Oct. 5, 1943. W. J. FEDORCHAK ET AL 2,331,018

PACKAGING MACHINE

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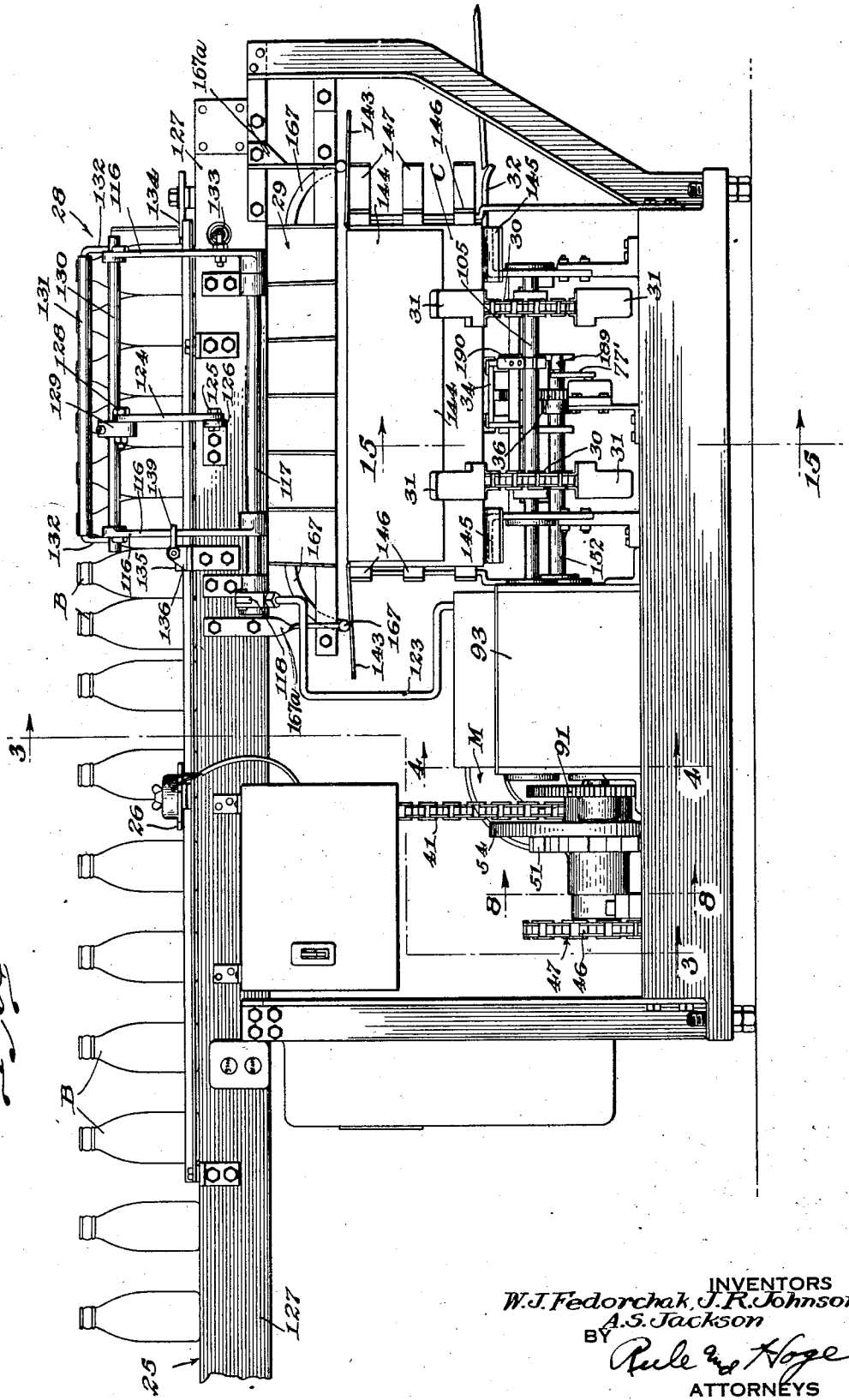


Fig. 1.

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PACKAGING MACHINE

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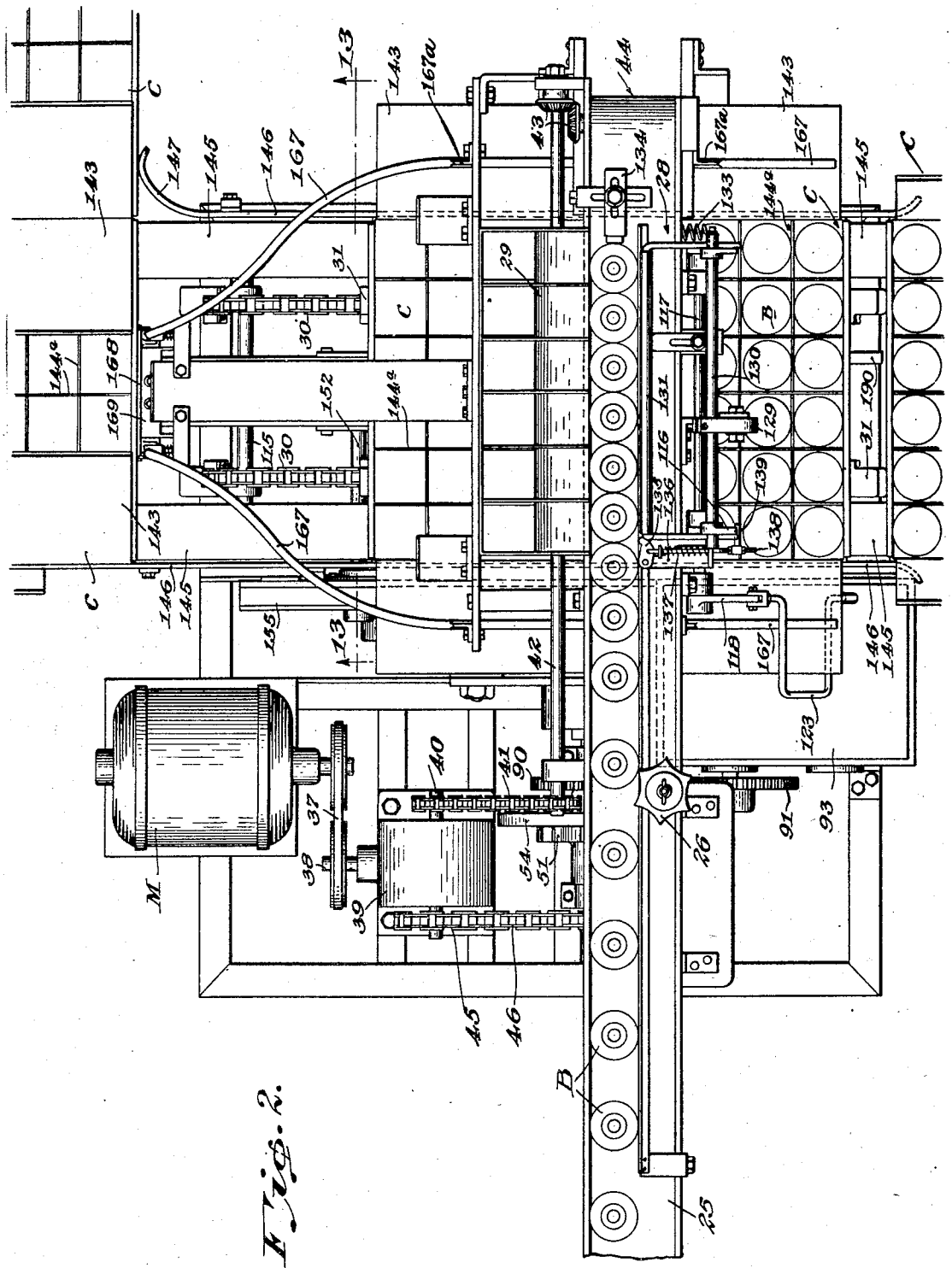


Fig. 2.

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PACKAGING MACHINE

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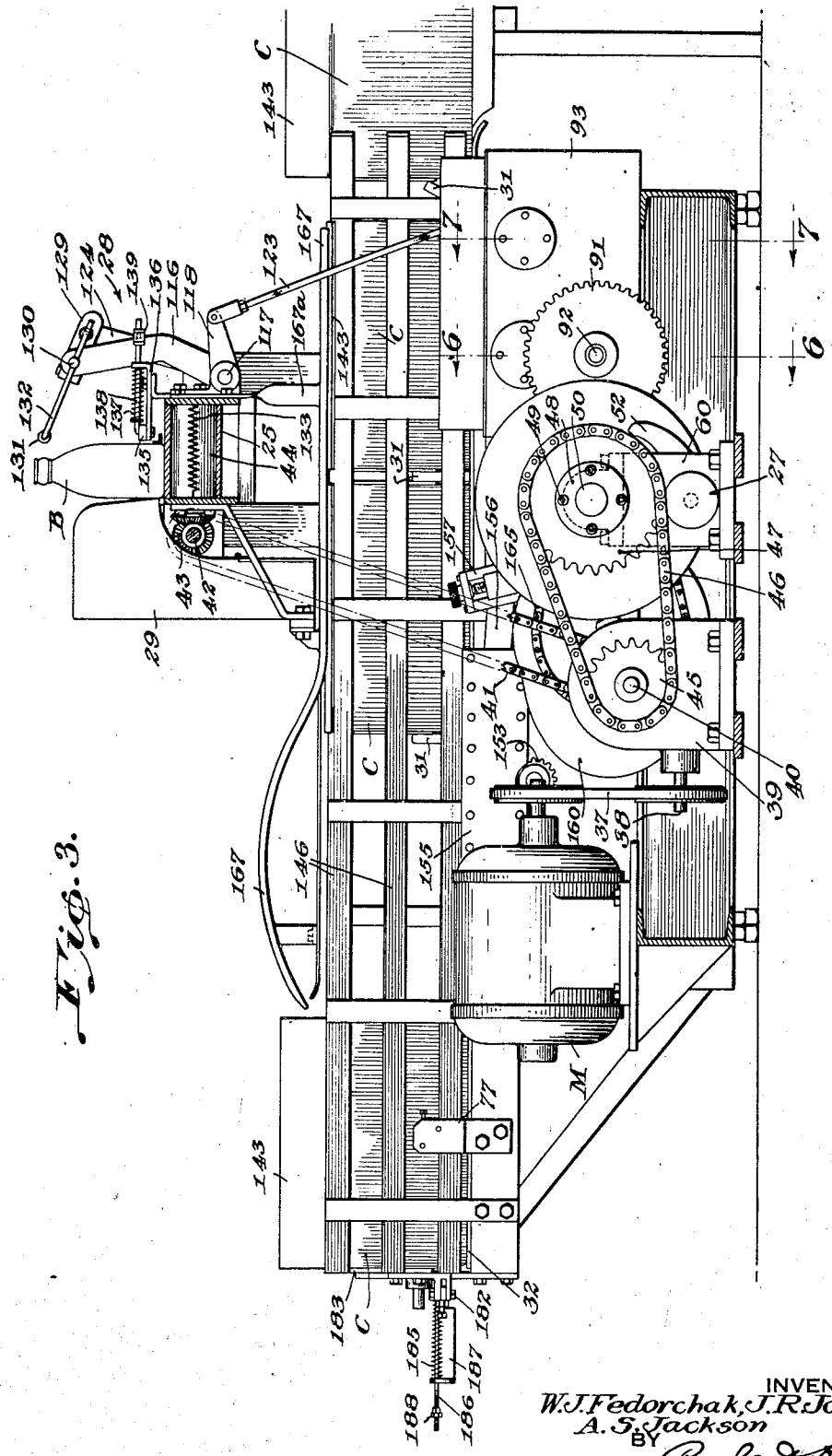


Fig. 3.

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PACKAGING MACHINE

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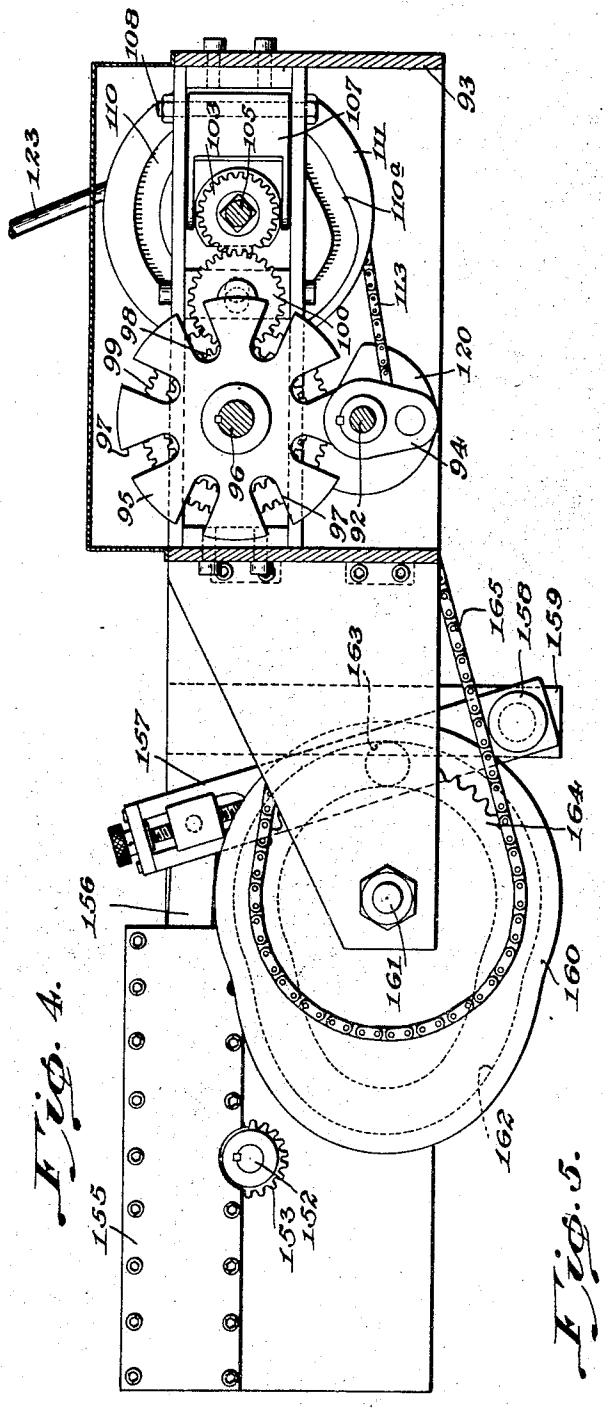


Fig. 4.

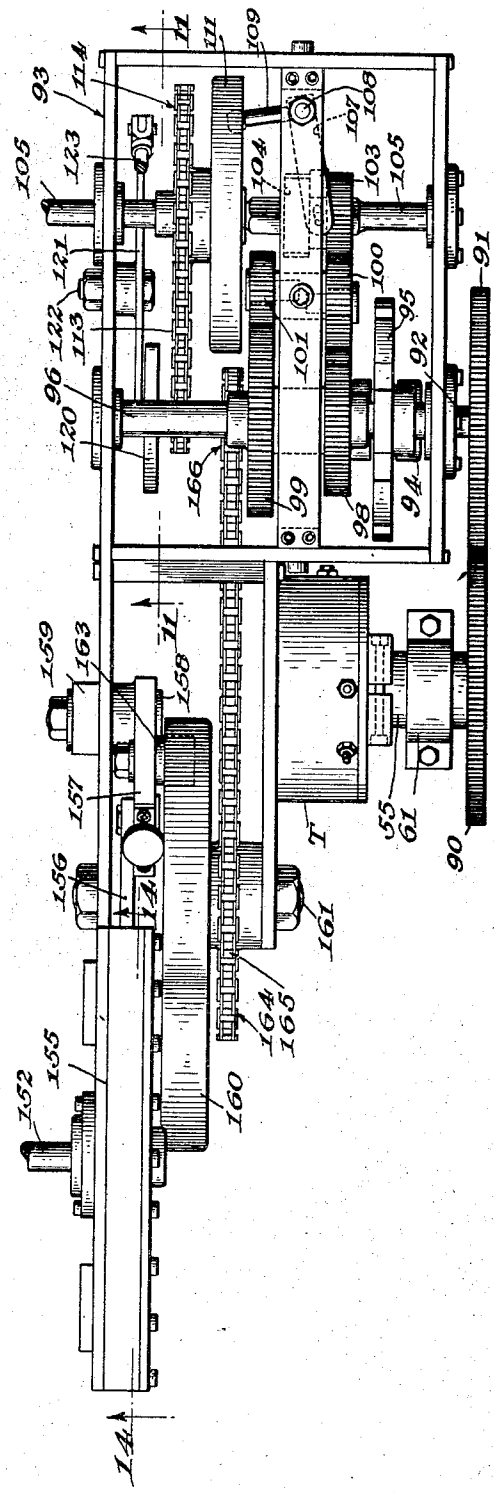


Fig. 5.

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Oct. 5, 1943. W. J. FEDORCHAK ET AL 2,331,018

PACKAGING MACHINE

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Fig. 7.

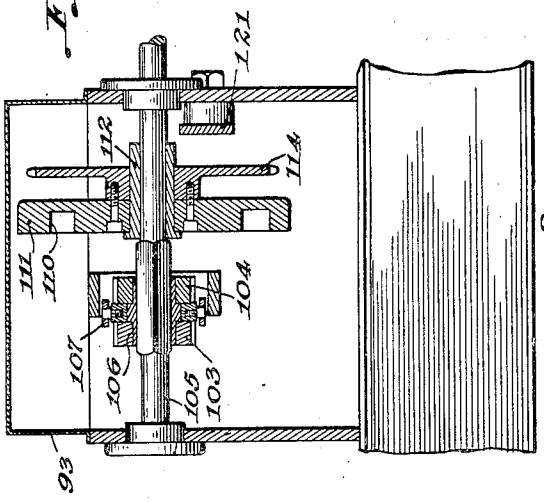


Fig. 9.

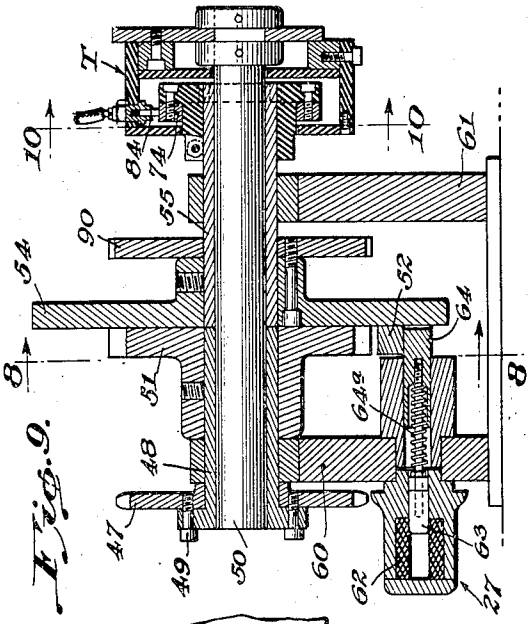


Fig. 8.

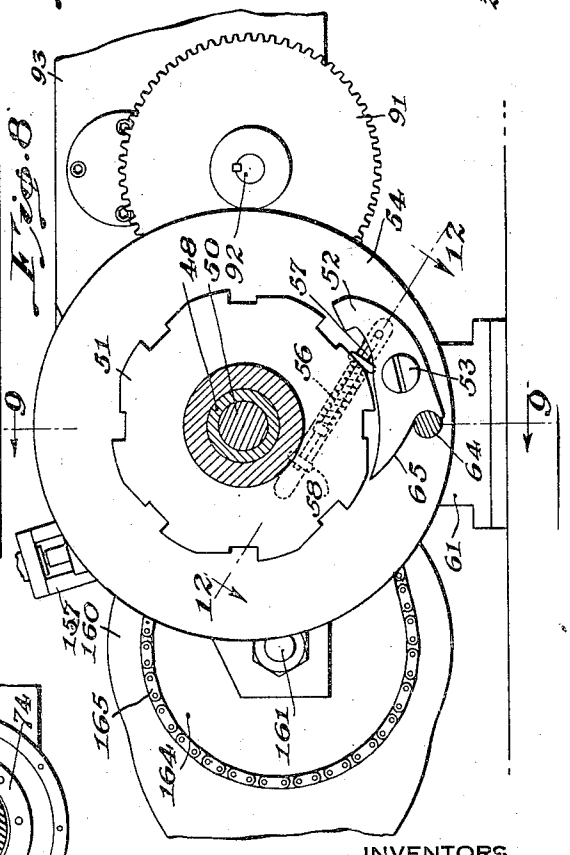


Fig. 6.

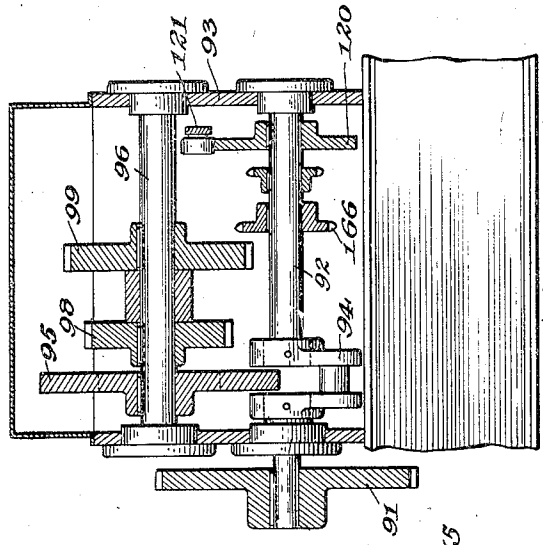
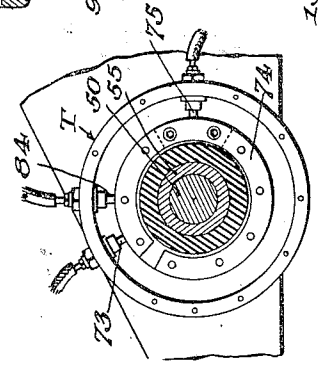


Fig. 10.



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PACKAGING MACHINE

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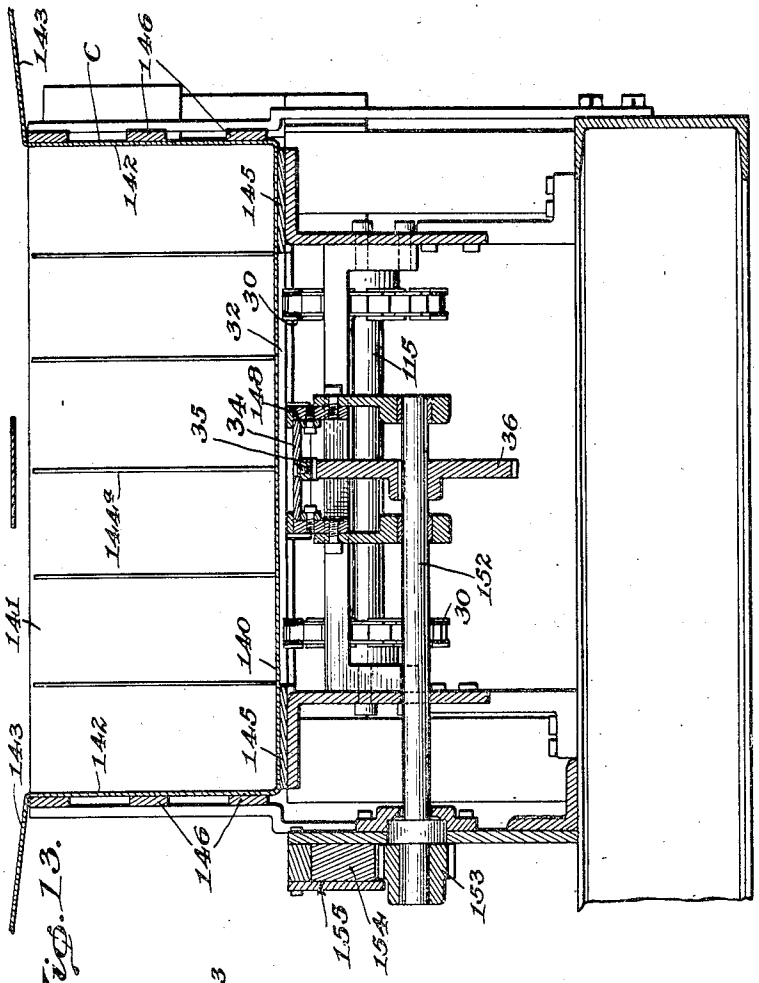


Fig. 13.

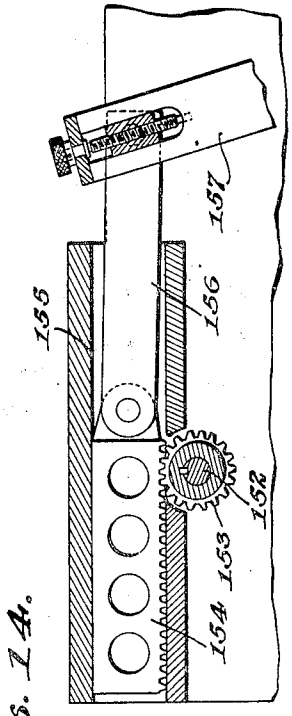


Fig. 14.

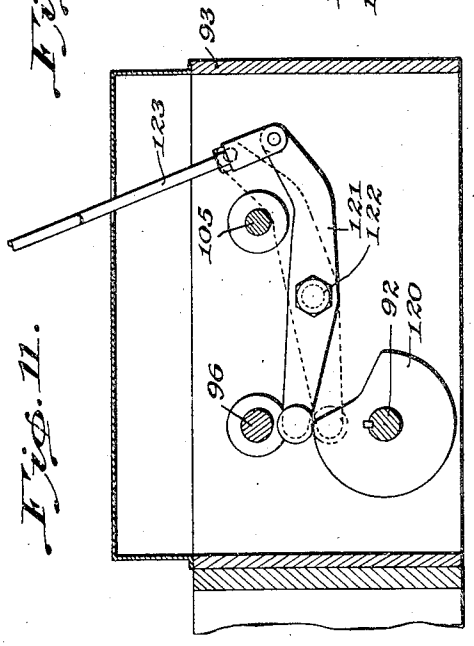


Fig. 11.

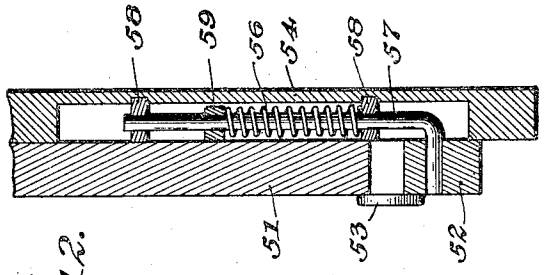


Fig. 12.

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PACKAGING MACHINE

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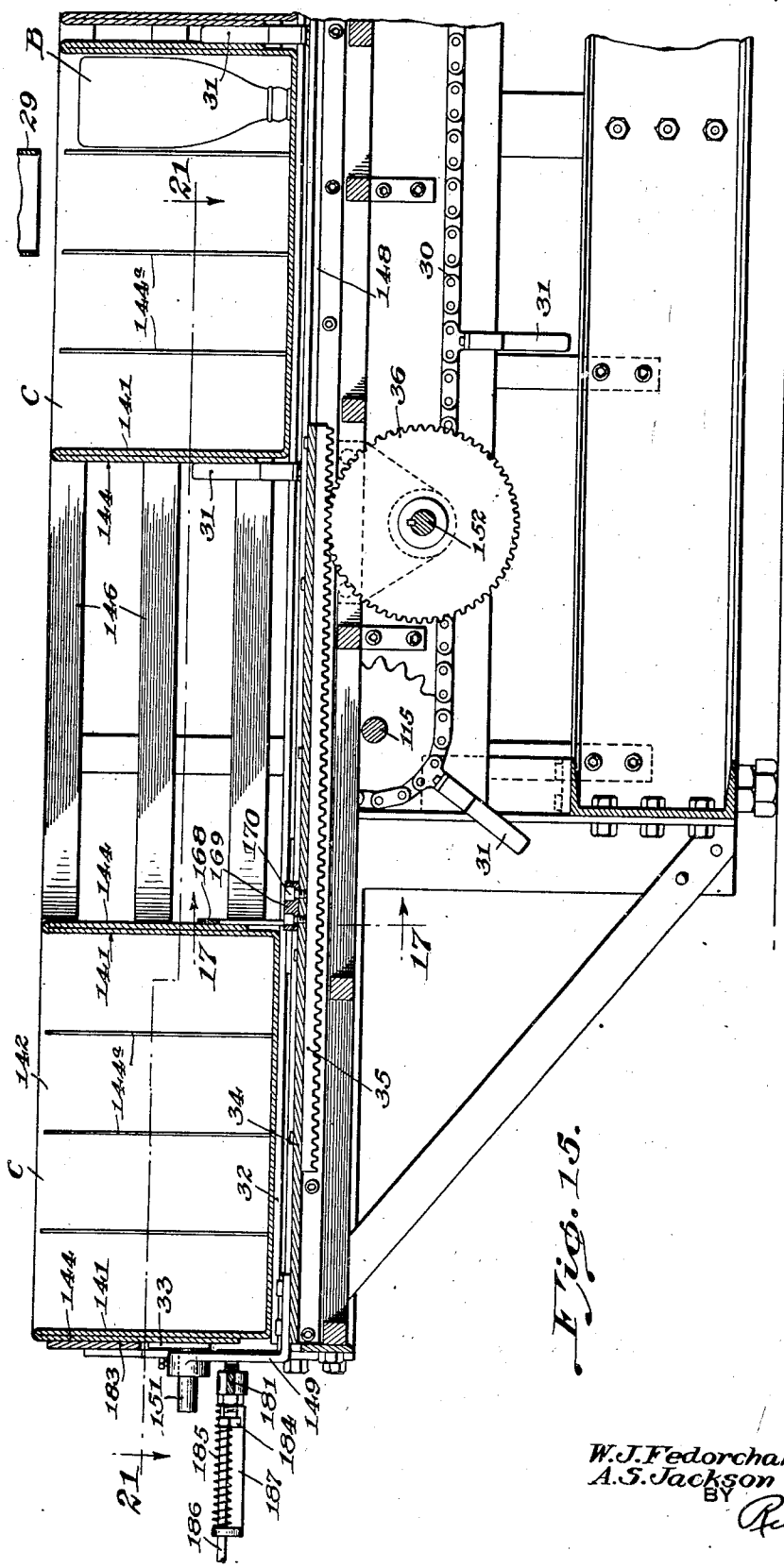


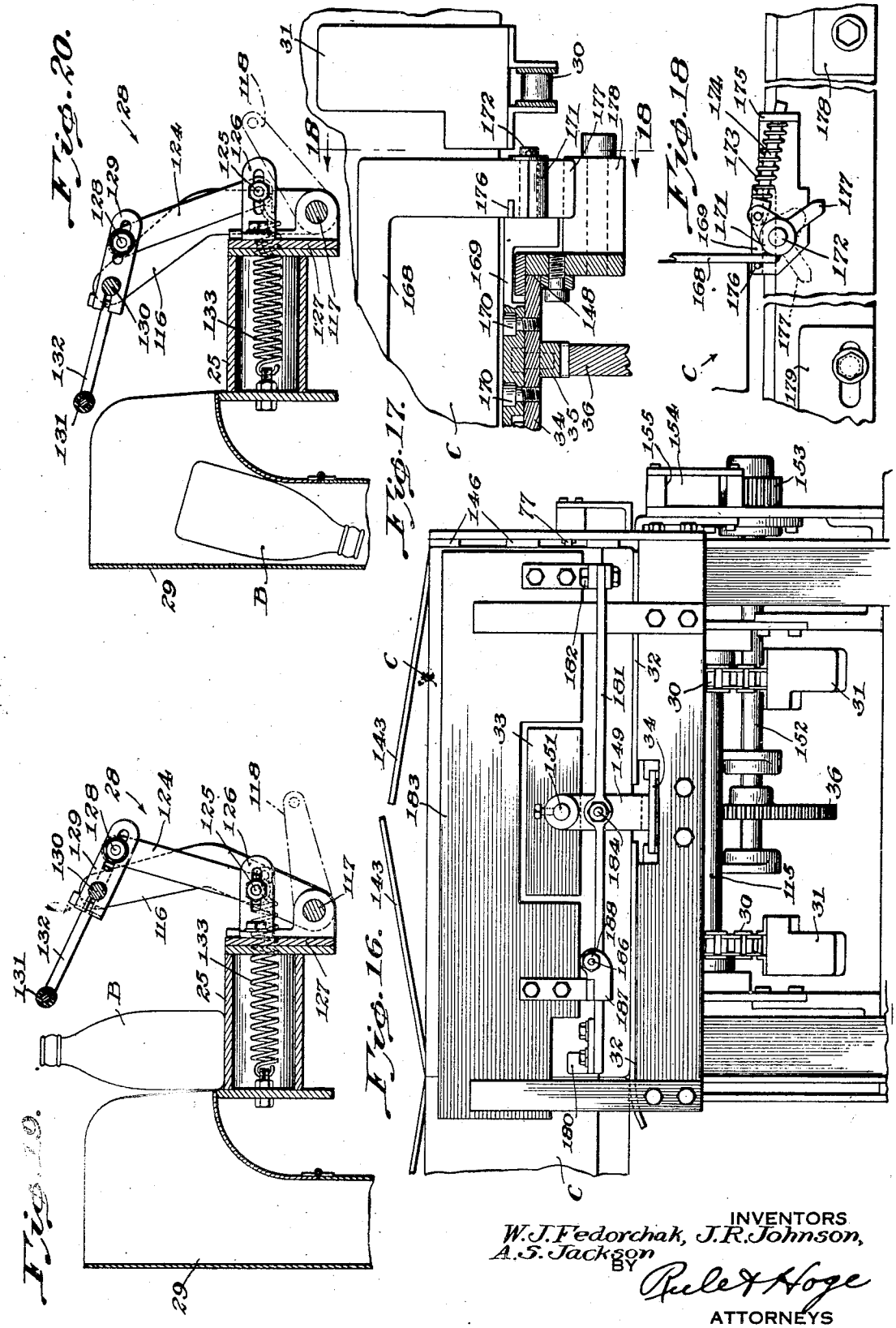
Fig. 15.

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PACKAGING MACHINE

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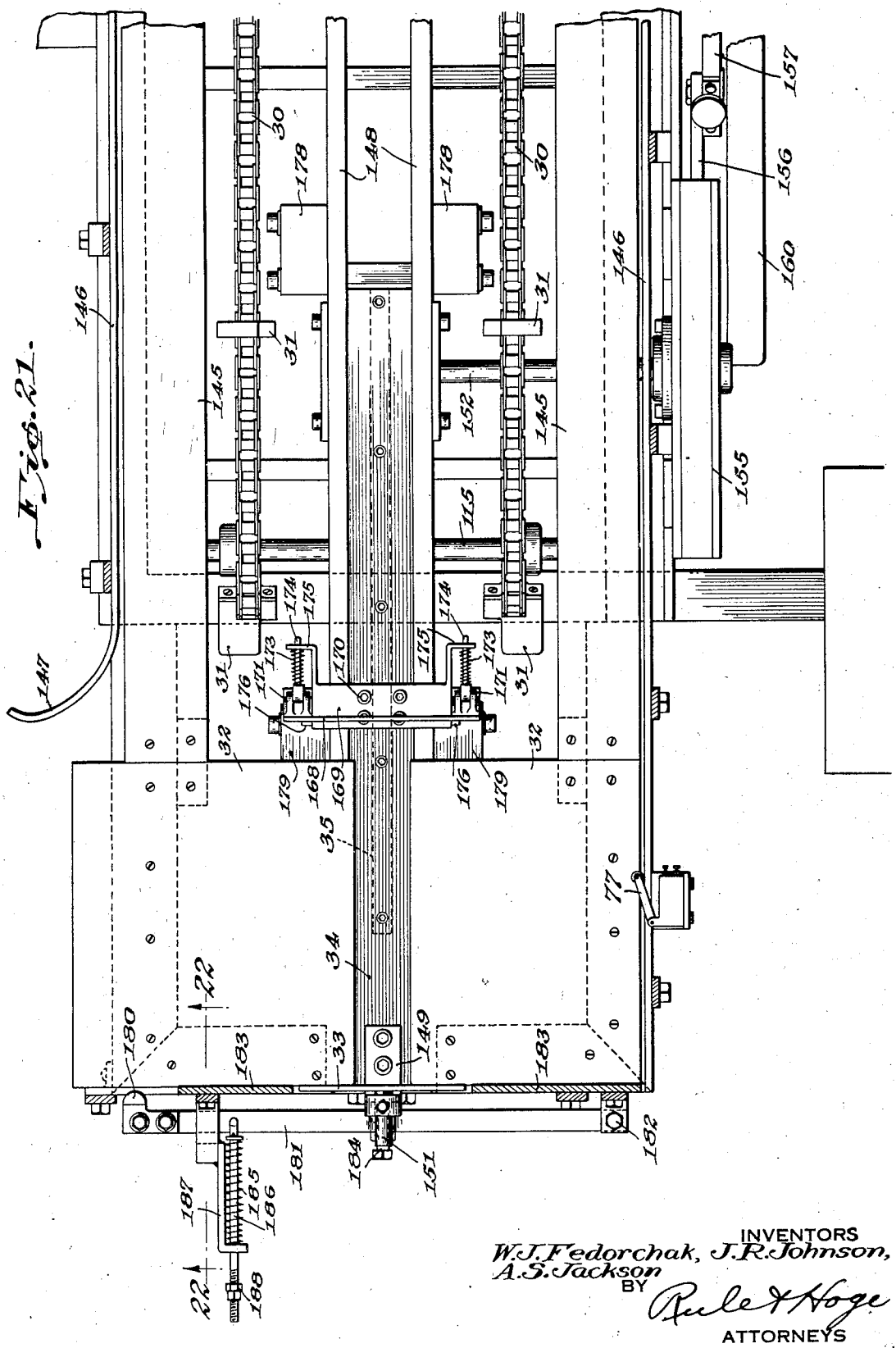
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PACKAGING MACHINE

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Fig. 21.



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PACKAGING MACHINE

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Fig. 23.

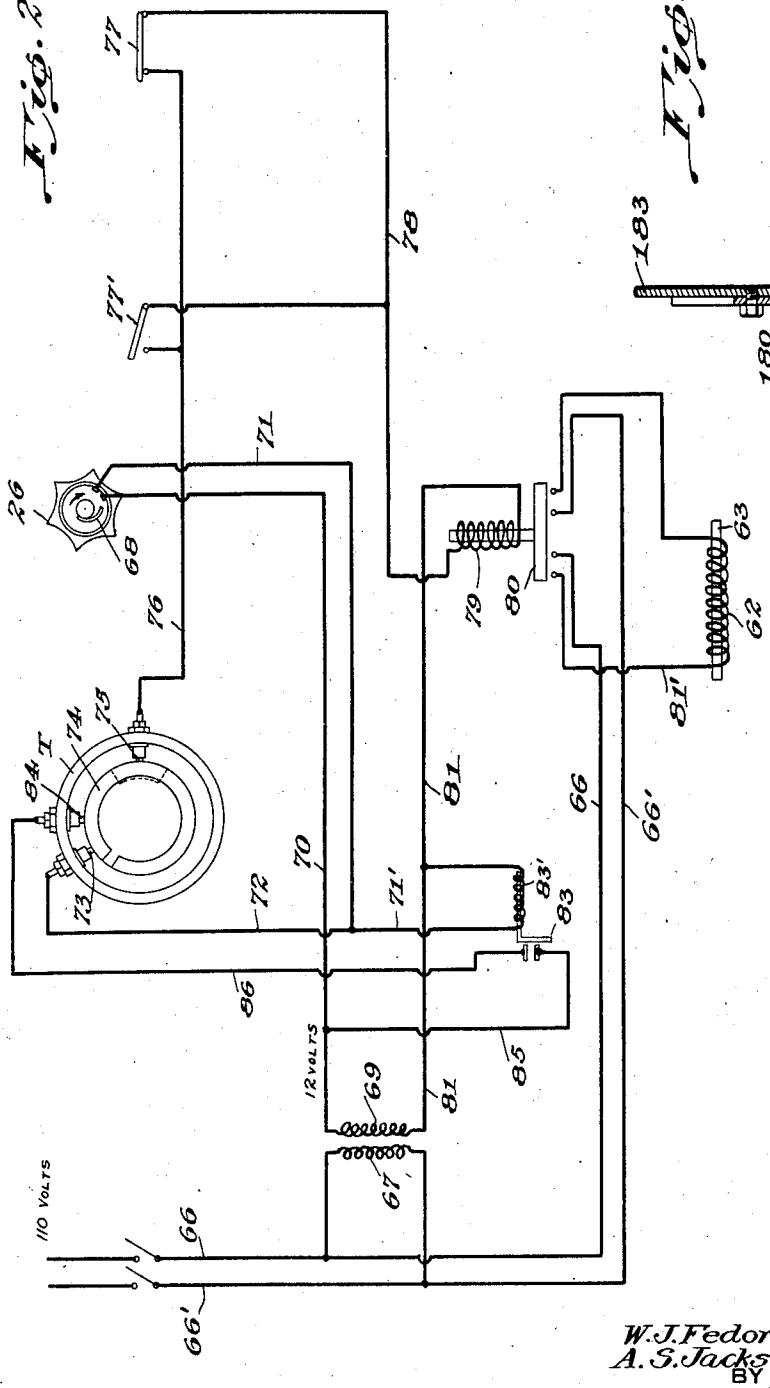
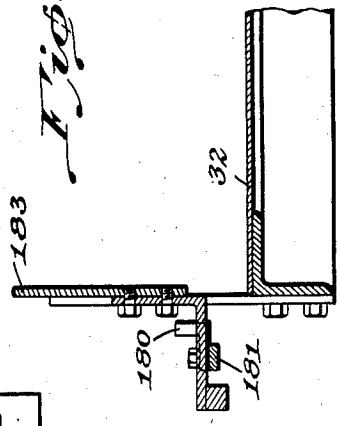


Fig. 22.



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Patented Oct. 5, 1943 2,331,018

UNITED STATES PATENT OFFICE

2,331,018

PACKAGING MACHINE

William J. Fedorchak, Granite City, John R. Johnson, Alton, and Albert S. Jackson, Wood River, Ill., assignors to Owens-Illinois Glass Company, a corporation of Ohio

Application October 25, 1940, Serial No. 362,816

12 Claims. (Cl. 226—14)

Our invention relates to packaging apparatus adapted for packing bottles, jars or other articles in cartons. The invention in the form herein illustrated is adapted for automatically placing bottles or like articles, a row at a time, in a carton which is provided with conventional partitions to divide the carton into individual cells.

At the present day in the manufacture and packing of bottles, jars and the like, the ware is usually inspected as it is taken from the annealing leer and packed by hand into cartons.

An object of our invention is to provide automatic means by which the bottles or other articles may be carried on a single line conveyor to a packaging zone and there transferred to the cartons. The invention provides an endless belt conveyor by which the bottles are carried to a packaging station, means for advancing the cartons step by step beneath the conveyor at said station, and means for transferring a row of bottles from the conveyor to the carton after each step movement of the carton, to fill one row of cells in the carton, the articles being directed through a chute, either in an upright position or inverted position into the carton.

Other objects of the invention will appear hereinafter.

Referring to the accompanying drawings which illustrate an apparatus particularly designed for packaging bottles in accordance with our invention:

Fig. 1 is a front elevation view of the apparatus;

Fig. 2 is a plan view, parts being broken away;

Fig. 3 is a sectional elevation at the line 3—3 on Fig. 1;

Fig. 4 is a sectional elevation at the line 4—4 on Fig. 1;

Fig. 5 is a plan view of gearing for driving various parts of the apparatus;

Fig. 6 is a sectional elevation at the line 6—6 on Fig. 3, showing the Geneva drive and associated gearing;

Fig. 7 is a section at the line 7—7 on Fig. 3;

Fig. 8 is a sectional elevation showing a one revolution clutch mechanism, the section being substantially at the lines 8—8 on Figs. 1 and 9;

Fig. 9 is a section at the line 9—9 on Fig. 8 showing the one revolution clutch mechanism and the timer device;

Fig. 10 is a sectional view of the timer device, the section being taken at the line 10—10 on Fig. 9;

Fig. 11 is a section at the line 11—11 on Fig. 5, showing cam operated means for tilting the bottles into the chute by which they are guided into the cartons;

Fig. 12 is a sectional detail at the line 12—12 on Fig. 8 showing means for actuating the clutch dog;

Fig. 13 is a sectional elevation at the line 13—13 on Fig. 2;

Fig. 14 is a section at the line 14—14 on line 5;

Fig. 15 is a section at the line 15—15 on Fig. 1;

Fig. 16 is a rear elevation view of the apparatus;

Fig. 17 is a sectional detail view, the section being taken at the line 17—17 on Fig. 15;

Fig. 18 is a fragmentary view taken as indicated by the line 18—18 on Fig. 17;

Fig. 19 is a sectional elevation of the tilting device by which the bottles are tilted into the guiding chute and directed into the carton;

Fig. 20 is a view similar to Fig. 19 but showing the tilting means in a different position;

Fig. 21 is a sectional plan view of the apparatus, parts being broken away, the section being at the line 21—21 on Fig. 15;

Fig. 22 is a detail sectional view at the line 22—22 on Fig. 21;

Fig. 23 is a diagram of the electrical controlling apparatus for the clutch.

A brief description of the general construction of the apparatus and its method of operation will now be given, followed by a more detailed description. The apparatus as herein illustrated is designed and adjusted for packing bottles in cartons, each of which is partitioned to provide individual cells arranged in four rows of six cells each. The bottles B are fed forward on a conveyor 25 (Figs. 1 and 2) driven continuously by a motor M having driving connection therewith as hereinafter described. The bottles as they advance engage an electrical counter in the form of a star wheel 26 (Figs. 1 and 2) and rotate it step by step. The star wheel as shown has six points so that the passage of six bottles imparts a complete rotation to the wheel. This operates to close an electric switch, thereby actuating an electromagnetic clutch control device 27 (Fig. 9) so that a one revolution clutch is operated to effect a cycle of movements of the various parts of the packaging apparatus. This cycle includes an operation of a bottle tilting apparatus 28 (Figs. 1, 2, 3, 19, 20) by which a row of six bottles is tilted off the conveyor into a chute 29 and guided into a carton C therebeneath. The carton is then indexed or moved

a step forward horizontally to position it for receiving the next row of bottles. The means for advancing the carton step by step comprises a pair of sprocket chains 30 carrying pusher arms 31 which engage the carton.

By reference to Fig. 15, which shows a carton with the first row of bottles therein, it will be noted that four indexing movements of the feeder chains 30 are required for packing each carton. The fourth indexing movement from the position shown in Fig. 15 carries the carton beyond the filling chute 29 and brings the next succeeding carton into position to receive its first row of bottles. This last indexing movement, it will be seen, must be through a comparatively long distance to provide for the space required for the wall thickness of the cartons with their folded flaps and also the space between adjacent cartons to accommodate the pusher arms 31. The mechanism for causing these indexing movements through periodically varying distances is fully described hereinafter.

The empty cartons may be moved automatically onto a receiving platform 32 (Figs. 15 and 21) by conveyor mechanism (not shown) which advances said cartons horizontally in a direction parallel with the bottle conveyor 25. The cartons are intermittently moved forward from the platform 32 in a direction perpendicular to the conveyor 25, into position to be engaged by the indexing arms 31. This movement is effected by a pusher plate 33 (Figs. 15 and 21) attached to and projecting upward from the rear end of a plate 34 which is reciprocated lengthwise by means of a rack 35 attached to the under side thereof and driven by a gear 36 which is periodically rotated in opposite directions as hereinafter set forth.

A more detailed description of the apparatus will now be given.

Referring to Figs. 2 and 3, the electric motor M which may be run continuously, has a belt driving connection 37 with a shaft 38 which is connected through speed reduction gearing within a gear box 39 to a drive shaft 40. Driving connections for the endless conveyor 25 include a sprocket chain 41 driven by the shaft 40 and driving a shaft 42 connected through bevel gears 43 with the driving pulley 44 of the conveyor 25. The drive shaft 40 has attached thereto a sprocket wheel 45 which drives a sprocket chain 46 trained over a sprocket wheel 47 (Figs. 3 and 9) mounted on a tubular shaft 48 to which it is secured by bolts 49 (Fig. 9). The tubular shaft 48 is mounted on a nonrotating shaft 50. Keyed to the shaft 48 is an annular clutch member 51 (Figs. 8 and 9) cooperating with a clutch dog 52 mounted to rock on a pivot pin 53 on a clutch disk 54. The latter is keyed to a tubular shaft 55 mounted for rotation on the shaft 50. The dog 52 is held in engagement with the ratchet 51 by means of a coil spring 56 (Figs. 8 and 12), mounted on a rod 57 movable lengthwise in bearings 58 on the clutch disk 54, the spring being held under compression between one of said bearings and a stop 59 on the rod.

The tubular shafts 48 and 55 (Fig. 9) are mounted respectively in bearings on standards 60 and 61. The electromagnetic clutch control device 27 is mounted on the standard 60 and includes an electromagnet coil 62 (Fig. 23) and armature or core 63 to which is connected a pin 64. When the magnet is deenergized, the locking pin 64 is projected by means of a coil spring 64a, into the path of the dog 52 in position to hold it disconnected from the ratchet 51 as shown in Fig. 8. When the magnet is energized the locking pin 64 is withdrawn, permitting the dog to be moved by its spring 56 into engagement with the ratchet 51. The continuously rotating shaft 48 is thus connected to drive the shaft 55 through one complete rotation. As the clutch disk 54 is completing its rotation the locking pin 64, which in the meantime has been projected to its dog-holding position, engages a cam surface 65 on the dog and releases it from the ratchet and stops the shaft 55.

As before noted, the operation of the clutch magnet is controlled by the star wheel or counter 26 which is given a step by step rotation as the bottles advance. Referring to Fig. 23, the electrical controlling circuits for the clutch magnet will now be described. Electric current is supplied from the mains 66, 66' to the primary coil 67 of a step down transformer. The star wheel 26 carries a wiper contact 68 which as its rotates bridges a pair of stationary contacts and establishes a circuit through the secondary coil 69 of the transformer. This circuit may be traced through a conductor 70, wiper 68, wires 71 and 72, brush 73 of a timer T, segment 74, brush 75, wire 76, switch 77, wire 78, coil 79 of a relay switch 80, wire 81 to the transformer. The coil 79 being thus energized operates the double pole switch 80 to establish a circuit for the clutch magnet coil 62, which circuit can be traced from the main 66 through relay switch 80, wire 81', magnet coil 62, switch 80 to main 66'. The coil 62 being energized withdraws the clutch pin 64 (Figs. 8, 9) so that the clutch is operated and imparts one rotation to the shaft 55.

When the star wheel operates to establish a circuit for the coil 79, it also energizes the coil 83' of a relay switch 83 (Fig. 23). This circuit may be traced through conductor 70, star wheel contacts, conductors 71, 71', coil 83' and conductor 81. The switch 83 is therefore closed and establishes a circuit for the coil 79 independent of the star wheel, which circuit may be traced through a conductor 85, switch 83, wire 86, timer brush 84, segment 74, brush 75, wire 76, switch 77, wire 78, coil 79 and wire 81. The closing of switch 83 also establishes a holding circuit through coil 83' by way of wire 85, switch 83, wire 86, timer brushes 84, 73, wire 72, coil 83' and wire 81. The circuits through coils 83' and 79 are maintained until the timer contact 73 runs off the segment 74, breaking the circuits through said coils. The switch 80 is thus opened and the clutch magnet deenergized so that the holding pin 64 is moved into the path of the clutch dog so that the clutch is released at the completion of a revolution. The purpose of the switch 77 and a switch 77' (Fig. 23) in parallel therewith will be described later.

The intermittent clutch disk 54 (Figs. 8 and 9) has a driving connection through a pair of intermeshing gears 90 and 91 to gearing within a gear case 93 (Figs. 4, 5, 6 and 7). The gear 90 is keyed to the clutch disk and gear 91 is keyed to a Geneva drive shaft 92 journalled in the gear box. The drive shaft 92 has keyed thereto a driving element 94 for driving a Geneva wheel 95 keyed to a shaft 96 journalled in the gear box. The gearing is so proportioned that the shaft 92 is given one complete rotation for each complete rotation of the intermittent clutch disk 54. The Geneva driving element cooperates in a conventional manner with radial slots 97 in the

Geneva gear wheel to impart a step rotation to the latter for each rotation of the shaft 92.

The Geneva wheel 95 operates through differential gearing which will now be described to impart intermittent movements to the indexing sprocket chains 30 and arms 31 for indexing the cartons. Mounted on the shaft 96 and keyed thereto are gears 98 and 99 which mesh with gears 100 and 101 mounted to rotate on stud shafts mounted within the gear casing. The gears 100 and 101 are adapted to mesh respectively with gears 103 and 104 carried on a squared portion of a shaft 105 (Figs. 4, 5 and 7). The gears 103 and 104 are mounted on a sleeve 106 (Fig. 7) slidable on the shaft for shifting the gears into and out of mesh with the gears 100 and 101 respectively. The gear 99 is of larger diameter than the gear 98 while the gear 100 which meshes with gear 98 is of larger diameter than the gear 101 which is in mesh with the gear 99.

Means for shifting the gears 103, 104 comprises a rock arm 107 on a rock shaft 108 to which is also attached a rock arm 109, the outer end of which carries a cam roll running in a cam track 110 formed in a cam disk 111 mounted on a bearing sleeve 112 (Fig. 7) on the shaft 105. The cam disk is rotated intermittently by means of a sprocket chain 113 trained over a sprocket wheel on the shaft 92 and a sprocket wheel 114 attached to the cam disk. The sprocket wheels are so proportioned that four rotations of the Geneva drive shaft 92 impart one complete rotation to the cam disk. The cam track includes a cam section 110a which operates the rock arms 109, 107, for shifting the pair of gears 103, 104, from the position shown in Fig. 5 to a position in which the gear 104 meshes with the gear 101 while the gear 103 is disconnected from the gear 100.

The indexing sprocket chains 30 are trained over sprocket wheels on a shaft 115 (Fig. 21) and corresponding sprocket wheels on the drive shaft 105 (Fig. 5). A step rotation of the Geneva wheel 95 transmits a motion either through the gear train 98, 100 and 103, or gear train 99, 101, 104, for imparting a step rotation to the shaft 105 and thereby indexing the chains 30 and carton carried thereby. The carton is thus advanced step by step and receives a row of bottles through the chute 29 after each step movement. After the last row of bottles has been placed in the carton, the next succeeding step movement brings the next succeeding carton into position to receive its first row of bottles. This requires a movement through a comparatively long distance to compensate for the thickness of the carton walls and the pusher arms 31, as heretofore noted. This longer indexing movement is effected by shifting the gears 103, 104 (Fig. 5) to bring the gear 104 in mesh with the gear 101 and disconnect the gears 100 and 103. This shifting of the gears is effected by the cam section 110a of the cam track and takes place while the Geneva wheel 95 is at rest after the last row of bottles has been deposited in the carton so that when the Geneva wheel is again indexed, it operates through the gear train 99, 101 and 104. After this indexing movement to bring an empty carton to loading position, the gears 103, 104 are returned to the Fig. 5 position for the three comparatively short indexing movements which take place during the loading of the carton.

The bottle tilting device 28 for tipping the bottles off the conveyor, inverting them and directing them into the chute 29 will now be described. This device, shown in Figs. 1, 2, 3, 19 and 20 includes a pair of rock arms 116 fixed to a rock shaft 117 to which is also secured a rock arm 118. Means for rocking the shaft 117 includes a cam 120 (Figs. 4, 5, 6, 11) keyed to the Geneva drive shaft 92. The cam operates a lever 121 fulcrumed at 122 and connected through a rod 123 to the rock arm 118. A rock arm 124 (Figs. 1, 19, 20) is fulcrumed to swing about a pivot pin 125 adjustably mounted in a slotted bracket arm 126 secured to the supporting frame 127 of the conveyor 25. The upper end of the rod 124 is connected to a pivot pin 128 which is adjustably secured in a slotted arm 129 clamped to a horizontal bar 130 extending between and journalled for rocking movement in the arms 116.

A pusher bar 131, parallel with the bar 130, has at its ends, arms 132 extending at right angles thereto, said arms being anchored in the ends of the bar 130. A coil tension spring 133 is attached at one end to one of the arms 116 and is anchored at its opposite end to the conveyor frame and serves to hold the cam roll on lever 121 (Fig. 11) in contact with its cam.

The operation of the bottle tilting device is as follows. As the cam 120 advances from the position shown in Fig. 11, it permits a quick movement of the lever 121 owing to the abrupt drop in the cam surface so that the spring 133 swings the arms 116 from the Fig. 19 position inwardly to the Fig. 20 position. The pusher bar 131 during this movement engages the neck portions of the row of bottles and tips them over so that they are guided neck end downward through the chute 29 into the carton therebeneath. During this movement the bar 130 is rocked in a clockwise direction about its longitudinal axis sufficiently to partly counteract the downward component of movement of the bar 131 caused by the swinging movement of the arms 116. The pusher bar is thus given a movement in the required direction to cause the bottles to be directed into the chute. Where it is desired to introduce the bottles in an upright position into the cartons a modified construction may be employed in which the pusher bar engages the bottles at a lower point, means also being provided to prevent the bottles from tipping over. It will be noted that this bottle tilting mechanism is given a cycle of movements each time the Geneva drive shaft 92 is rotated. The parts are timed to cause the transfer of a row of bottles to the carton while the latter is at rest after each indexing movement of the carton conveyor chains 30.

As the bottles are carried forward by the conveyor into position to be tilted by the pusher bar, the foremost bottle is arrested by an adjustable stop 134, and each bottle in turn provides a stop for the next bottle until the row of six bottles is in position for the transfer. In order to prevent interference of the oncoming bottles with the bottle tilting mechanism while the latter is in operation, we provide stop mechanism for the bottles including a stop arm or lug 135 (Figs. 2 and 3) pivoted on a stationary plate 136 for swinging movement into the path of the oncoming bottles. The arm 135 is moved forward into the path of the bottles by a coil spring 137 mounted on a rod 138 connected at its forward end to said arm. The rod carries at its opposite end a finger 139 (Figs. 1, 2 and 3) which projects behind one of the arms 116. When the pusher bar 131 is moved forward to tip the bottles, the rod 138 moves forward and swings the stop arm 135

into the path of the bottle immediately adjacent to the bottles which are being tilted, thereby holding the oncoming bottles on the conveyor 25 until the pusher bar has returned and the stop arm has been retracted.

Each carton C (Figs. 13 and 15) comprises a bottom 140, side walls 141, end walls 142, end flaps 143, and side flaps 144. Spacers 144a divide the interior of the carton into individual cells for the bottles. The empty carton may be slid into position on the platform 32 (Fig. 21) from one side of the packaging apparatus, either by hand or by an automatic conveyor or the like. The side flaps 144 are folded downward against the sides of the carton as shown in Fig. 15 before the carton is placed on the platform. As shown in Fig. 21, the platform is made in sections horizontally spaced to accommodate a pusher device presently to be described by which the cartons are advanced to the indexing fingers 31. Extending forward from each section of the platform is a side plate or ledge 145 to support the carton as it is moved forward off the platform. The cartons as they are advanced are guided between rails 146 positioned above and laterally beyond the ledges 145. The end portions 147 of the rails on one side of the apparatus which are curved as shown (Figs. 2, 21), serve as guides to the cartons C as the latter are moved forward onto the platform 32.

The mechanism for advancing each carton from the platform into position to be engaged by the indexing fingers 31 will now be described. Such mechanism includes the horizontal plate 34 positioned at a plane just beneath the platform 32 and extending forward parallel with the indexing chains 30, the plate 34 being mounted to reciprocate in guideways 148. Attached to the rear end of the plate 34 is an angle bar comprising an arm 149 projecting upwardly therefrom (Figs. 15 and 16). The pusher plate 33 is provided with a shank 151 adjustably supported in a bearing on the arm 149, permitting adjustment of the pusher plate. The plate 34 has attached to its under surface and extending lengthwise thereof the rack bar 35 reciprocated by the pinion 36. The latter is keyed on a shaft 152 (Figs. 15, 13, 14) to which is also keyed a pinion 153. The pinion is rotated alternately in opposite directions by a rack bar 154 mounted to reciprocate in a guideway 155. The rack 154 is connected through a link 156 to a rock arm 157 (see Figs. 14, 4 and 5) having a pivotal connection 158 with a stationary arm 159. The arm 157 is rocked by means of a cam plate 160 mounted for rotation on a shaft 161. The cam plate is formed with a cam track 162 in which runs a cam roll 163 on the arm 157. The cam is rotated by means of a sprocket wheel 164 connected thereto and driven by a sprocket chain 165 trained over the wheel 164 and a driving sprocket pinion 166 (Fig. 6) keyed to the shaft 92.

The sprockets 166 and 164 are so proportioned that the cam 160 is given one complete rotation for four rotations of the sprocket pinion 166 and its driving shaft 92, the latter as heretofore noted being given one complete rotation for each indexing movement of the chains 30. The cam track 162 is also so formed that it reciprocates the arm 157 during one rotation of the drive shaft 92 and then remains at rest during the next succeeding three rotations of the drive shaft. In other words, the arm 157 is reciprocated during every fourth indexing movement of the carton and through the connections above described reciprocates the pusher plate 33 for advancing an empty carton to the filling zone.

The end flaps 143 of the carton, owing to their inherent resiliency, tend to swing inward toward a closed position. In order to counteract this tendency and hold the flaps fully open during the placing of the bottles in the carton, a pair of stationary guide rails 167 (Figs. 1, 2 and 3) are provided. These rails are positioned and shaped to engage beneath the flaps 143 as the carton advances and gradually swing the flaps upwardly, outwardly and downwardly to fully open position with the flaps substantially horizontal and to hold them in such position until the carton has been filled and passes beyond the filling zone.

The guide rails 167 are anchored to the framework of the machine by means of straps 167a and include straight portions extending horizontally in the direction in which the cartons are advanced through the filling zone and positioned at opposite sides of the cartons. As shown in Fig. 2, the rear ends of the rails are comparatively close together, the rails being flared from said ends outwardly and forwardly with respect to the direction in which the cartons are advanced therebeneath. In other words, the rails are forwardly and outwardly divergent in the direction of travel of the cartons therebeneath. The free ends of the rails are so positioned that as a carton commences its forward movement toward the filling zone the ends of the rails will engage beneath the flaps 143. The forwardly divergent portions of the rails have an upwardly convex form or curvature as shown in Fig. 3 to facilitate the swinging movement of the flaps 143 as the carton advances. The rails are so shaped that when the carton reaches the filling zone the flaps have been swung thereby to their fully open position.

In order to hold the forward side flap 144 of the carton downward against the side wall 141 as shown in Fig. 15, while the carton is moved forward from the platform to the next preceding carton, there is provided a U-shaped holding plate 168 or stop plate (see Figs. 15, 17, 18 and 21). This stop plate is pivotally mounted on a supporting plate 169 to swing from a vertical position, forwardly and downwardly to a horizontal position. The plate 169 is connected by bolts 170 to the longitudinally reciprocating plate 34. The pivotal connection for the stop plate 168 includes bearing lugs 171 fixed to said plate and mounted to swing on pivot pins 172 on the plate 169.

The stop plate 168 is yieldingly held in its upright position by a pair of coil springs 173 mounted on rods 174, said rods pivoted at one end to the bearing lugs 171 and slidable in arms 175 formed on the plate 169. While the carton is being advanced the plate 168 is held by means of the springs 173 in its vertical position against a stop pin 176 (Figs. 17, 18). As the plate 34 carrying the stop plate 168 nears the limit of its forward movement a trip arm 177 (Figs. 17, 18) on the lug 171 engages a stop 178 and moves said arm to the dotted line position (Fig. 18), thereby swinging the stop plate 168 forward and downward to a horizontal position so that a carton may pass thereover under the control of the indexing fingers 31. This movement throws the pivots of the rods 174 downward past the dead center line so that the springs 173 hold the stop plate in its downward position during the return of the stop plate. As the latter nears the limit of its return movement, the trip arm engages

a stop 179, thereby reversing the trip arm and throwing the stop plate 168 up to its operative position.

When a carton is moved forward off the platform 32, movement of a succeeding carton onto the platform is prevented until the platform has been cleared. This is accomplished by a stop 180 (Figs. 16 and 21) on the free end of an arm 181, the other end of which is connected by a pivot 182 to a bracket on a stationary back plate 183 at the rear of the platform 32, said back plate forming a guide for the empty cartons as they are moved onto the platform. An adjustable stop pin or bolt 184 carried on the arm 181 engages the arm 149 when the pusher plate 33 is in its retracted position and thereby holds the stop 180 out of the path of the cartons. As soon as a carton starts its forward movement toward the filling zone, the arm 181 is free to swing inward a short distance, bringing the stop lug 180 over the platform and thereby preventing the next carton from being moved onto the platform. This movement of the stop lug is effected by a coil spring 185 mounted on a rod 186 pivoted to the rod 181 and slidable in a stationary bracket arm 187. The inward movement of the stop lug 180 may be adjustably limited by stop nuts 188 on the rod 186.

The switches 77 and 77' (Fig. 23) are comprised in a safety mechanism now to be described by which indexing of a carton at the filling station is prevented unless an empty carton has been positioned on the platform 32 at the proper time—that is, immediately after the preceding carton has been advanced from the platform to the filling zone. The switch 77, as shown in Fig. 21, is so positioned that it is held closed by a carton when the latter is in position on the platform 32. The switch 77' (Figs. 1 and 23) carries a roll 189 on the switch arm in the path of a lug 190 on the shaft 105 which, as before described, serves as a drive shaft for the indexing chains 30. This switch operating lug is arranged to hold the switch 77' open at the time the star wheel closes its circuit. If at this time an empty carton is properly positioned on the platform, the switch 77 is held closed thereby as indicated in the wiring diagram (Fig. 23). If, however, there is no carton in such position, the switch 77 is held open. Both said switches being held open, connection between the wires 76 and 78 is broken and no controlling circuit for the clutch magnet can be established by the star wheel. Consequently, operation of the mechanism is arrested until the operator properly adjusts the cartons. When a carton moves forward normally from the platform, it releases the switch 77 so that it is opened but the switch 77' is closed, permitting the circuit through the relay magnet 79 controlling the clutch to be maintained until the circuit is opened by the timer.

Modifications may be resorted to within the spirit and scope of our invention.

We claim:

1. Packaging apparatus comprising means for advancing a carton intermittently step by step through an article receiving zone, means for introducing a row of articles into the carton at each step movement thereof within said zone, and means operable after each carton has completed its movement through the zone to move a succeeding carton up to said zone in the direction in which the cartons are moving through said zone, said last mentioned means including a pusher bar and automatic means for periodically reciprocating the pusher bar and causing it to advance said succeeding carton by a single step movement through a distance corresponding to the entire movement of the preceding carton through said zone.

2. Packaging apparatus comprising means for moving a carton step by step through an article receiving zone, means for transferring articles to the carton as it passes through said zone and thereby filling the carton, a platform for receiving empty cartons, automatic means for advancing a succeeding carton from the platform to the said zone when the preceding carton has been filled, and safety mechanism operable automatically to prevent operation of said first mentioned means when an empty carton has been moved to the receiving zone until a succeeding carton has been positioned on said platform, said safety mechanism comprising an electro-responsive device controlling the operation of said first mentioned means, and a switch in circuit with said electro-responsive device and positioned and arranged to be actuated by a carton when the latter is positioned on the platform.

3. Packaging apparatus comprising means for moving a carton step by step through an article receiving zone, means for transferring articles to the carton as it passes through said zone and thereby filling the carton, a platform for receiving empty cartons, automatic means for advancing a succeeding carton from the platform to the said zone when the preceding carton has been filled, and safety mechanism operable automatically to prevent operation of said first mentioned means when an empty carton has been moved to the receiving zone until a succeeding carton has been positioned on said platform, the means for effecting said step by step movements of the carton including an electromagnetic clutch, electrical control means for controlling the actuation of the clutch, and a switch in the control circuit, said switch positioned to be actuated by a carton when the latter is positioned on said platform.

4. Packaging apparatus comprising a support for empty cartons, a conveyor for advancing cartons, means for actuating said conveyor intermittently and imparting step by step movement to the cartons, a pusher plate positioned to engage behind a carton when the latter is placed on said support, means for periodically reciprocating said pusher plate toward and from said conveyor for advancing cartons from said support to said conveyor, a holding plate arranged to engage the forward side of a carton while on said support to hold the carton flap folded against the side of the carton, said holding plate being connected to reciprocate with said pusher plate, and automatic means for swinging said holder plate out of the path of the carton as the latter moves up to a preceding carton on said conveyor.

5. The combination of means for positioning articles in rows at a transfer station, means for advancing empty cartons horizontally to a receiving position beneath the articles at said station, means comprising a pair of horizontally disposed stationary guide rails arranged above the path of the cartons and having ends in position to engage beenath the upper flaps of the carton, the rails being flared from said ends outwardly and forwardly with respect to the direction in which the cartons are advancing and arranged for swinging the carton flaps to a fully open position and holding them in said position

while the carton is advanced to the transfer station, and means for transferring the articles in rows to the carton at said station.

6. A packaging machine comprising mechanism for automatically advancing the cartons serially step by step and causing each carton during a cycle of operations of said mechanism to pass through an article receiving zone in a predetermined number of steps, said mechanism including automatic means by which a carton is caused to move a greater distance through one step than another in its passage through said zone, said mechanism including a driving element, a conveyor on which the cartons are carried to said zone, parallel gear trains between the driving element and conveyor, and automatic means for shifting the driving connections from one gear train to the other.

7. Packaging apparatus comprising in combination a continuously traveling conveyor by which articles carried thereby and spaced at intervals therealong are advanced toward a transfer station, means for arresting the articles and causing them to accumulate in a row at said station, a counter wheel in the path of said articles and rotated step by step by the advancing articles, means for advancing a carton step by step through the transfer station, means actuated by said counter wheel to bring into activity said carton advancing means, means for transferring a row of articles to the carton after each said step movement of the carton, means for holding a succeeding carton stationary in a predetermined position during said step by step movement, and automatic means for advancing the succeeding carton from said position to the transfer station by a single step movement.

8. The combination of a horizontally traveling conveyor by which articles are carried into a packaging zone, means for moving cartons in succession through said zone, comprising mechanism for moving each carton intermittently step by step through said zone in a direction transverse to the conveyor, an electrical counter comprising a star wheel in the path of the articles and actuated by said articles as they advance with the conveyor, means providing an electrical circuit extending through said counter, a safety switch in said circuit, electro-responsive means in said circuit and controlled by said counter for automatically bringing into activity said step by step mechanism when a predetermined number of articles required to complete a row have been brought to a transfer station, mechanism for transferring the articles in rows from the conveyor to the carton, and means for supporting each carton in a predetermined position while the next preceding carton is being moved through the said packaging zone, said safety switch being positioned and arranged to be controlled by the carton while in said predetermined position and controlling the operation of said electro-responsive means.

9. Packaging apparatus comprising in combination a horizontally disposed endless conveyor, means for driving the conveyor continuously and thereby bringing articles thereon to a packaging station, a stop to arrest the articles and cause them to accumulate in a row, a horizontally disposed carton conveyor beneath said article conveyor, a platform for supporting cartons, means for moving cartons from the platform to the carton conveyor, mechanism for moving the carton conveyor and a carton thereon step by step, said mechanism including an electromagnetic clutch, means providing an electrical circuit for the clutch magnet, an electrical counter comprising a star wheel in the path of the articles and operated by said articles, a switch in said circuit actuated and controlled by said counter for causing said clutch to be operated when a predetermined number of articles have been positioned at said station and thereby effecting a step movement of the carton conveyor, automatic means for transferring a row of articles to the carton after each step movement thereof, and a safety switch in said circuit and positioned and arranged to be controlled by a carton while the latter is supported on the platform.

10. Packaging apparatus comprising means for advancing cartons step by step through an article receiving zone, means for transferring articles to the cartons while in said zone, a platform, means for intermittently advancing cartons from the platform to said zone in the direction in which the cartons are advanced through said zone, means for guiding cartons onto said platform, and automatic means for preventing movement of a carton onto the platform until the preceding carton has completed its movement off the platform, said preventing means comprising a stop positioned to obstruct the movement of a carton onto the platform, and means providing an operating connection between the carton advancing means and said stop for moving the stop to an inoperative position.

11. Packaging apparatus comprising automatic mechanism for advancing a carton step by step during a cycle of operations of said mechanism and comprising means by which one step of advance during the cycle is greater than another, said mechanism including a driving element, a conveyor by which the cartons are advanced, gear trains between said driving element and the conveyor including parallel shafts and differential gears on each shaft, gear shifting mechanism for shifting the gears on one shaft each into and out of mesh with a gear on the other shaft, whereby the conveyor is alternatively connected through different gear trains to the driving element, and automatic means for periodically actuating the gear shifting mechanism.

12. Packaging apparatus comprising automatic mechanism for advancing a carton step by step during a cycle of operations of said mechanism and comprising means by which one step of advance during the cycle is greater than another, said mechanism including a driving element, a conveyor by which the cartons are advanced, gear trains between said driving element and the conveyor including parallel shafts and differential gears on each shaft, gear shifting mechanism for shifting the gears on one shaft each into and out of mesh with a gear on the other shaft, whereby the conveyor is alternatively connected through different gear trains to the driving element, and automatic means for periodically actuating the gear shifting mechanism, said gear shifting mechanism including a cam driven by said driving element, and a gear shifting device actuated by the cam.

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