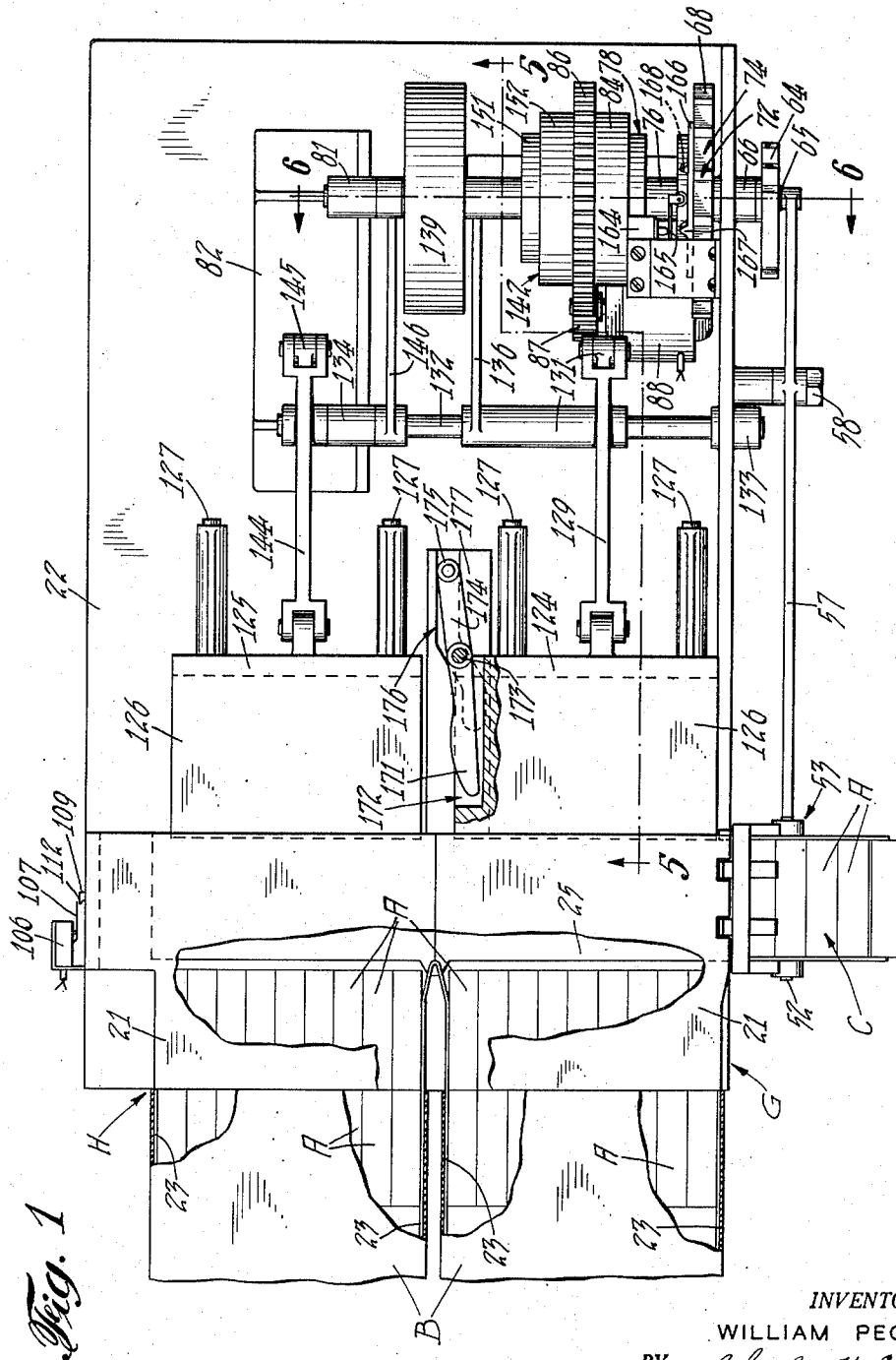
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2,814,922

MACHINE FOR PACKING ARTICLES INTO CARTONS AND THE LIKE

Filed July 27, 1954

6 Sheets-Sheet 1



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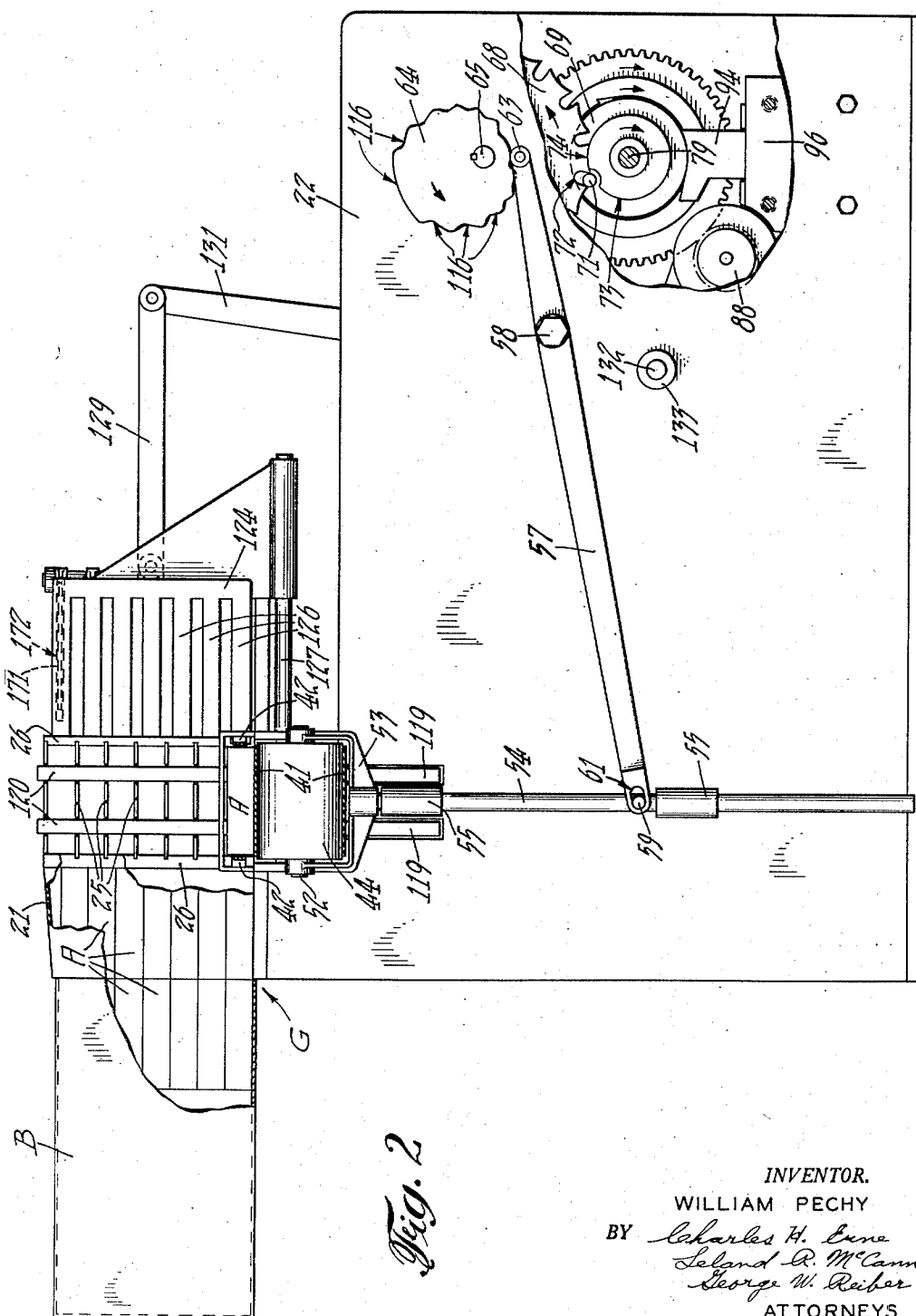
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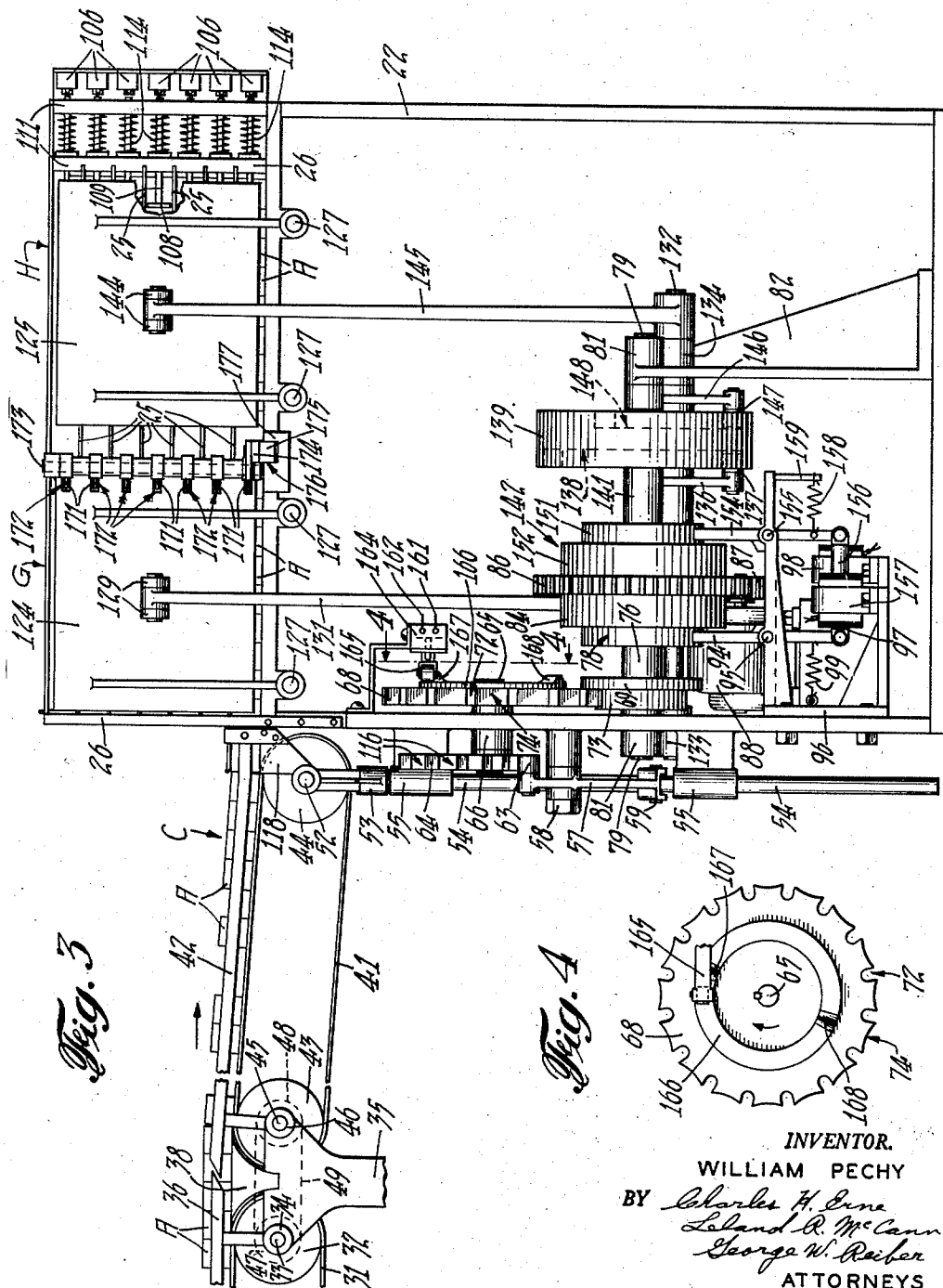
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6 Sheets-Sheet 3



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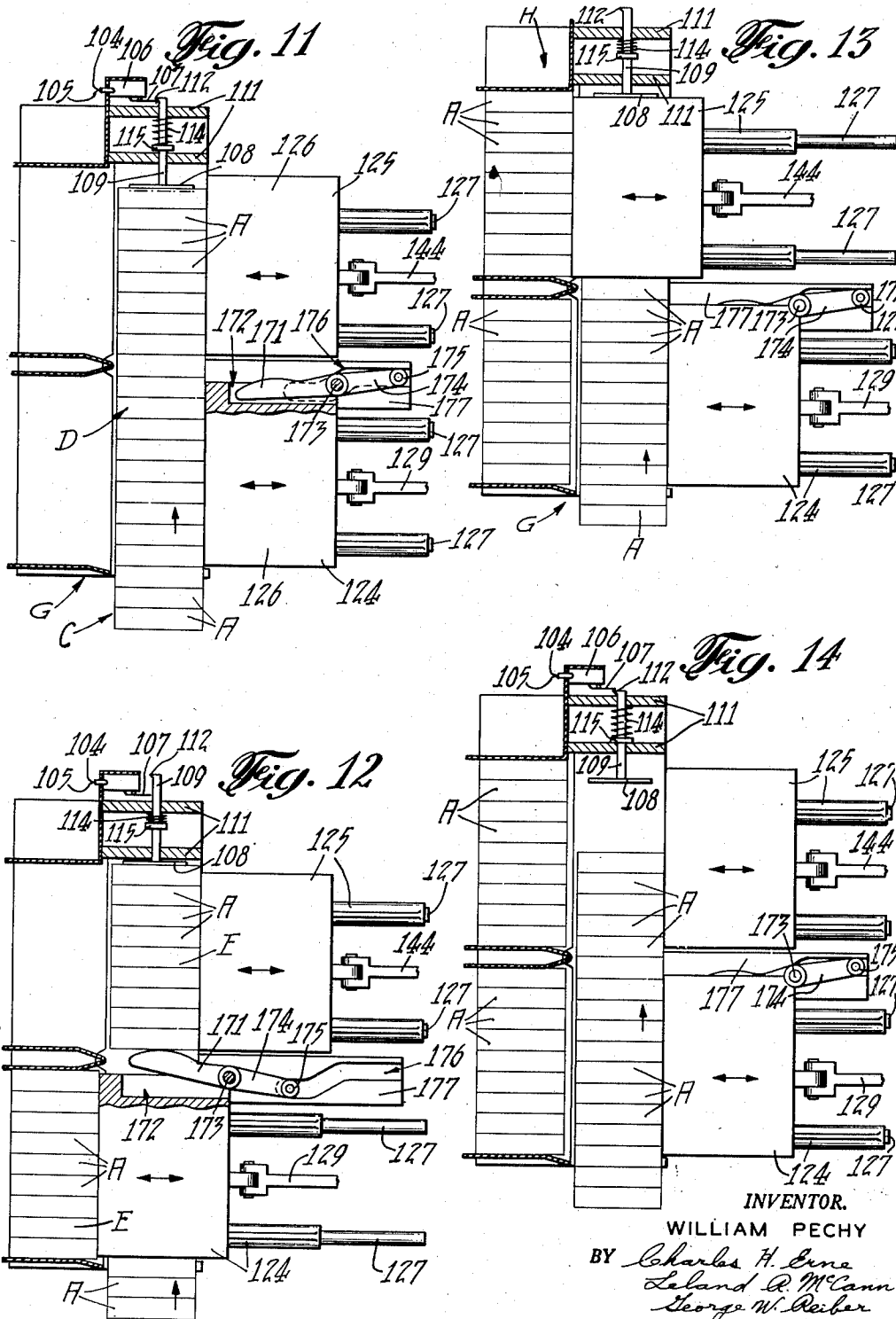
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MACHINE FOR PACKING ARTICLES INTO CARTONS AND THE LIKE

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6 Sheets-Sheet 6



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2,814,922

MACHINE FOR PACKING ARTICLES INTO
CARTONS AND THE LIKE

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Application July 27, 1954, Serial No. 446,021

8. Claims. (Cl. 53—153)

The present invention relates to machines for packing articles into shipping or storage cartons and the like carriers in orderly arranged rows and tiers and has particular reference to devices for arranging the articles in rows and tiers preparatory to packing.

An object of the instant invention is the provision of an article packing machine wherein a substantially continuous moving line of articles is arranged into a plurality of superposed rows to provide a unit tier of the articles, and the unit tiers, as built up, assembled into cartons or the like carriers for shipment and storage.

Another object is the provision of such a machine wherein unit tiers of articles may be built up in proportions greater than the dimensions of the carriers to be filled and subdivided into a plurality of smaller unit tiers of proper proportions to fit the carriers during the packing operation.

Another object is the provision in such a machine of devices for building up vertically disposed unit tiers of articles wherein successive tiers are built up progressively from bottom to top, and also from top to bottom in alternating uninterrupted order to save time and motion to facilitate economical and high speed operation of the machine.

Numerous other objects and advantages of the invention will be apparent as it is better understood from the following description, which, taken in connection with the accompanying drawings, discloses a preferred embodiment thereof.

Referring to the drawings:

Figure 1 is a top plan view of an article packing machine embodying the instant invention, with parts broken away and parts shown in section;

Fig. 2 is a side elevation of the machine shown in Fig. 1, with parts broken away;

Fig. 3 is a front elevation of the machine as viewed from the right in Fig. 2, with parts broken away;

Fig. 4 is an elevational detail of a Geneva wheel used in the machine, the view being taken substantially along a plane indicated by the line 4—4 in Fig. 3;

Fig. 5 is a sectional view taken substantially along the broken line 5—5 in Fig. 1, with a portion shown in dot and dash lines indicating a different position of one of the machine parts;

Fig. 6 is a sectional view taken substantially along the line 6—6 in Fig. 1, with parts broken away;

Fig. 7 is an enlarged section of a clutch detail as taken substantially along the line 7—7 in Fig. 6;

Fig. 8 is an enlarged perspective view of a fragmentary portion of an entrance conveyor shown at the upper left in Fig. 3;

Fig. 9 is an enlarged perspective view of a fragmentary portion of a clutch actuating device shown at the bottom in Fig. 3;

Fig. 10 is a schematic view of certain of the drive parts of the machine and a connecting wiring diagram of the electrical apparatus used in the machine; and

Figs. 11, 12, 13 and 14 are schematic views illustrating

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successive stages incidental to the division of built up unit tiers of articles into smaller unit tiers to fit and to be assembled into appropriate carriers.

As a preferred or exemplary embodiment of the instant invention the drawings illustrate a packing machine for assembling articles, in the instant case rectangular shaped fibre milk containers A (Fig. 3), into vertically disposed unit tiers of a predetermined number of containers arranged in rows stacked upon each other for insertion into a carrier B (Fig. 2) for shipment or storage.

In the machine, the containers A are received in a substantially continuous single moving line or procession C (Fig. 3) which is shifted upwardly and downwardly in a step-by-step fashion adjacent a plurality of supports extending across the open front end of a carrier B to build up an initial unit tier D (Fig. 11) of a plurality of rows or layers of containers stacked upon each other vertically. The initial tier D thus built up is of a height sufficient to fit a carrier B and preferably of a length sufficient to fit one or more carriers. By way of example the drawings show the initial tier D having a length of two carriers B, although the invention is equally well adapted to providing a tier D having a height of more than one carrier for packing carriers arranged in tiers.

Upon completion of the initial tier D of containers A, the tier is divided as to length to form smaller unitary tiers E to fit the carriers B as shown in Fig. 12. These unitary tiers E are then pushed forward toward the open ends of the carriers. Succeeding unitary tiers E are pushed forward against those already advanced and in this manner the containers push each other forward into the carriers to fill them. By way of example, the drawings show each initial tier D consisting of seven vertically stacked rows, each row containing 18 containers. This initial tier D is divided into two unit or unitary tiers E of 7 rows with 9 containers in each row. Each carrier B holds three of these unitary tiers E thus making a total of 189 containers in each carrier. The initial tiers D of containers are built up in two directions, from the bottom upwardly for one tier and from the top downwardly from the next tier.

The machine for packing the containers A into the carriers B preferably is equipped with two packing or loading stations G, H (Figs. 1, 3 and 11) although any number of stations within reason may be provided in side by side relation or in vertically disposed relation. At each station, the machine is provided with a rectangular shaped, horizontally disposed mold or shoe horn 21 (Figs. 1 and 2) having a horizontal bottom wall section, tapered side wall sections and open ends. These molds 21 are disposed side-by-side with their open ends facing the front and back of the machine (right and left as viewed in Fig. 1) and are supported on a rectangular frame 22 which constitutes the main frame of the machine. The tapered sides of the molds slope from front to back thereby making the front opening larger than the back opening.

The back opening of the molds 21 is rectangular in shape and is substantially the same dimensions as the open end of a carrier B, to permit the passage of the containers A through the mold and into the carrier. Adjacent the back open end of the molds 21, each station G, H is equipped with a conventional holding device having horizontally extending holding elements 23 (Fig. 1) which support a carrier B in a horizontal position with its open end adjacent the back end of the mold to receive the containers therefrom. There are several well known holding devices which may be used for this purpose such as those disclosed in the following United States Patents 2,608,331 issued August 26, 1952 to E. Hoffman; 2,561,410 issued July 24, 1951 to J. F. Peters and 2,608,332

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issued August 26, 1952 to R. K. Pottle; all on Bag Opening Machines. Empty carriers B are placed on the holding elements 23 and are subsequently removed when filled with containers, manually.

Adjacent the front open ends of both molds 21, the machine is provided with a series of horizontally disposed stationary shelves 25 (Figs. 2 and 3) arranged in vertically separated relation and spaced apart a distance substantially equal to the vertical dimension of a container lying on its side. These shelves 25 are of a width substantially equal to the length of a container A and are of a length extending the full width of the two adjacently disposed molds 21. The shelves are supported at their four corners by uprights 26 secured at their lower ends to the main frame 22. There preferably are seven of these shelves 25, defining seven spaces for receiving rows of containers A to make up an initial multi-layer tier D of the containers.

The containers A to be inserted in the spaces between the shelves 25, are received in a horizontal, contiguous, side-by-side relation, from any suitable source of supply such as a container making machine, in a substantially continuous single line or procession C. This procession C is supported on and is advanced into the machine by a continuously operating endless belt conveyor 31 (Fig. 3) which in the disclosed machine operates over a pulley 32 mounted on a shaft 33 journaled in bearings 34 of a stationary bracket 35. A pair of spaced and parallel guide rails 36 attached to the bracket 35 keeps the advancing containers in straight line alignment.

The conveyor 31 feeds the procession of containers A across a bridge member 38 attached to the bracket 35 and pushes them onto a continuing endless belt elevator conveyor 41 (Fig. 3) which is disposed in endwise alignment with and which carries the containers toward the shelves 25. Side guides 42 disposed adjacent the upper run of the conveyor keep the containers in line. This elevator conveyor 41 operates over a pair of spaced pulleys 43, 44. The pulley 43 is a driving pulley and is disposed adjacent the pulley 32 of the feed conveyor 31 and is mounted on a shaft 45 journaled in bearings 46 in the bracket 35. The elevator conveyor 41 is continuously actuated in time with the feed conveyor 31 by a pair of sprockets 47, 48 which are mounted on the pulley shafts 33, 45 respectively and which are connected and driven by an endless chain 49 which operates over the sprockets.

The opposite pulley 44 is an idler pulley and is disposed for vertical reciprocating movement adjacent the entrance ends of the shelves 25 (at the left as viewed in Fig. 3) so as to hinge the entire elevator conveyor 41 on the shaft 45 of the driving pulley 43. For this purpose the idler pulley 44 is mounted on a shaft 52 which at its ends is journaled in a U-shaped bracket 53 (see also Figs. 2 and 8) carried on the upper end of a vertical elevator rod 54 slideably disposed for vertical movement in a pair of spaced slide bearings 55 which extend out from the main frame 22.

The elevator rod 54 is lifted in time with the other moving parts of the machine in a step-by-step fashion to align and stop the discharge end of the elevator conveyor 41 at the entrance end of each of the shelves 25 to permit containers from the elevator conveyor to be fed into position on the shelves. This vertical stepped movement of the elevator rod 54 is brought about by a long lever 57 (Figs. 1, 2, 3 and 8) which intermediate its length is mounted on a pivot stud 58 threadedly secured in a side of the machine frame 22. One end of the lever 57 is connected to the elevator rod 54 by a pin 59 which extends through the rod and which operates in slots 61 formed in a bifurcated end of the lever. The opposite end of the lever 57 carries a cam roller 63 which operates against the outer stepped periphery of an edge cam 64 mounted on a short shaft 65 journaled in a bearing 66 formed in the machine frame 22.

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Within the machine frame 22 the short shaft 65 carries a Geneva wheel 68 (see also Fig. 4) which is rotated through partial or stepped rotations by a Geneva driving disc 69. The Geneva disc is a conventional device having a driving pin 71 for driving engagement in slots 72 spaced around the periphery of the Geneva wheel 68 and having a cylindrical locking face 73 for locking engagement with concave locking faces 74 on the edge of the wheel between the slots 72 to hold the wheel stationary between partial rotations.

The Geneva disc 69 is mounted on and is keyed to a sleeve 76 (see Fig. 6) of a free member 77 of a one revolution clutch 78 (see also Fig. 7). The free member 77 is freely mounted on a shaft 79 journaled in bearings 81 formed in the machine frame 22 and in a bracket 82 secured to the frame (see Figs. 1 and 3). The free member 77 of the clutch 78 is normally stationary but when activated is rotated through a single revolution by an actuating ring 84 which overlaps and surrounds the free member 77 and is formed with an internal notch 85 (Fig. 7). The ring 84 is formed integrally with and is rotated by a gear 86 which meshes with a continuously rotating pinion 87 (Figs. 1 and 3) on the rotor shaft of an electric motor 88 maintained in continuous operation.

The free member 77 of the clutch 78 is activated through a driving key 91 (Fig. 7) which is disposed in a recess 92 in the periphery of the member and is pivotally mounted in the member for hinging movement. A spring barrel 93 in the member presses the driving key outwardly toward the inner face of the surrounding ring 84 containing the driving notch 85. The key 91 is normally held inwardly away from the path of travel of the notch 85 by a vertically disposed flapper arm 94 (Figs. 2, 3, 6, 7, 9 and 10) which extends under and supports the key. Intermediate its length the flapper arm 94 is mounted for lateral rocking displacement on a pivot pin 95 (Figs. 3, 9 and 10) carried in a bearing bracket 96 secured to a side wall of the machine frame 22. The lower end of the flapper arm 94 is connected to a movable core 97 of a normally deenergized electric solenoid 98 mounted on the bracket 96. A tension spring 99 stretched between the lower end of the flapper arm 94 and the bracket 96 maintains the core 97 in a retracted position as shown in Fig. 10.

The solenoid 98 is energized to activate the one revolution clutch, through action of the containers A as they are fed into loading position on the shelves 25. For this purpose the solenoid 98 is connected to a pair of lead wires 101, 102 (Fig. 10) one of which (101) is connected with a source of electric current such as a generator 103. The lead wires 101, 102 are connected in series, by short connecting wires 104, 105, to a series of normally open electric switches 106 disposed adjacent the shelves 25. There are seven of these electric switches 106, located one adjacent the far end (at the right as viewed in Fig. 3) of each shelf 25 and each switch is provided with a movable element 107 (Fig. 1) which is movable in one direction only to close the switch. This is a conventional switch which is commercially available.

Adjacent each element 107, the machine is provided with a yieldably mounted stop pad 108 (Figs. 11 to 14) which is located in the spaces between the shelves 25, there being one stop pad 108 for each shelf. These stop pads 108 are secured to the inner ends of horizontally disposed rods 109 which are slideably carried in bearings formed in a pair of vertical webs 111 formed on the machine frame 22 adjacent the far ends of the shelves 25. The outer ends of the rods 109 are formed with actuating lugs 112 disposed adjacent the movable elements 107 of the switches 106. Compression springs 114 located between the webs 111 and interposed between the outer web 111 and locating collars 115 on the rods, yieldably hold the collars 115 normally against the inner web 111

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and thus hold the stop pads 108 and lugs 112 in a normal inoperative position.

In the operation of the machine, the containers A on the elevator conveyor 41 aligned with a shelf 25, as for example the first or lowermost shelf as shown in Fig. 3, are advanced by the conveyor into position on the shelf and push each other along the shelf toward the far end until the shelf is full and the leading container engages and is stopped by the stop pad 108 at the far end of this first shelf as shown in Fig. 11. This stops further travel of the line or procession of containers. Support of the containers during their transfer from the elevator conveyor 41 to the shelf 25 is effected by a bridge plate 117 (Fig. 8) which is part of a bracket 118 secured to the U-shaped bracket 53.

Engagement of the leading container A of the line positioned on the first shelf 25 as shown in Fig. 11 pushes the stop pad 108 outwardly against the resistance of its spring 114, a sufficient distance to push the lug 112 past the movable element 107 of the adjacent electric switch 106 and thus momentarily closes the switch. This momentary closing of the switch 106 is sufficient to momentarily energize the solenoid 98 (Fig. 10) and thus draw its movable core 97 into the solenoid. This movement of the core 97 rocks the flapper arm 94 of the one revolution clutch 78 and causes the upper end of the arm to move laterally outward toward the left as viewed in Figs. 3, 6 and 10) and thus slide out from under the driving key 91 (Fig. 7) of the free normally stationary element 77 of the clutch. The key 91 under pressure of the spring barrel 93 pivots down into engagement with the inner face of the ring 84 and is engaged by the notch 85 in the rotating ring to connect the free clutch member 77 to the ring and thus cause the free member to revolve with the ring.

When the flapper arm 94 moves laterally to release the driving key 91 and permit it to drop down into operating position, the flapper cannot return to its normal position until the ring 84 rotates the free member 77 sufficiently to move the key away from the arm. As soon as this takes place however the arm returns to its normal position under tension of the solenoid core spring 99, and the key upon making one revolution with the ring 84, rides up onto the top edge of the flapper arm and is thus unlatched from the notch 95. The free member 77 thereupon, after making one revolution, stops while the ring 84 continues to rotate.

During this one revolution of the free member 77 of the clutch 78, the clutch sleeve 76 and the Geneva disc 69 mounted thereon, rotates with the free member and partially rotates or advances the Geneva wheel 68 through one step of rotation. This partially rotates the shaft 65 (Fig. 2) through one step and likewise partially rotates the edge cam 64 mounted thereon. In the instant machine where seven shelves 25 are provided, the partial rotation of the cam 64 is one fourteenth of its full rotation, one half of the cam being utilized for moving the conveyor 41 upwardly and the other half being utilized to return the conveyor to its lowered position. For this purpose the edge of the cam 64 is provided with graduated steps or flats 116 (Fig. 2).

The partial rotation of the cam 64 advances it one step or flat 116 and rocks the lever 57 sufficiently to raise the elevator rod 54 and the elevator conveyor 41 supported thereon, through one step of elevation from the position shown in Fig. 3, to a position where the upper run of the elevator conveyor 41 is an endwise alignment with the second or next higher shelf 25. This raising of the elevator conveyor 41 cuts off the line of containers A and leaves a full row of 18 of the containers on the first shelf 25. This cutting off of the line is effected preferably by pairs of cut off rails or elements 119, 120 (Fig. 8) which are secured to the bracket 118 and which extend vertically

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below and above the conveyor adjacent the entrance ends of the shelves 25.

In this manner, through repetition of the operation just explained each of the seven shelves 25 when the conveyor 41 reaches and loads the top shelf, are loaded with a full row of 18 containers making a total of 126 containers which taken collectively constitute the initial tier D of vertically stacked rows of containers hereinbefore mentioned. When a full initial tier D of containers is so built up on the shelves 25 as described, the layer is divided into two unitary tiers E as mentioned hereinbefore and the containers are then pushed off the shelves into the carriers B by a pair of pushers or pusher elements 124, 125 (Figs. 1, 2, 3, 5 and 11) disposed in front of the shelves 25 and in endwise alignment with the carriers B at the sections G, H.

The pusher elements 124, 125 (Figs. 1 and 2) preferably are cubical in configuration, of dimensions substantially equal to those of the carriers B and are provided with a plurality of horizontally disposed and vertically spaced prongs 126 adapted to fit into the spaces between the shelves 25. Each pusher element is provided with seven prongs. The elements are mounted on horizontal slide bars 127 secured in the machine frame 22 and on which the elements slide toward and away from the carriers B. In their normal positions the pusher elements 124, 125 are disposed clear of the shelves 25 so that they do not interfere with the feeding of the containers A into place on the shelves.

The pusher elements 124, 125 are shifted independently of each other through cam operation and in time with the raising and lowering of the elevator conveyor 41. For this purpose the first pusher element 124 is pivotally connected by a link 129 (Figs. 1 and 2) to the upper end of a bell crank 131 loosely carried on a horizontal shaft 132 supported in bearings 133, 134 formed respectively in the machine frame 22 and in the bracket 82 (see Fig. 1). A lower arm 136 of the bell crank 131 carries a cam roller 137 (Figs. 3 and 5) which operates in a cam groove 138 of a double face cam 139 mounted on a sleeve 141 (Fig. 6) of a one revolution clutch 142 carried on the clutch shaft 79 adjacent the clutch 78 hereinbefore mentioned.

In a similar manner the second pusher element 125 is pivotally connected by a link 144 (Figs. 1 and 3) to a lever 145 mounted on the shaft 132 for rocking the shaft and an arm 146 carried thereon. The arm 146 carries a cam roller 147 (Fig. 3) which operates in a cam groove 148 (see also Figs. 5 and 6) in the opposite face of the face cam 139.

The face cam 139 normally is stationary but is rotated through a single rotation through the clutch 142 each time an initial tier D of containers A is built up. For this purpose the one revolution clutch 142 is provided with a free member 151 (Fig. 6) similar to the free member 77 of the clutch 78 and surrounded by a notched ring 152 formed integrally with the ring 84 and gear 86. The free member 151 carries a driving key 153 similar to the key 91 of the clutch 78 and held in normally inoperative position by a flapper arm 154 similar to the flapper arm 94. The flapper arm 154 like the arm 94 is mounted on a pivot pin 155 (see Figs. 3 and 9) carried in the bracket 96. The lower end of the arm 154 is connected to a movable core 156 of an electric solenoid 157 mounted on the bracket 96 adjacent the solenoid 98. A tension spring 158 stretched between the lower portion of the flapper arm 154 and a depending pin 159 in the bracket 96, holds the core 156 in a retracted position and holds the upper end of the arm 154 under the driving key 153 of the clutch 142.

The solenoid 157 is connected by lead wires 161, 162 (Fig. 10) to a source of electric current such as a generator 163 and to a normally open electric switch 164 having a movable element 165 disposed adjacent a ring cam 166 secured to the inner face of the Geneva wheel

68 (see Figs. 1, 3 and 10). The cam is formed with a pair of diametrically disposed high spots 167, 168 arranged for engagement against the movable element 165 of the switch 164.

As the Geneva wheel 68 rotates through its stepped rotations to elevate the elevator conveyor 41 to build up an initial tier D of containers A on the shelves 25, it rotates the ring cam 166 and swings one of the high spots, which would be spot 168 as viewed in Fig. 3, past the movable element 165 of the electric switch 164 and thus momentarily closes the switch. This action takes place while the elevator conveyor 41 is up as far as it will go to deliver containers onto the seventh or top shelf 25 and is effected after the delivery of the containers.

In this top position of the elevator conveyor 41, the edge cam 64 is provided with a double or long step 116 to permit of holding the conveyor in position for delivery of two rows of containers to the top shelf 25, the first delivered row being to complete the first built up initial tier D and the second row to begin a new initial tier D which will be built up when the conveyor 41 descends through a return movement to be explained hereinafter. Closing of the switch 164 takes place after the first of the two rows is delivered to the top shelf 25.

This closing of the switch 164 momentarily energizes the solenoid 157 (see Fig. 10) and thereby momentarily draws its core 156 into the solenoid and thus rocks the flapper arm 154 of the clutch 142. This momentary working of the arm 154 releases the driving key 153 in the same manner as explained in connection with the clutch 78 and thereby effects a single revolution of the face cam 139.

During this one revolution of the face cam 139, its cam groove 138 rocks the bell crank 131 in a direction which slides the first pusher element 124 inwardly toward its carrier B while the cam groove 148 of the same cam holds the second pusher element 125 temporarily stationary. The inward movement of the first pusher 124 causes the prongs 126 of the element to engage against the first 9 containers A of all of the seven rows of containers on the shelves 25 and push these containers, a total of 63 containers, as a unit tier E inwardly off the shelves and into the tapered mold 21 of the carrier holding device at the first loading station G as best shown in Fig. 12. This action divides or separates the initial tier D into two separate unit tiers E, the first of which is now in the first mold 21 at station G and the second of which is still on the shelves 25.

During this initial tier dividing action the containers of the second unit layer E are pushed laterally of the first unit layer and longitudinally along their shelves 25 against the resistance of the stop pads 108 (Fig. 12) to create a space between the two unit tiers and to align the second unit tier E with its pusher element 125 and tapered mold 21 at the loading station H. This shifting of the containers of the second unit tier E is effected by a plurality of pusher fingers or auxiliary pusher means 171 (Figs. 1, 3, 11 and 12) which are disposed within recesses 172 in the edges of the prongs 126 of the first pusher element 124 at the station G. There are seven fingers, one finger for each row of containers on the shelves 25. These fingers 171 are mounted on a vertical pivot shaft 173 carried in bearings in the pusher element 124. The shaft 173 carries an actuating lever 174 having a cam roller 175 which operates in a cam groove 176 of a stationary cam 177 secured to the machine frame 22.

As the first pusher 124 at station G moves forward to push its unit tier E of containers into the tapered mold 21, the cam roller 175 traverses the cam groove 176 and thus rocks the lever 174 and pivot shaft 173 to swing the pusher fingers 171 in unison laterally against the containers A of the second unit tier E and thus slide these containers along their shelves 25 into alignment

with the second pusher element 125 as shown in Fig. 12. With the second unit tier E thus separated or divided from the first, the second pusher element 125 moves forward under the influence of its cam groove 148 in the cam 139 and thus pushes this unit tier E of 63 containers off the shelves 25 and into the mold 21 at the station H as shown in Fig. 13. This shifting of the containers from the shelves 25 permits the spring urged stop pads 108 to return to their original positions for repeat operation. During this forward movement of the second pusher element 125, the first pusher element 124 moves back into its normal position as shown in Fig. 13, and is immediately followed by the return movement of the second pusher element 125 as shown in Fig. 14.

The forward movement of the first pusher element 124 cuts off the procession of incoming containers A from the elevator conveyor 41 as shown in Fig. 12 and holds back these containers until the pusher element returns to its normal position. Upon its return, the pusher element 124 releases these incoming containers and permits the elevator conveyor 41 to again feed containers to the top shelf 25 until they engage and are stopped by the forwardly disposed second pusher element 125 as shown in Fig. 13. When this second pusher element returns to its normal position the containers are further released so that they can fill the top shelf 25 to capacity, which process is shown in Fig. 14.

When the top shelf 25 is filled and the leading container engages the stop pad 108 to close its switch 106, the stage is set for the lowering of the elevator conveyor 41 to the next lower shelf 25 for a repeat operation, and thus as the conveyor 41 is lowered step-by-step it fills all the shelves 25 to build down, from top to bottom, another horizontally elongated initial tier D, to be divided into relatively short unit tiers E for successive projection into the molds 21 by a repeat operation of the pusher elements 124, 125 as explained above. This procedure of building up initial tiers D of containers on the shelves 25 and their division into unit tiers E and their forward movement into the molds 21 is repeated endlessly as the machine operates to raise and lower the elevator conveyor 41 through its stepped movements. As each unit tier E is pushed forward into its mold 21, it pushes forward a previously inserted unit tier until three such unit tiers E are disposed in each of the carriers B located adjacent the molds. When the carriers are filled they are removed manually for sealing and new empty carriers are placed in position to be filled.

It is thought that the invention and many of its attendant advantages will be understood from the foregoing description, and it will be apparent that various changes may be made in the form, construction and arrangement of the parts without departing from the spirit and scope of the invention or sacrificing all of its material advantages, the form hereinbefore described being merely a preferred embodiment thereof.

I claim:

1. In a machine for packing articles into carriers, the combination of a plurality of vertically spaced fixed supports extending past a plurality of adjacently disposed packing stations for supporting an initial vertical tier of articles in superposed rows, means adjacent said supports for mounting a plurality of juxtaposed carriers, means for advancing the articles to one of said supports to fill the same, movable means cooperating with said advancing means for directing the articles to said supports in succession as the latter are filled to stack said articles in said vertical tier with said supports disposed between adjacent superposed rows of articles, pusher means at each of said stations and disposed adjacent said supports and engageable in succession with the superposed articles in said initial tier for dividing said initial vertical tier into a plurality of unit tiers and for pushing said unit tiers from said supports for transfer into said carriers, and means for actuating said pusher means in succession,

2. In a machine for packing articles into carriers, the combination of a plurality of vertically spaced, fixed supports extending past a plurality of adjacently disposed packing stations for conjointly supporting an initial vertical tier of articles disposed in superposed rows thereof, means adjacent said supports for holding a plurality of juxtaposed carriers, means for advancing the articles to one of said supports, movable means cooperating with said advancing means for directing the articles to said supports in succession as the latter are filled to stack said articles in said vertical tier with said supports disposed between adjacent superposed rows of articles, a pusher member disposed adjacent said supports at one of said stations for engaging a portion of said initial article tier for dividing out and removing transversely from said supports a unit tier of superposed rows of said articles for packing into a said carrier, an auxiliary pusher member engageable with the remaining portion of said initial tier of articles for advancing it longitudinally along said supports into alignment with an adjacent packing station, means for actuating said auxiliary pusher member in synchronism with said pusher member, a second pusher member disposed adjacent said supports at said second packing station for engaging said remaining initial tier portion for dividing out and removing from said supports another unit tier of said articles for packing into another carrier, and means for actuating said pusher members in succession for the purpose described.

3. A machine of the character defined in claim 2 in which said auxiliary pusher member is carried by and is movable with and relative to said first mentioned pusher member.

4. A machine of the character defined in claim 2 wherein said auxiliary pusher member comprises a plurality of vertically spaced pusher fingers movably mounted on said first mentioned pusher member and respectively disposed adjacent said superposed rows of said articles in said initial tier thereof.

5. In a machine for packing articles into carriers, the combination of a plurality of horizontally disposed vertically spaced and aligned continuous support shelves extending in front of at least two packing stations for supporting an initial vertical tier of articles in superposed rows, said tier being of a height sufficient to fit a carrier and of a length sufficient to fit at least two carriers, means adjacent said support shelves for mounting a plurality of juxtaposed carriers, means for advancing the articles to said support shelves, a vertically movable elevating conveyor cooperating with said advancing means for directing said articles in succession to said support shelves as the latter are filled to form a plurality of superposed rows of articles in said vertical tier, a pronged pusher at each of said stations and adjacent said support shelves and engageable in succession with adjacent portions of the initial tier of articles on said filled support shelves for dividing said initial tier into at least two unit tiers each of a length to fit a said carrier, said pushers being further operative for pushing said unit tiers successively from said support shelves for respective packing into said carriers, means for intermittently actuating said elevating conveyor, and means for actuating said pushers in succession.

6. In a machine for packing articles into carriers, the combination of a plurality of horizontally disposed vertically spaced and aligned continuous support shelves extending in front of at least two packing stations for supporting an initial vertical tier of articles in superposed rows and of a height sufficient to fit a carrier and of a length sufficient to fit at least two carriers, means adjacent said support shelves for mounting a plurality of article carriers in side by side relation, means for advancing the articles to said support shelves, a vertically movable elevating conveyor for receiving the articles from said advancing means and for directing the articles progressively to said support shelves to successively fill the latter and constitute said vertical tier of articles, a pronged

pusher member disposed adjacent said support shelves at one of said stations for engaging a portion of the articles on each shelf for dividing out from said initial tier a smaller unit tier sufficient to fit a carrier and for removing said unit tier from said shelves for packing into a carrier, a plurality of pusher fingers pivotally mounted on said pusher member and movable therewith into the spaces between said shelves and adjacent the ends of the rows of articles exposed by removal of said unit tier, means for pivoting said pusher fingers simultaneously against the exposed ends of said rows of articles on said shelves to push the remaining portion of said initial tier longitudinally along said shelves into alignment with the other of said packing stations, another pusher member disposed adjacent said support shelves at said other station for engaging the aligned remaining portion of said initial tier and for removing it from said shelves for packing into a carrier, means intermittently actuating said elevating conveyor, and means for actuating said pusher members in succession for the purpose described.

7. In a machine for packing articles into carriers, the combination of a plurality of vertically spaced fixed support shelves extending past a plurality of adjacently disposed packing stations for supporting an initial vertical tier of articles in superposed rows, means adjacent said support shelves for mounting a plurality of article carriers in side by side relation, means for advancing the articles to said support shelves to successively fill the latter, a vertically movable elevating conveyor for receiving the articles from said advancing means and for directing the articles progressively to said support shelves to successively fill the latter and constitute said vertical tier of articles, a pusher member disposed adjacent said support at one of said stations for engaging a portion of the superposed articles in said initial tier for dividing out and removing from said support shelves a unit tier of said articles for packing into a said carrier, auxiliary pusher means engageable with the remaining portion of said initial tier of articles for advancing said remaining initial tier longitudinally along said support shelves and into alignment with another packing station, means for actuating said auxiliary pusher means in synchronism with said pusher member, resilient means engageable by said advancing remaining portion of said initial tier of articles for retarding said advancement of said articles to hold them in place at said another packing station, a second pusher member disposed adjacent said support shelves at said another packing station for engaging said remaining portion of said initial tier for dividing out and removing from said shelves another unit tier of said articles for packing into another carrier, means for intermittently moving said elevating conveyor into alignment with said support shelves in succession as the latter become filled with articles, and means for actuating said pusher member in succession.

8. In a machine for packing articles into carriers, the combination of a plurality of horizontally disposed vertically spaced and aligned support shelves extending in front of a packing station for supporting an initial vertical tier of articles in superposed rows, means for mounting an article carrier adjacent said shelves, an elevating conveyor having one end pivotally mounted for hinging action and having its opposite end movably disposed adjacent the entrance ends of said shelves, means for raising the movable end of said conveyor in a step-by-step movement into alignment with each of said shelves successively from the bottom shelf to the top shelf for filling each shelf with articles to build up an initial tier of superposed horizontal rows of articles, said raising means being thereafter operable for lowering said movable conveyor end in a step-by-step movement into successive alignment with each of said shelves from the top shelf to the bottom shelf for progressively building down a subsequent initial tier of horizontal rows of articles, a pusher member located at said station and operable for pushing said tiers

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of articles in succession from said shelves into a said carrier, and means for actuating said pusher member in time with the vertical movement of said conveyor.

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