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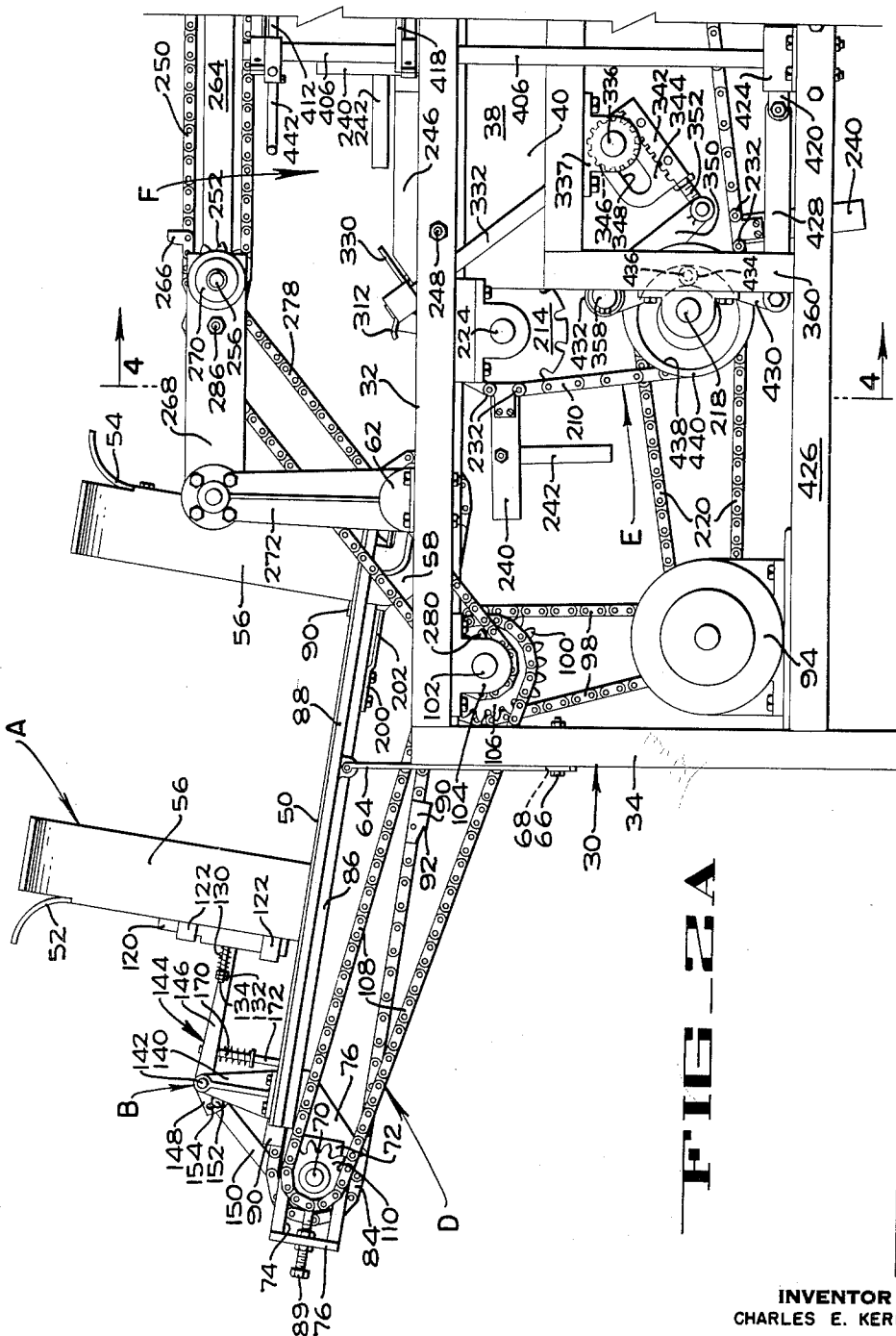
C. E. KERR

3,016,807

CARTON HANDLING MACHINE

Filed July 23, 1958

12 Sheets-Sheet 2



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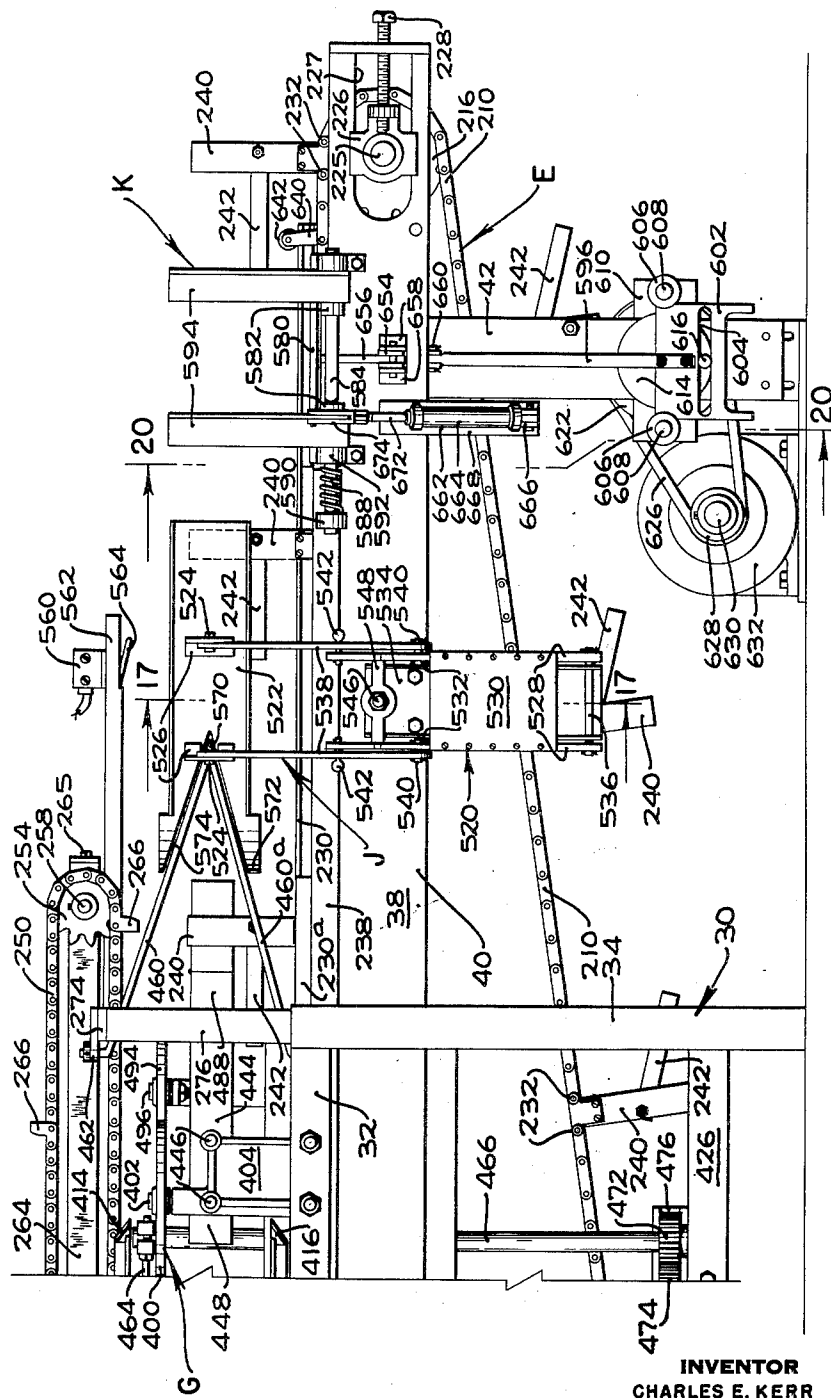
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Jan. 16, 1962

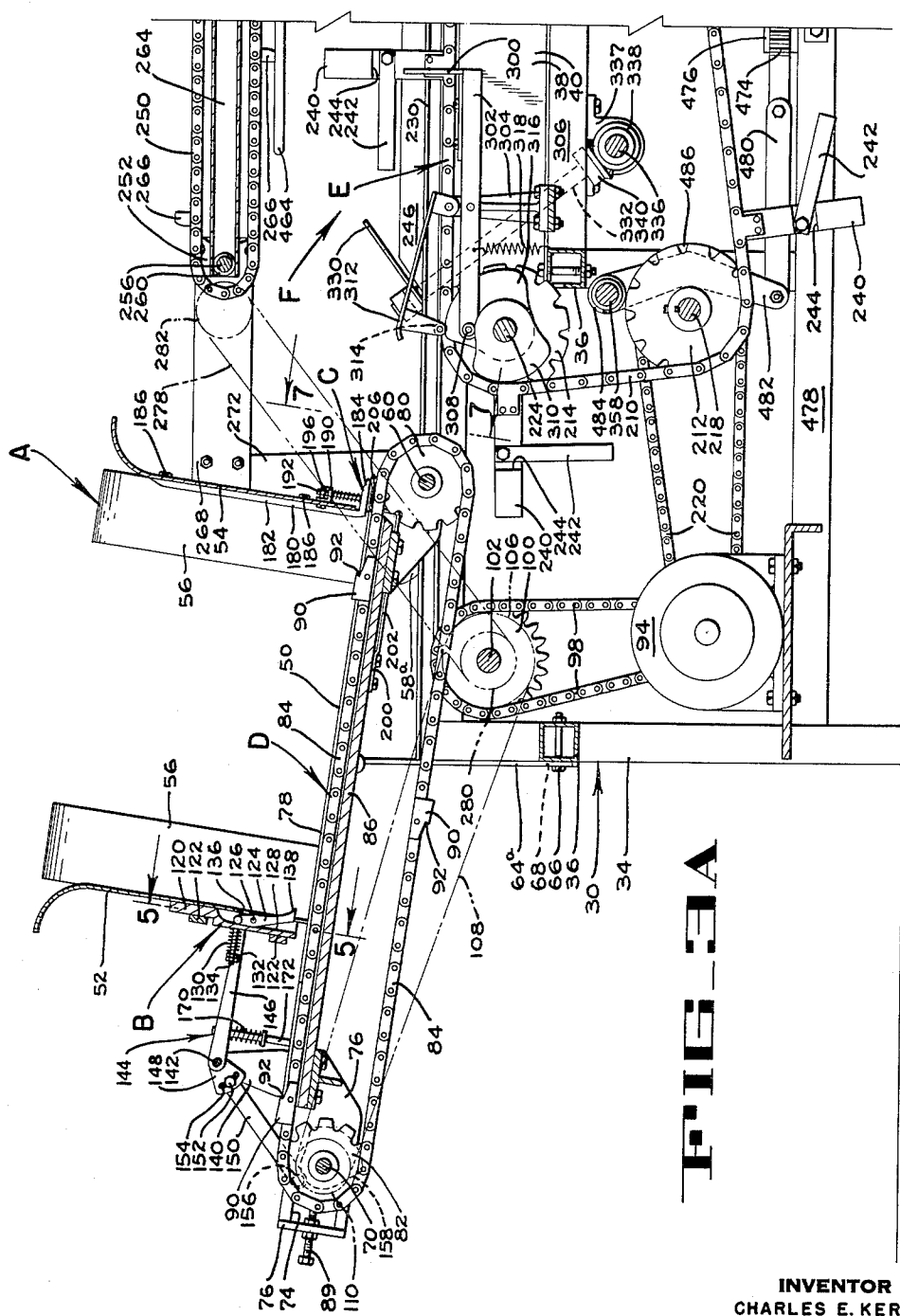
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CARTON HANDLING MACHINE

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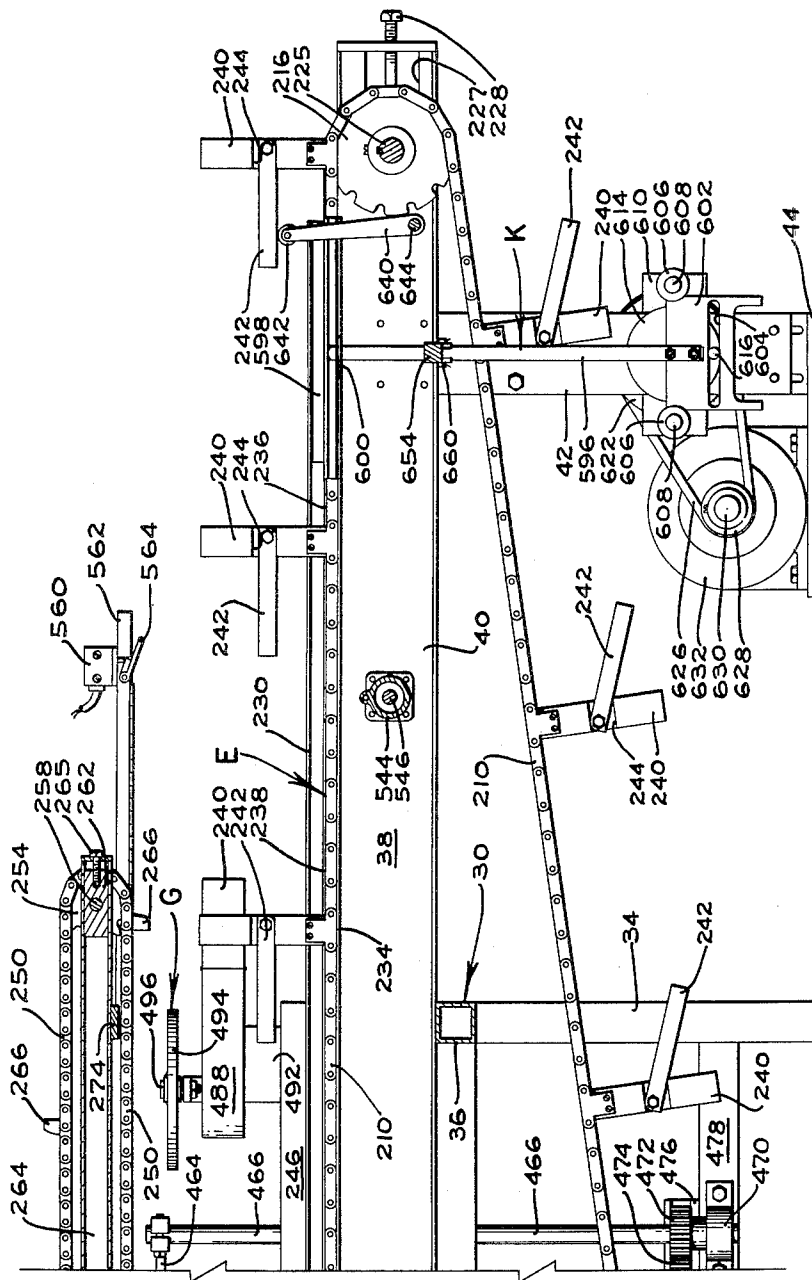
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12 Sheets-Sheet 5

FIG. 3B



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3,016,807

CARTON HANDLING MACHINE

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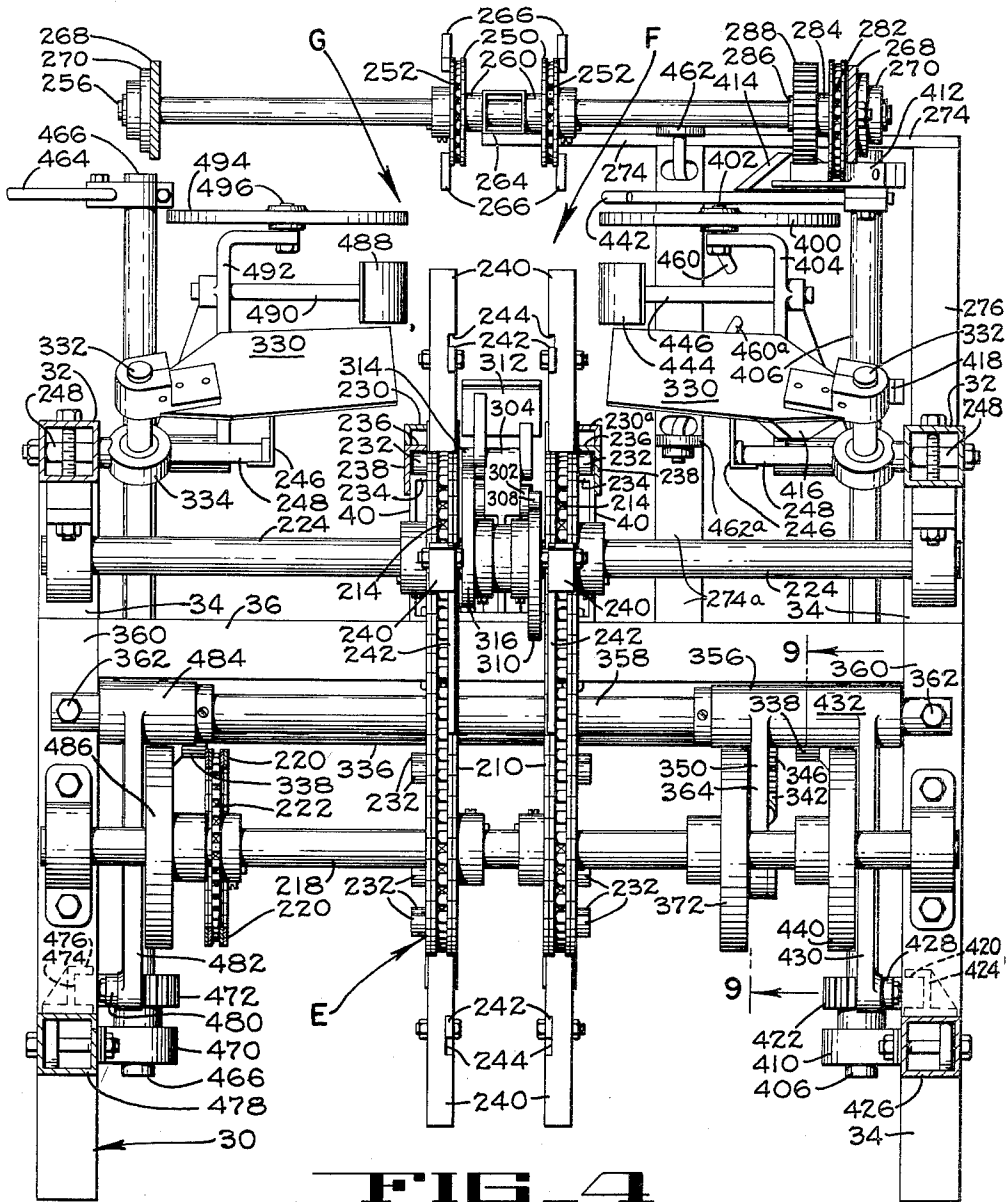


FIG. 4

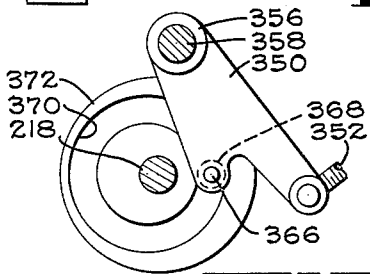


FIG. 9

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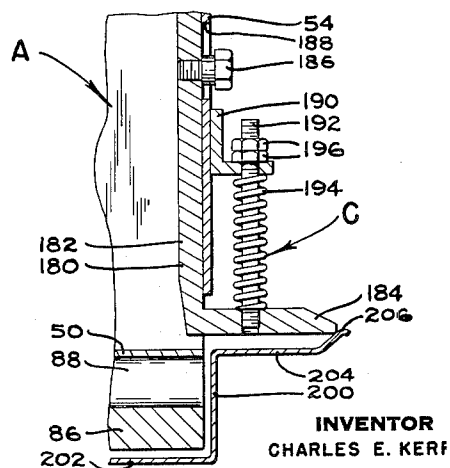
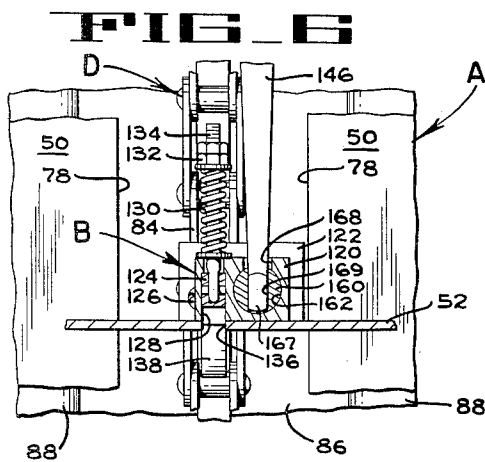
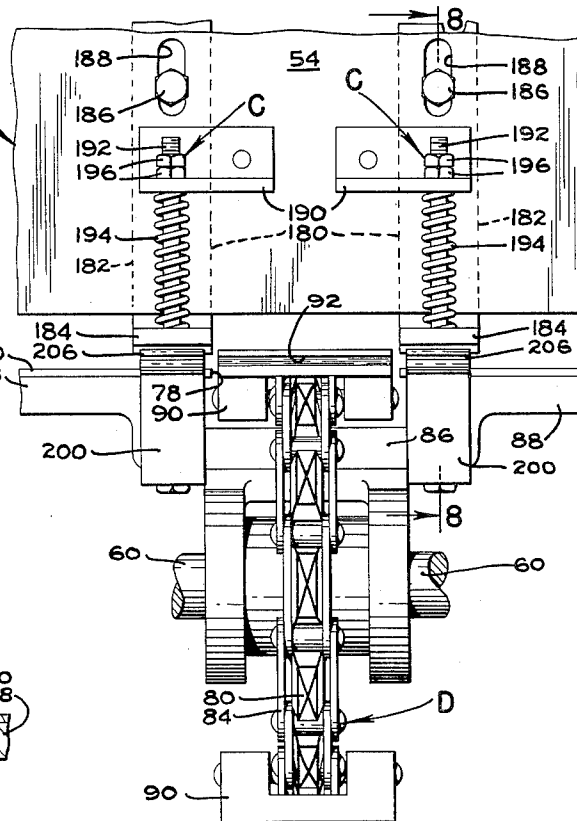
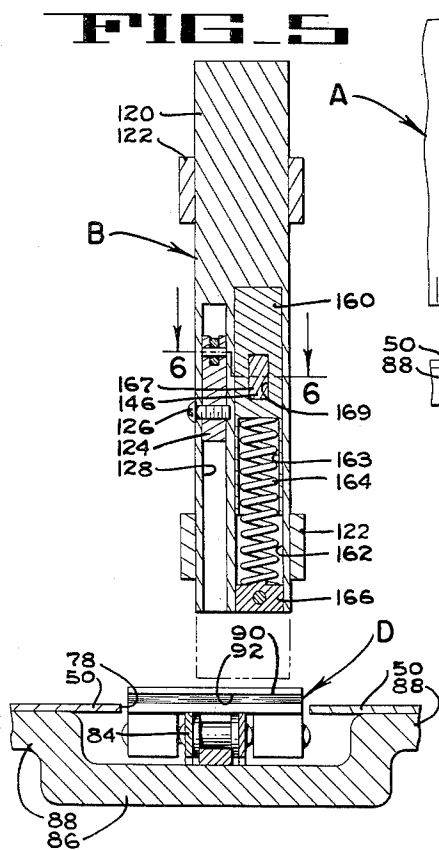
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12 Sheets-Sheet 7



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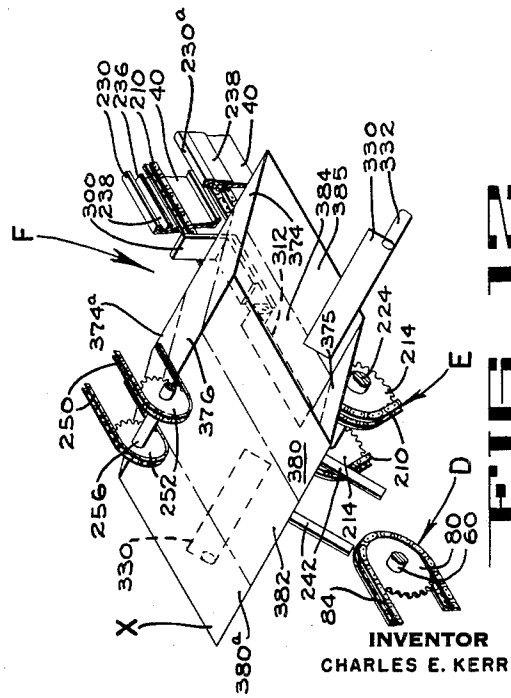
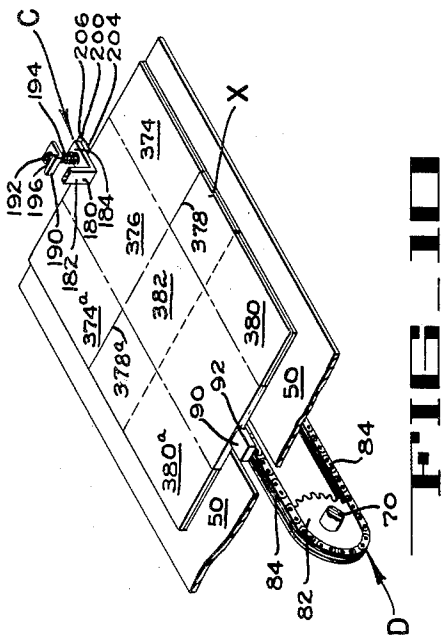
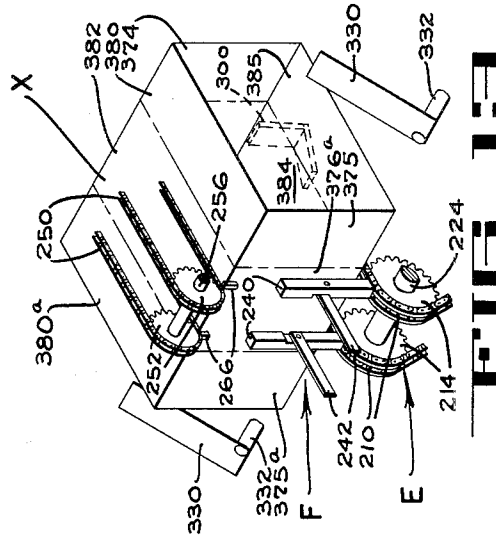
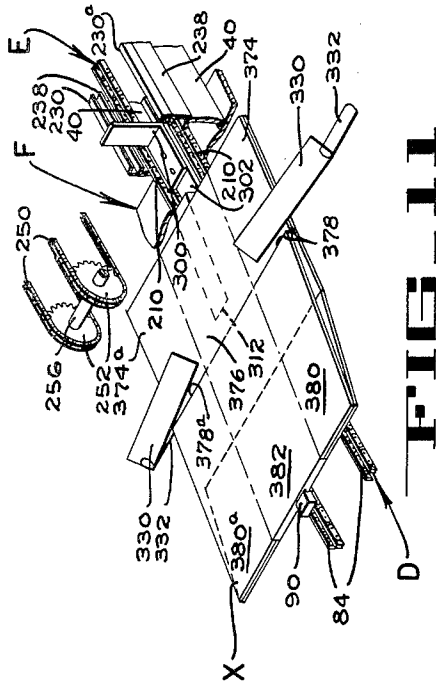
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12 Sheets-Sheet 8



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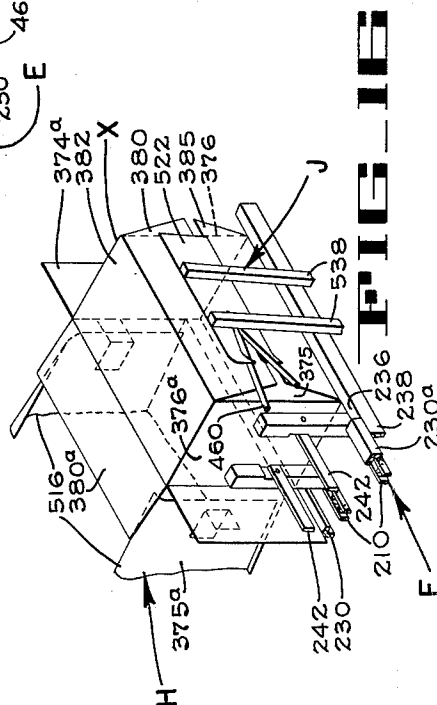
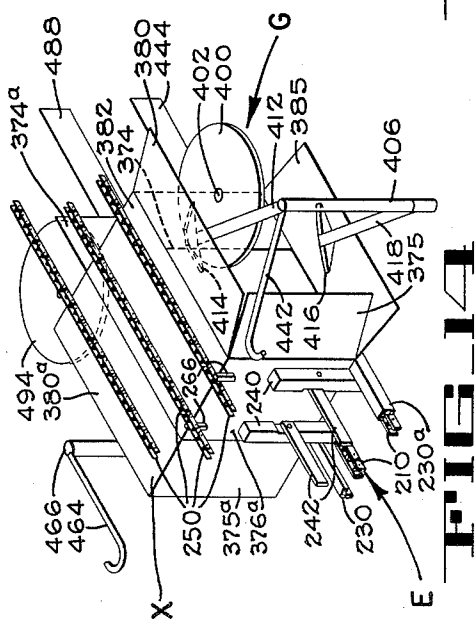
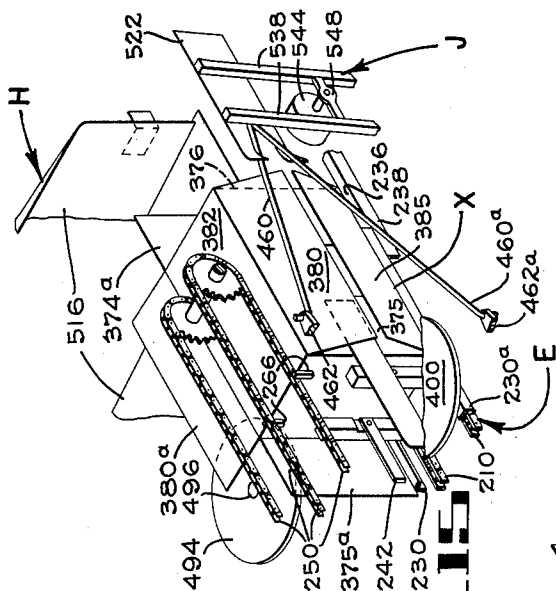
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12 Sheets-Sheet 9



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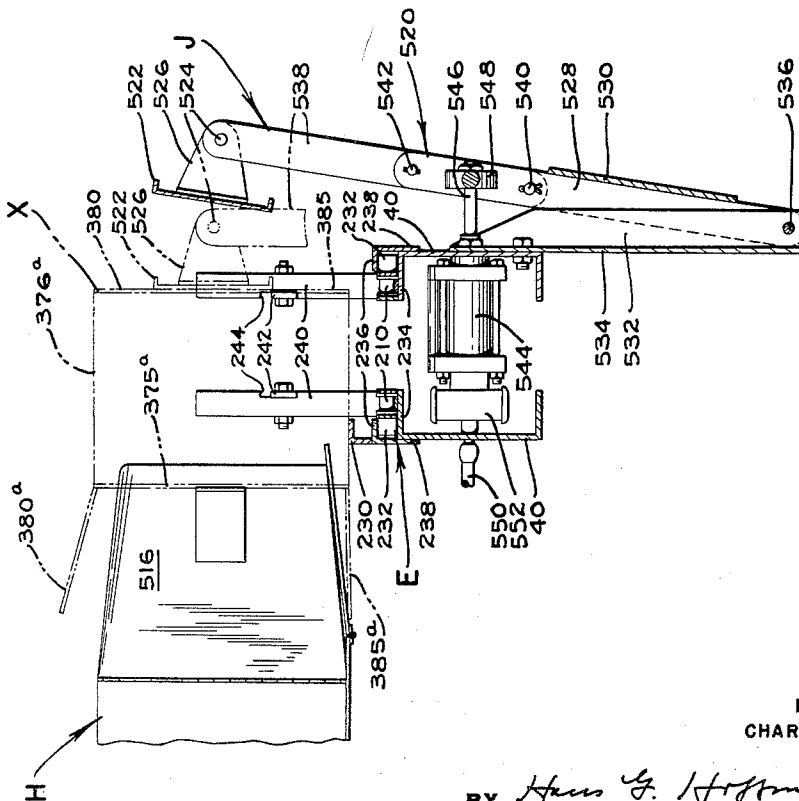
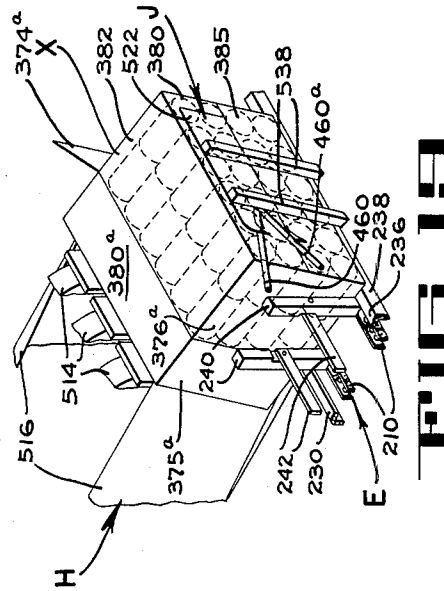
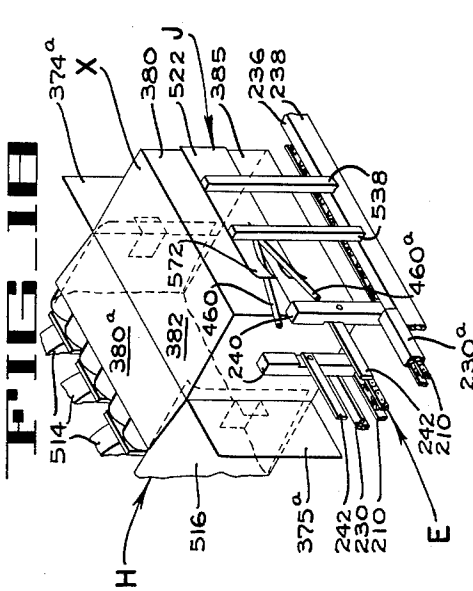
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CARTON HANDLING MACHINE

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12 Sheets-Sheet 10



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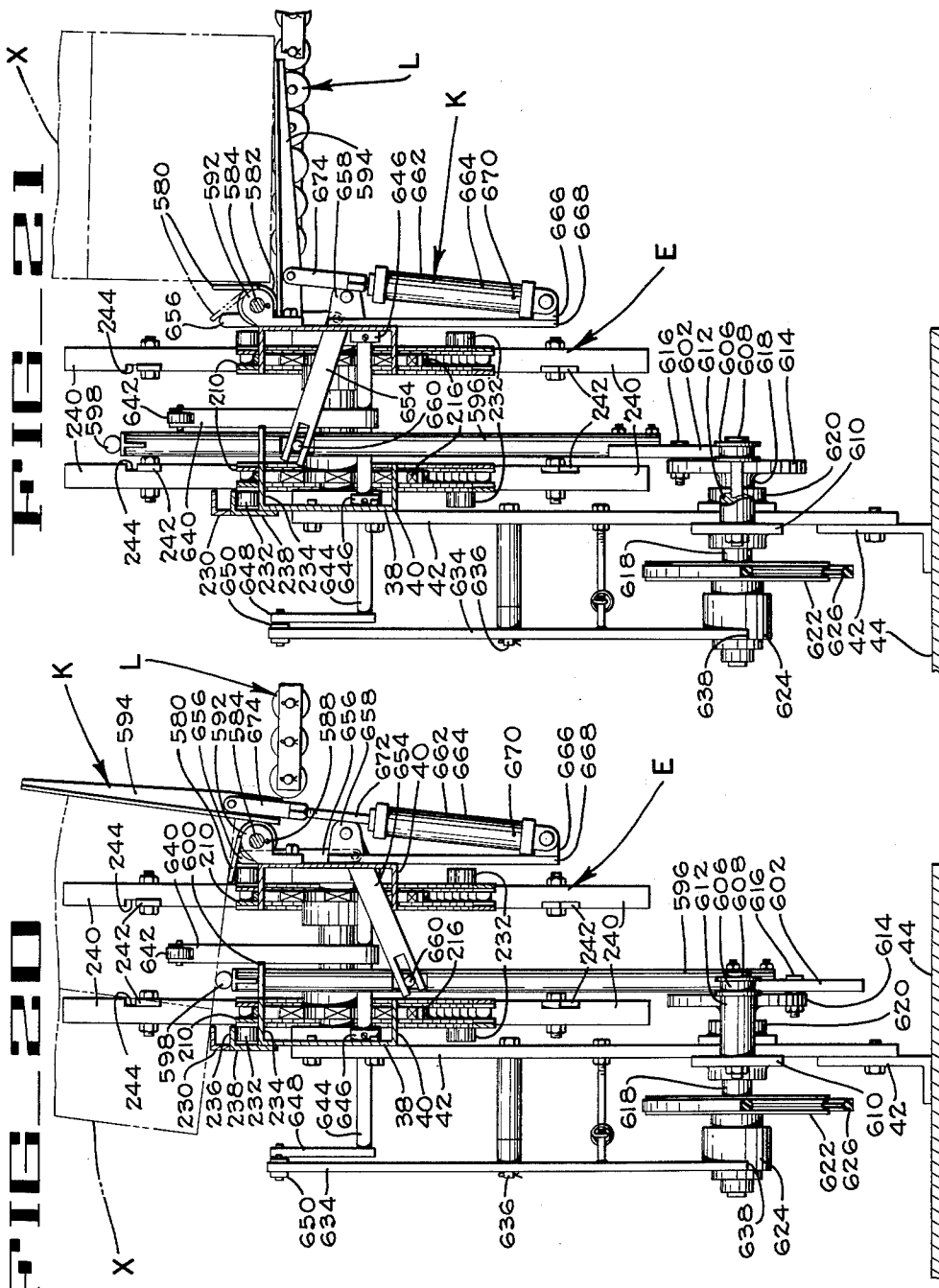
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12 Sheets-Sheet 11



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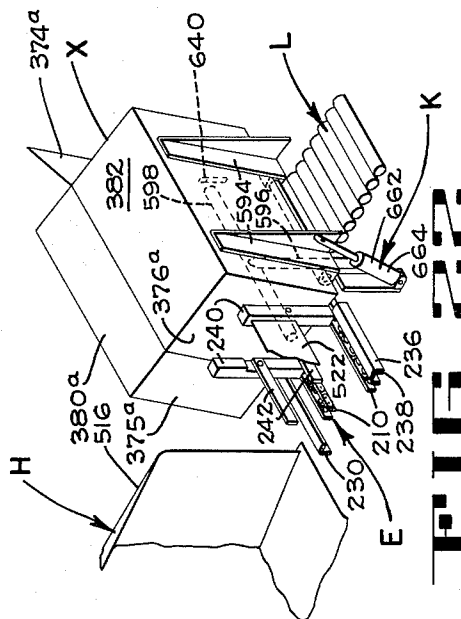
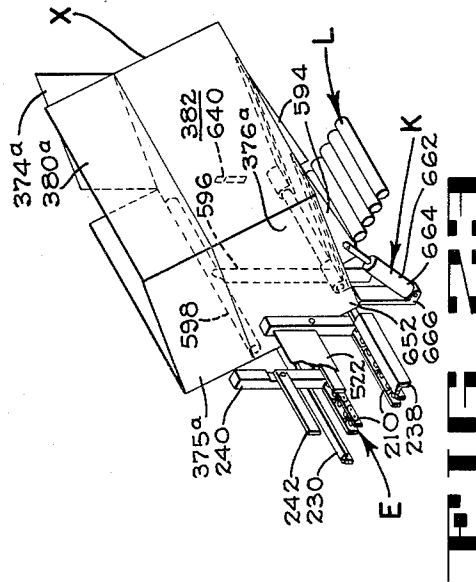
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12 Sheets-Sheet 12



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1

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CARTON HANDLING MACHINE
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Filed July 23, 1958, Ser. No. 750,420
9 Claims. (Cl. 93-49)

This invention relates to carton handling machines and more particularly to automatic machines for erecting cartons from a folded condition, closing the erected cartons at one end of the same, presenting the cartons to a machine that fills them, and discharging the filled cartons.

An object of the invention is to provide an improved carton handling machine.

Another object of the invention is to provide a machine that receives a supply of cartons in a folded or collapsed condition, successively erects the cartons and closes or partly closes one end of each, disposes each erected carton in receiving relation to a loading machine, and after the carton has been filled discharges it in readiness for top and bottom closure flap sealing.

Another object is to provide a carton handling machine of the character described that is completely automatic and which is capable of fully dependable, high speed operation.

Another object is to provide an improved mechanism for withdrawing flat, folded cartons successively from a supply of the same within a storage magazine.

Another object is to provide an improved gate mechanism for a folded carton storage magazine, that facilitates the removal of the cartons singly from the magazine.

Another object is to provide an improved mechanism for erecting cartons from flat, folded condition to rectangular, tubular form.

Another object is to provide an improved mechanism for manipulating the closure flaps of a carton so as to close or substantially close one of two opposite sides of the carton (which one side may be either the side which later will become the bottom side of the carton or the one that will become the top side) and to effectively open the opposite side of the carton to facilitate entry thereto of the article or articles that are to be placed within the carton.

Another object is to provide, in a carton handling machine including a conveyor adapted to transport cartons to a position of alignment with a case loading machine, a mechanism for shifting the carton laterally when aligned with the case loader so as to enter the delivery chute of the loader into an open side of the carton and thereby facilitate operation of the case loader.

Another object is to provide a mechanism adapted to receive filled cartons each of which is lying on a lateral side thereof and to tip each carton to its right side up position and dispose the carton upon a suitable receiver such as a take-away conveyor.

Another object is to provide a single, compact machine whose mechanically interconnected and functionally interrelated parts include all of the above-mentioned mechanisms for performing upon cartons the operations necessary to prepare them for filling and after they have been filled to discharge them in a condition ready for the top and bottom closure flaps to be fastened closed.

Other objects and advantages of the invention will become apparent from the following description and the accompanying drawings, in which:

FIG. 1 is a plan of the carton handling machine of the invention.

FIGS. 2A and 2B are enlarged fragmentary elevations

2

which when assembled end to end together form a side elevation of the carton handling machine of FIG. 1.

FIGS. 3A and 3B are fragmentary sections which when assembled end to end together form a longitudinal, vertical section of the carton handling machine.

FIG. 4 is an enlarged section along lines 4-4 of FIG. 2A.

FIG. 5 is an enlarged section of part of the mechanism for discharging cartons singly from the supply magazine, taken along lines 5-5 of FIG. 3A.

FIG. 6 is a section along lines 6-6 of FIG. 5.

FIG. 7 is an enlarged elevation of the carton releasing gate of the storage magazine viewed as indicated by the line 7-7 of FIG. 3A.

FIG. 8 is a vertical section along lines 8-8 of FIG. 7.

FIG. 9 is a detail view in vertical section along lines 9-9 of FIG. 4.

FIGS. 10, 11, 12, and 13 are diagrammatic views illustrating successive steps in the unfolding or squaring up of a folded carton to its rectangular, tubular form.

FIGS. 14, 15, and 16 are diagrammatic perspectives illustrating successive steps of manipulating the top and bottom closure flaps of the carton.

FIG. 17 is an enlarged section of the mechanism for pushing a carton into receiving relation with a case loading machine, taken along lines 17-17 of FIG. 2B.

FIGS. 18 and 19 are diagrammatic perspectives showing successive steps in the operation of the carton pushing mechanism of FIG. 17.

FIG. 20 is an enlarged section of the carton tipping mechanism taken along lines 20-20 of FIG. 2B.

FIG. 21 is a view similar to FIG. 20 showing the tipping mechanism in a different operating position.

FIGS. 22 and 23 are diagrammatic perspectives showing successive steps in the operation of the tipping mechanism of FIGS. 20 and 21.

The present invention is adaptable by dimensional modification, and possibly other minor re-design that does not constitute departure from the operational principles involved, to operate upon cartons of different kinds. A typical example of the cartons that can be handled by a machine incorporating the principles of the present invention are the large cartons in which a number of small cartons, usually a dozen or a multiple of a dozen, are commonly enclosed for shipment and for sale in wholesale quantities, or in which a number of cans of milk, fruit, vegetables, pet food, or the like, are handled. Such cartons are characterized by a body portion of rectangular, tubular form, dimensioned to contain a number of cans, boxes or other packages, and a top flap and a bottom flap hinged along fold lines to the upper and lower edges, respectively, of each of the four walls of the body portion. These cartons, commonly called "shipping cases," usually are constructed of heavy paperboard and are received from the manufacturer in a flattened, or folded condition with one end wall and one side wall in planar alignment with each other and superimposed upon the other side wall and the other end wall, respectively, which likewise are in planar alignment with each other. When so folded, the top and bottom closure flaps project from their respective side and end walls in planar alignment therewith. A carton X thus folded is illustrated in FIGS. 10 and 11.

Described in general terms, the carton handling machine of the invention includes a supply magazine A (FIGS. 1, 2A, and 3A) adapted to receive and store a number of cartons X in the above-described flat, folded condition and in superimposed relation. The cartons are withdrawn one at a time from the bottom of the stack within the magazine A with the aid of a presser mechanism B and a gate mechanism C (FIGS. 1 and

3

3A) that cooperate with a first conveyor D (FIGS. 1, 2A, and 3A) to deliver the folded cartons successively to a second, or main conveyor E (FIGS. 1, 3A, 3B, 4, 17, 20, and 21). The two conveyors cooperate with each other in initiating the operation of opening, or unfolding, each carton. This operation occurs at an opening station F adjacent the receiving end of the main conveyor E.

When unfolded, the carton is carried toward the rear of the machine by the conveyor E with the side walls of the carton disposed horizontally and the end walls vertically, one of the end walls being in the lead so that the longitudinal axis of the carton is parallel to its direction of advance. The closure flaps project laterally from the body of the carton, each still in planar alignment with its respective side or end wall, as the case might be. Each carton is propelled in this position to and through a closure flap manipulating station G (FIGS. 1, 2B, and 3B) where the four flaps at one side of the carton, say the side which is destined to become the bottom, are folded inward to, or nearly to, their closing position. Likewise at the manipulating station G, the vertically disposed end wall flaps at the opposite side of the carton are folded outward so that when the carton reaches a position of alignment with a case loading machine H (FIG. 1) the carton can, without interference from the flaps, be shifted laterally of the conveyor by a pusher mechanism J (FIGS. 1, 2B, and 17) to dispose the delivery chute of the case loader within the thus opened side of the carton. The loaded carton is returned to position for advancement on the conveyor E, by the continued action of the case loader in pushing into the carton a charge of the articles to be encased therein; and the filled carton is carried to a tipping mechanism K (FIGS. 1, 2B, 3B, 20, and 21) which operates to tip the carton in a manner disposing it right side up and to place it upon a take-away conveyor L (FIGS. 1 and 21) or other means for disposing of the filled carton.

Referring now to FIGS. 1-4, inclusive, all components of the carton handling machine of this invention are mounted upon a frame 30 including two horizontally extending side bars 32 of rectangular cross section (FIGS. 1 and 4) supported on legs 34 and held rigidly in spaced, parallel relation by transverse bars 36 (FIGS. 1, 3A, 3B, and 4), at least two of which preferably interconnect two opposed legs 34 at points somewhat below the level of the side bars 32 thus leaving between the side bars 32 suitable working clearance for certain operative parts of the machine presently to be described. An extension 38 of the frame 30 includes two channel members 40 (FIGS. 2B, 3B, and 4) secured to and projecting rearward from two of the transverse bars 36 (FIGS. 3A and 3B) and supported at their rear ends by a pedestal 42 (FIGS. 2B and 3B) whose lower end is rigidly secured to a foot plate 44.

The supply magazine A

The magazine A (FIGS. 1, 2A, and 3A) is mounted upon the forward end of the frame 30 and includes a longitudinally slotted bottom plate 50 and front and rear walls 52 and 54, respectively, each of which is provided with flanges 56 projecting inwardly from its lateral edges. The magazine A is supported by two spaced brackets 58 (FIG. 2A) and 58a (FIG. 3A) secured to the bottom plate 50 and projecting rearward therefrom for engagement upon a shaft 60 (FIG. 3A) that extends rotatably through the two brackets 58 and 58a. The shaft 60 is journaled at its ends in bearings 62 (one of which is shown in FIG. 2A), each of which is mounted on one of the side bars 32 of the frame 30. Thus the supply magazine A is mounted for pivotal adjustment about the transverse shaft 60. The magazine A is adapted to be rigidly secured in position sloping downward and rearward at selected slope, by means of a pair of supporting straps 64 (FIG. 2A) and 64a (FIG. 3A) each of which is pivotally connected at its upper end to the magazine

4

bottom plate 50 and both of which are adjustably connected to one of the transverse bars 36 of the frame 30 by bolts 66 extending through the bar 36 and through vertically elongate slots 68 in the straps 64 and 64a, respectively, adjacent their lower ends.

A second shaft 70 (FIGS. 2A and 3A) is mounted adjacent the end of the magazine bottom plate 50 that is opposite the shaft 60. The shaft 70 is mounted for adjustment longitudinally of the bottom plate 50 by means of bearings 72 (one shown in FIG. 2A) each of which is slidable in a slot 74 (FIG. 2A) in a bracket 76, and both brackets 76 are secured to the plate 50 so that the shaft 70 is spaced the same distance below the magazine bottom plate 50 as is the shaft 60.

Midway between the two lateral sides of the bottom plate 50 and in alignment with the longitudinal slot 78 thereof are sprockets 80 and 82 (FIG. 3A) mounted on the shafts 60 and 70, respectively. Since the sprocket 82 is the driving sprocket of the conveyor D, it is rigidly secured to the shaft 70. However, since the sprocket 80 is merely an idler sprocket it can be mounted to rotate freely upon the shaft 60. A conveyor chain 84 is trained around the two sprockets 80 and 82, the parts being so proportioned and arranged that the upper run of the conveyor chain 84 lies within the slot 78 (FIG. 5) of the magazine bottom plate where it is slidably supported in substantially rectilinear configuration by a channel member 86 bridging the slot 78 and thus interconnecting the two halves of the bottom plate 50. Preferably, the channel member 86 is of relatively heavy construction and is provided with coplanar flanges 88 that extend substantially to the outer lateral edges of the bottom plate 50 so as to provide suitable stiffening reinforcement for the same.

Each of the bearings 72 in which the shaft 70 is mounted is provided with an adjusting screw 89 associated therewith in the well known manner, so that the chain 84 can be properly tensioned.

Pusher lugs 90 are provided on the conveyor chain 84 at suitably spaced intervals throughout the length thereof. As each pusher lug 90 is advanced longitudinally of the slot 78 in the magazine bottom its upper end projects above the level of the magazine bottom 50, the distance that it so projects being substantially equal to the thickness of one of the cartons in its flat, folded condition. The leading end of each pusher lug 90 is formed with a notch 92 therein (FIGS. 3A and 5) within which the trailing edge of a folded carton X is adapted to seat while the lug propels the carton out from under the stack of cartons within the magazine A.

The conveyor chain 84 is adapted to be driven so as to move the pusher lug 90 thereof rearwardly of the machine, by a motor 94 having a suitable speed reduction unit (not shown). A driving sprocket (not shown) on the output shaft (not shown) of said speed reduction unit is connected by a drive chain 98 to a sprocket 100 (FIG. 3A) on a countershaft 102 journaled in suitable bearings 104 (FIG. 2A) on the frame side bars 32 adjacent their forward ends. The countershaft 102 is likewise provided with a sprocket 106 that is connected by a chain 108 to a driven sprocket 110 on the shaft 70 of the conveyor D.

The presser mechanism B

As shown in FIGS. 1, 2A, and 3A, the presser mechanism B is mounted partly on the front wall 52 of the magazine A and partly upon the end of the magazine bottom 50 that projects forward beyond the front wall 52. The part of the presser mechanism B that is mounted upon the magazine wall 52 includes an elongate block 120 that is mounted for vertical, longitudinally reciprocatory movement on the outer or forward face of the front wall 52 of the magazine by means of two vertically aligned straps 122, as best shown in FIGS. 5 and 6. A finger 124 (FIGS. 3A, 5, and 6) is mounted by a pivot

5

pin 126 for pivotal movement within a groove 128 that is machined in the rear face of the block 120.

The pivot pin 126 is intermediate the upper and lower ends of the finger 124, and the finger 124 is constantly urged to rotate counterclockwise as viewed in FIG. 3A by means of a spring 130 (FIGS. 3A and 6) under compression between the front face of the block 120 and one of two cooperating jam nuts 132 screwed onto a threaded rod 134 that extends through the spring 130 and is engaged with the upper end of the finger 124. In this manner, the lower end of the finger 124 is constantly, but yieldably, urged rearwardly of the machine, through a vertical slot 136 in the magazine front wall 52.

The lower end of the finger 124 is formed with a tapered presser foot 138 having a flat under surface and an upper surface so inclined that when the block 120 is slid upward, the sloping upper surface of the presser foot 138 engages the forward ends of folded cartons within the magazine A in a manner causing the presser foot 138 to be cammed forward, i.e., to a position where the presser foot will slide past the edge of each folded carton without exerting any lifting effect thereupon, similarly to the manner in which a ratchet tooth operates. However, upon clearing each carton as the block 120 moves upward, the presser foot 138 is forced rearwardly again by the spring 130 so that when the block 120 moves downward, the flat under surface of the presser foot will engage upon the upper surface of the folded carton therebelow and cause the corresponding region of that carton, as well as the corresponding regions of any cartons below the one engaged by the presser foot, to be pressed downward firmly against the bottom 50 so as to enhance the security with which the lowermost carton in the stack will be engaged by the next pusher lug 90 to pass under the wall 52 of the magazine.

The part of the presser mechanism B that is mounted upon the magazine bottom plate 50 includes a pair of brackets 140 (FIGS. 1, 2A, and 3A) upstanding from the bottom plate 50 and carrying a short, transversely extending shaft 142 (FIGS. 2A and 3A). Carried by the shaft 142 for pivotal movement about the axis thereof is an operating lever 144 including a rearwardly projecting rod 146 and a forwardly and downwardly inclined sector plate 148 that is rigid with the rod 146. Pivotaly mounted on the shaft 142 is an arm 150 that is adapted to be rigidly secured to the operating lever 144 by a bolt 152 screwed into the arm 150 and extending through a clearance slot 154 in the sector plate 148. The slot is arcuate about a center lying within the axis of the shaft 142. The arm 150 is of such length that a cam follower roller 156 (FIG. 3A rotatably mounted upon its lower end is adapted to be engaged by a cam 158 rigid with the conveyor drive shaft 70.

The parts are so proportioned and arranged that just before a pusher lug 90 passes rearwardly under the front wall 52 of the magazine, the high lobe of the cam 158 engages the roller 156 causing the operating lever 144 to turn clockwise (FIG. 3A) about the axis of the shaft 142 and thus pushing the block 120 downward. The connection between the operating lever 146 and the block 120 includes a rod 160 (FIGS. 5 and 6) that is vertically reciprocable within a bore 162 within the block 120 and having a socket 163 in its lower end. The upper end of a coil spring 164 is seated within the socket 163 while the lower end of the spring 164 bears against a plug 166 firmly secured to the block 120 within the lower end of the bore 162. Thus, the spring 164 constantly resists downward motion of the rod 160 relative to the block 120.

The rear end 167 of the rod 146 is rounded and extends through a slot 168 in the forward face of the block 120 and is seated within a diametrical slot 169 in the rod 160. Thus, when the operating lever 144 is turned clockwise as hereinabove described, the block 120 is forced downward, carrying with it the finger 124 until the press-

6

er foot 138 encounters a carton and compresses the same with a force determined by the strength of the spring 164, after which the block 120 can continue to move downward as determined by the height of the lobe of the cam 158 without exerting any pressure upon the compressed carton, or cartons, as the case might be, in excess of the strength of the spring 164.

The cam follower roller 156 is held against the cam 158, thus causing the block 120 to rise when the lobe of the cam 158 turns out of engagement with the roller 156, by a spring 170 under compression between the rod 146 and a washer suitably immobilized on a rod 172 extending rigidly upward from the magazine bottom plate 50 and axially through the spring 170.

Gate Mechanism C

As hereinabove mentioned, the function of the gate mechanism C is to release one carton, and only one, at a time, so that the folded cartons can be successively propelled from the magazine A onto the main conveyor E. For this purpose, the gate mechanism C is mounted partly upon the rear wall 54 of the magazine A and partly upon the underside of the channel member 86 of the bottom plate 50, immediately below the magazine wall 54. Each carton being propelled rearwardly of the machine by a pusher lug 90 of the conveyor 84 must pass between these two parts of the gate mechanism C, as shown in FIG. 10.

The part of the gate mechanism C that is mounted upon the magazine wall 54 includes two gauge bars 180. Each of the gauge bars 180 (FIGS. 3A, 7, and 8) is of L-shaped configuration including a stem 182 slidably mounted upon the inner surface of the magazine wall 54 and a foot portion 184 extending below the lower edge of the wall 54, as shown in FIGS. 3A and 8. The stem 182 of each gauge bar 180 is slidably mounted for reciprocatory movement toward and away from the magazine bottom plate 50 by means of shoulder screws 186 (FIGS. 3A, 7, and 8) that extend slidably through vertically elongate slots 188 in the magazine wall 54 and are screwed tightly against the stem 182 of the associated gauge bar 180.

Welded or otherwise rigidly secured to the outer face of the magazine wall 54 is an angle bracket 190 in operative association with each of the gauge bars 180. A guide rod 192 extends slidably through the leg of the angle bracket 190 that projects outward from the wall 54. The lower end of the guide rod 192 is secured to the foot portion 184 of the associated gauge bar and a coil spring 194 encircling the rod 192 and under compression between the bracket 190 and the foot portion 184 constantly urges the gauge bar 180 downward to the limit of its downward movement as determined by the adjustment of a pair of cooperating jam nuts 196 screwed onto the upper end of the guide rod 192. When both sets of the nuts 196 are properly adjusted they hold the foot portions 184 of the gauge bars 180 in such an elevation above the magazine bottom plate 50 that one folded carton can pass freely under the same but more than one can not.

The part of the gate mechanism C that is mounted on the channel member 86 is a leaf spring 200 disposed directly below each foot portion 184. Both leaf springs 200 are secured to the channel member 86 of the bottom plate 50. Each leaf spring 200 includes a relatively long base section 202 (FIG. 3A and FIG. 8) secured to the under surface of the channel member 86, a substantially vertical portion rising from the after end of the base section 202, and an upper portion 204 extending rearward from the vertical riser portion. As best shown in FIG. 8, the after end 206 of the upper portion 204 is deflected upward so as to engage the corresponding end of the associated foot 184. Moreover, the upwardly inclined end 206 extends upward and rearward beyond the end of the foot 184 where it is curved to provide a rounded shoulder over which a carton can slide without harm to the carton.

The parts are so proportioned and arranged that the forward part of the upper portion 204 of each leaf spring

is parallel to the associated foot 184 and is spaced therefrom a distance substantially equal to the thickness of a folded carton, thus providing a space adapted to receive the leading edge of a folded carton when the same is carried rearward by one of the pusher lugs 90. When the leading edge of the carton engages the inclined portions 206 of the leaf springs 200 the springs are deflected downward, permitting the carton to pass between the springs and the foot portions 184 of the gauge bars. However, the leaf springs 200 exert such frictional resistance to such movement of the carton as to insure that the carton is in firm contact with the pusher lug when the carton is discharged from the magazine A. This assures accurate timing of carton release.

When the trailing edge of a carton thus being propelled out from under a stack of cartons within the magazine A passes the terminal ends of the foot portion 184 of the gauge bars 180, the trailing edge of the carton is snapped vigorously upward by the projecting after ends of the leaf springs 200, thus insuring prompt and accurately timed release of the folded carton from the pusher lug.

The main conveyor E

The main conveyor E comprises a pair of endless chains 210 (FIGS. 1-4, inclusive) each of which is trained around three sprockets 212, 214, and 216, respectively (FIGS. 3A and 3B). The sprockets 212 (FIGS. 3A and 4) are driving sprockets for the respective chains 210, being secured to a lower countershaft 218 which is driven by a chain 220 trained around a driven sprocket 222 (FIG. 4) rigid with the countershaft 218 and around a second sprocket (not shown) secured to the hereinbefore mentioned output shaft of the speed reduction unit associated with the motor 94. The sprockets 214 (FIGS. 2A, 3A, and 4) are driven sprockets that impart rotation to an upper countershaft 224 to which they are rigidly secured. The sprockets 216 are idler sprockets carried by a shaft 225 (FIGS. 1, 2B, and 3B) journaled in bearings 226 (FIG. 2B) slidably mounted in slots 227 in the channel members 40 of the frame extension 38 at the rear end of the machine. Adjusting screws 228 are associated with the bearings 226 in the well known manner to properly tension the conveyor chains 210.

Parallel rails 230 and 230a (FIGS. 1 to 4, inclusive) slidably support the cartons as they progress through the opening station F and the flap manipulating station G. The rail 230 extends clear to the rear end of the machine, but the rail 230a is considerably shorter, terminating at a point that causes each carton to slide off the rear end of the rail 230a as the carton comes into alignment with the case loader H, for a reason that will presently be explained. The chains 210 are each provided with laterally projecting rollers 232 (FIG. 4), and while the part of either chain to which any one of the rollers is attached is in the upper run of the chain, that roller is supported upon the upper flange 234 of the associated channel member 40, and is prevented from being raised therefrom by the horizontal flange 236 of an angle bar 238. The angle bars 238 and the rails 230 and 230a are supported upon the channel members 40 (FIG. 4).

Each chain 210 is provided with a plurality of carton erecting and propelling fingers 240, each of which is transversely aligned with a companion finger 240 on the opposite chain 210. Each finger 240 is rigidly secured to one of the links of the associated chain 210 in such a position that throughout the time that the link is within the upper run of the chain the finger projects vertically upward therefrom. Each finger 240 has a bar 242 pivoted at one end thereto and projecting rearwardly therefrom, i.e., in the direction opposite to the direction in which the finger advances when the conveyor E is in operation. The pivoted end of each bar 242 is loosely seated within a notch 244 in a lateral side of the associated finger 240, the arrangement being such that when the part of the as-

sociated chain on which the finger is mounted is in the upper, rearwardly moving run of the chain the bar 242 rests against one side of the associated notch 244 and is held thereby in a position projecting substantially horizontally rearward from the finger, but after passing around the associated sprocket 216 the bar 242 is free to pivot under the influence of gravity to a position of oblique angularity with the finger as shown in the lower portion of FIGS. 2B and 3B. The erecting and propelling fingers 240 are so spaced apart on their chains 210 that the distance between each finger 240 and the trailing end of the bar 242 of the preceding finger 240 is equal to the longitudinal dimension of one of the cartons after the carton has been erected by the machine. Thus, each finger and the bar 242 of the preceding finger cooperate to define a carton receiving pocket on the conveyor E within which an erected carton can be propelled by the conveyor toward the rear of the machine.

In the opening or erecting station F of the machine, the lower portion of each carton is kept in proper alignment by longitudinally extending guides 246 (FIGS. 3A, 3B and 4) which are adjustably mounted on the machine frame 30 by supporting rods 248 (FIGS. 1 and 4). A pair of overhead endless chains 250 (FIGS. 1-4, inclusive) cooperate with the fingers 240 and bars 242 in guiding and propelling the cartons through the machine. Each of the overhead chains 250 is trained around longitudinally spaced sprockets 252 and 254, respectively, carried by shafts 256 and 258, respectively. The two shafts 256 and 258 are suitably journaled in bearings 260 and 262, respectively (FIGS. 3A and 3B). The bearing 260 is mounted in fixed position at one end of a tubular brace bar 264 of rectangular cross section while the bearing 262 is slidably mounted within the opposite end of the brace bar and is provided with an adjusting screw 265 in association therewith in the well known manner to enable the overhead chains 250 to be properly tensioned.

Each of the overhead chains 250 is provided with upstanding pusher lugs 266 spaced apart thereon distances equal to the spacing between each erecting finger 240 and the trailing end of the preceding bar 242. Moreover, each pusher lug 266 on either overhead chain 250 is transversely aligned with a companion pusher lug on the other overhead chain 250 and the conveyor chains 210 and 250 are so related to each other that when the parts of the overhead chains 250 by which a pair of pusher lugs 266 are carried are in the lower runs of the chains 250, the leading edges of that pair of lugs 266 are in planar alignment with the leading edges of a pair of erecting and propelling fingers 240 immediately therebelow.

The overhead chains 250 are mounted at such height above the main conveyor E that the lower runs of the chains 250 rest upon the upper surface of an erected carton on the conveyor E and thereby aid in holding the carton in position upon the conveyor E.

The supporting means for the overhead chains 250 includes a pair of longitudinally extending plates 268. Each plate 268 carries a bearing 270 (FIGS. 1, 2A and 4) at its rear end and the shaft 256 is journaled in the two bearings 270. Each plate 268 is rigidly but adjustably mounted at its forward end on a bracket 272 rigidly secured to and extending upward from a side bar 32 of the frame 30. The after end of the brace bar 264 rests upon an arm 274, the outboard end of which is rigidly secured to a post 276 extending rigidly upward from a side bar 32 of the frame 30. The arm 274 extends inward from the post 276 and just above the lower run of one of the chains 250 (FIG. 3B) so that the portion of the brace bar 264 adjacent its rear end can rest upon the inboard end of the arm 274.

The overhead chains 250 are driven by a chain 278 (FIGS. 1 and 2A) trained around a sprocket 280 (FIG. 2A) rigid with the countershaft 102 and around a sprocket 282 rigid with a sleeve 284 (FIG. 4) that is rotatable upon a stub shaft 286 carried by one of the plates 268. The

sleeve 284 also has a reversing gear 288 secured thereto which is enmeshed with a gear 290 (FIG. 1) on the shaft 256 of the overhead chains 250. The ratios of the several gears involved in the drive for the overhead chains 250 are such that the linear speed of the chains 250 is the same as that of the chains 210; and in view of the presence of the reversing gear 288 in this drive, the lower runs of the chains 250 move in the same direction as the upper runs of the chains 210.

The carton opening mechanism

A movable stop 300 (FIG. 3A) is mounted on one end of a lever 302 in position to be projected upward between the rails 230 and 230a at such a distance from the discharge end of the first conveyor D that the leading edge of each folded carton engages the stop 300 while the trailing edge thereof is being propelled by the notch 92 of the lug 90 that propelled the carton out from under the stack of folded cartons within the magazine A. The lever 302 is fulcrumed intermediate its ends on a bracket 304 that is rigidly mounted upon a supplementary frame member 306, and the end of the lever 302 opposite that to which the stop 300 is secured carries a cam follower roller 308 that rides upon a cam 310 rigidly secured to the upper cam shaft 224.

The cam 310 operates to lower the stop 300 to an inoperative position wherein its upper end is below the level of the carton supporting rails 230 and 230a when the roller 308 is in engagement with the high lobe of the cam 310; and a spring 318 functions to project the stop 300 upward to its operative position illustrated in FIG. 3A when the roller 308 is not engaged by the high lobe of the cam 310.

The upper run of the main conveyor E is considerably lower than the discharge end of the first conveyor D and, consequently, for a brief interval after a carton first engages the stop 300 and while its trailing edge is still supported upon the discharge end of the first conveyor D, the carton is disposed in an inclined position with its intermediate portion supported upon a plate 312 whose after end is likewise pivotally supported upon the bracket 304. The forward end of the pivoted support plate 312 is supported by a cam follower roller 314 that rides upon another cam 316 that is rigidly secured to the upper cam shaft 224. The roller 314 is held against the periphery of a cam 316 by the force of gravity, whereas the spring 318 is employed to hold the roller 308 of the lever 302 against its cam 310.

The cam 316 operates to elevate the rear end of the plate 312, disposing the plate 312 in the downwardly and forwardly inclined position illustrated in FIG. 3A when the high lobe of the cam 316 engages the roller 314 and to permit the plate 312 to return to a substantially horizontal position below the level of the carton supporting rails 230 and 230a when the high lobe of the cam 316 passes out of engagement with the roller 314.

A pair of carton opening blades 330 (FIGS. 1, 2A, 3A, and 4) are mounted, one adjacent each of the side bars 32, substantially midway between the discharge end of the first conveyor D and the carton engaging stop 300. Both blades 330 lie in a common plane that slopes upward and rearward of the machine and both blades partake of oscillatory motion in this plane, each being mounted upon a shaft 332 (FIGS. 1, 2A, and 4) which is perpendicular to the said plane and which, therefore, slopes downward and rearward of the machine. Each shaft 332 is suitably mounted in bearings 334 (only one of which is shown for each shaft in FIG. 4) the bearings being suitably mounted upon the frame 30.

The two blades 330 are simultaneously oscillated in opposite directions about the axes of their respective shafts 332 by a common drive shaft 336 mounted in bearings 337 suitably supported on the supplemental frame member 306. The drive shaft 336 is provided with two miter gears 338 which face in opposite directions, as best shown

in FIG. 1. Each of the blade oscillating shafts 332 is operatively connected to one of the miter gears 338 by a driven miter gear 340 rigidly secured to the lower end of the shaft, and since the two miter gears 338 face in opposite directions, the two shafts 332 are turned in opposite directions when the shaft 336 is turned.

The drive shaft 336 is oscillated about its own axis by a rack 342 (FIGS. 2A and 4) that engages a pinion gear 346 rigid with the shaft 336. The rack 342 is carried by a guide plate 344 having a rectilinear slot 348 therein through which the shaft 336 extends so that the guide plate 344 can slide back and forth on the shaft 336. The guide plate 344 and rack 342 are reciprocated by a lever 350 (FIGS. 2A, 4, and 9) to which the rack 342 is adjustably connected by a rod 352 pivoted to the lower end of the lever 350. The upper end of the lever 350 is carried by a sleeve 356 that is free to rotate upon a shaft 358 extending transversely of the machine and rigidly secured to vertical brace members 360 of the frame 30 by bolts 362 (FIGS. 2A and 4). A lateral extension 364 (FIG. 9) of the lever 350 carries a pin 366 upon which a cam follower roller 368 is rotatable and this roller is engaged within a cam groove 370 in a face cam 372 rigidly secured to the lower countershaft 218. The parts are so arranged that as the face cam 372 is rotated by the constantly turning countershaft 218 the lever 350 is oscillated in pivotal motion about the axis of the stationary shaft 358 thus causing the rack 342 to reciprocate in a manner imparting oscillatory, rotary motion to the drive shaft 336, whereby the carton opening blades 330 are oscillated.

Since the driving sprockets 212 of the main conveyor chains 210 are the same size as the driven sprockets 214, the carton stop 300, the pivoted plate 312, and the carton opening blades 330 are operated in synchronism with each other and with the carton conveyor D whereby cartons are withdrawn from the magazine A. As a folded carton X is being discharged from the magazine A its leading edge slides along the rails 230 and 230a as it approaches the stop 300. After the leading edge is well past the pivoted plate 312 the cam 316 raises the after end of the plate 312 so as to provide support for the folded carton in an area between the leading and trailing edges thereof. The cam 372 is so arranged that just before the leading edge of the carton X encounters the stop 300, the carton opening blades 330 are pivoted downward and inward. These blades are of such length that they engage the end closure flaps 374 and 374a (FIG. 11) associated with the leading end wall 376 of the carton body. As the blades 330 continue to descend they bend the folded carton X slightly around the raised rear end of the pivoted plate 312 and along longitudinal lines of bend, thus tending to open the slots 378 and 378a that occur between the end closure flaps 374 and 374a and the closure flaps 380 and 380a, respectively, of the upper side wall 382. Furthermore, the blades 330 exert gradually increasing pressure upon the end closure flaps 374 and 374a as the folded carton continues to slide toward the stop 300 and before the leading edge of the carton encounters the stop 300, the blades 330 pass through the slots 378 and 378a so that they present upwardly and rearwardly inclined surfaces to the leading edges of the side closure flaps 380 and 380a as the carton X continues to advance. As this occurs, the high lobe of the cam 316 passes out from under the cam follower roller 314 of the pivoted plate 312 permitting the latter to drop to its inoperative position below the level of the carton supporting rails 230 and 230a so that the intermediate portion of the folded carton is no longer supported thereby. Therefore, the lower side wall 384 (FIG. 12) of the carton is free to pivot downward about the leading edge of the folded carton in response to the continued downward motion of the carton opening blades 330.

When the leading edge of the folded carton X en-

counters the stop 300, the trailing edge of the carton is still being propelled by one of the pusher lugs 90 of the carton dispensing conveyor D and at this instant a pair of the erecting and propelling fingers 240 swinging upward and forward about the axis of the upper counter-shaft 224 engage the lower, or trailing end wall 376a as indicated in FIG. 12 and as shown in FIG. 13. Since the lower side wall 384 is held down against the rails 230 and 230a by the blades 330 while the lower end wall 376a of the carton is being swung upward and forward by the erecting fingers 240, the folded carton is opened to its erected or squared-up position as shown in FIG. 13.

The cam 310 (FIG. 3A) is so arranged that when the carton X achieves this squared-up condition the stop 300 is lowered so that the carton X then is free to be propelled along the rails 230 and 230a by the erecting fingers 240 that now are engaging its rear end wall 376a. The cam 372 (FIGS. 4 and 9) is so designed and arranged that as the stop 300 is withdrawn, the blades 330 likewise are withdrawn by being swung upward and outward to their fully retracted position. Furthermore, the overhead chains 250 are so synchronized with the chains 210 that a pair of its pusher lugs 266 engage the upper rear corner of the erected carton X in planar alignment with a pair of the carton propelling fingers 240 immediately therebelow (FIG. 13) so that the fingers 240 and the lugs 266 then cooperate to propel the carton X out of the erecting or opening station F and into and through the flap manipulating station G. When thus propelled into and through the flap manipulating station G, the carton X is in its fully open or squared-up position as illustrated in FIG. 13, with each of the closure flaps projecting laterally from the body of the carton in planar alignment with the end wall or side wall, as the case might be, with which that closure flap is associated. Furthermore, the two end walls 376 and 376a of the carton are vertical and the two side walls 382 and 384 are horizontal, while the two sides which are destined to become the top and bottom sides of the carton, respectively, open laterally, i.e., toward the sides of the conveyor E by which they are advanced as they enter the closure flap manipulating station G.

Closure flap manipulating station G

It is immaterial, in so far as the purposes of the present invention are concerned, whether the carton be filled through the open side thereof which later will become the bottom of the carton, or through that which will become the top of the carton. However, for the sake of convenience in the present disclosure, it will be assumed that the side which is nearest the observer in FIGS. 2A and 2B and that which is to the right of an observer viewing the apparatus as in FIG. 4, is destined to become the bottom of the carton X and that the opposite side will become the carton's top side and that, consequently, the carton will be filled through its open top side.

Means are provided, therefore, in the carton flap manipulating station G for folding the bottom closure flaps 374, 375, 380, and 385 inward toward their carton closing arrangement. As the carton progresses through the flap manipulating station G, its leading bottom end closure flap 374 encounters an abutment which folds the flap 374 inward, i.e., in the direction opposite that in which the carton is advancing. This abutment is in the form of a disk 400 (FIGS. 1, 2B, and 4) lying in a horizontal plane and mounted for free rotation upon a vertical stub shaft 402 that is carried by a bracket 404 rigid with the frame 30 of the machine. The disk 400 is fully as effective in folding the leading bottom end closure flap as is the more conventional stationary shoulder or plate previously employed for this purpose, since the disk 400 is free to rotate, it turns as the flap progresses therepast and, therefore, tends to eliminate friction between itself and the flap with the result that scuffing or scarring of the flap is avoided.

Means are provided for spreading the horizontally disposed upper and lower side closure flaps 380 and 385 farther apart before the leading end bottom flap 374 encounters the disk 400. A vertical shaft 406 (FIGS. 1, 2A, and 4) is journaled in bearings 408 (FIG. 1) and 410 (FIG. 4), respectively, mounted in axially aligned relation, one vertically above the other, upon the frame 30. Adjacent its upper end the shaft 406 carries an arm 412 rigid therewith and extending radially therefrom. An upper flap spreading shoe 414 is rigidly secured to the outer end of the arm 412. This shoe is of arcuate form and is disposed with its center substantially within the axis of the shaft 406. Whereas the lower edge of the shoe 414 is flat and horizontal, its upper edge slopes downward from approximately the mid portion of the shoe toward each end, as is best shown in FIGS. 4 and 14. A lower flap spreading shoe 416 is mounted directly below the upper flap spreading shoe 414 on another arm 418 likewise rigidly secured to the shaft 406. The shoe 416 is similar to the shoe 414 but is inverted as compared therewith since its upper edge is flat and its lower edge inclines upward toward each end of the upper edge. The lower flap spreading shoe 416 is mounted in position to engage the lower bottom side flap 385 at the same time that the upper spreader shoe 414 engages the upper bottom side closure flap 380. Thus the two flap spreading shoes 414 and 416 cooperate to spread the upper and lower bottom side closure flaps 380 and 385 apart far enough for the end closure flaps 374 and 375 to be folded inwardly therebetween.

The shaft 406 is oscillated about its axis by a rack 420 (FIGS. 2A and 4) enmeshed with a pinion gear 422 (FIG. 4) rigid with the lower end of the shaft 406. The rack 420 is reciprocable longitudinally of the machine and is guided in such movement by a guide 424 (FIGS. 2A and 4) rigidly mounted upon a lower supplementary frame member 426. A connecting rod 428 (FIG. 2A) is pivoted at one end to the rack 420 and at its opposite end to the lower end of a lever 430 whose upper end is carried by a second sleeve 432 that is mounted to turn freely upon the stationary shaft 358. Intermediate its ends, the lever 430 carries a laterally projecting cam follower roller 434 (FIG. 2A) upon a suitable pin 436 projecting laterally from the lever 430. The roller 434 is engaged within a groove 438 in a face cam 440 rigidly secured upon the lower countershaft 218 and, consequently, the shaft 406 is arranged to be oscillated once during each cycle of operation of the apparatus.

The shaft 406 also carries a bent rod 442 (FIGS. 1, 2A, and 4) that is adapted to engage and fold inward the trailing bottom end closure flap 375 and fold the same inward toward its closing position as indicated in FIG. 14, it being understood that the shaft 406 is oscillated at such speed and in such timed relation with the advance of the propelling fingers 240 that both the spreader shoes 414 and 416 and the rod 442 are moving in the same direction as the carton bottom and at a faster rate so that they overtake the side bottom flaps 380 and 385 and the trailing bottom end flap 375 as the carton is advancing toward the rear of the machine.

Thus it may be seen that as a carton progresses through the flap manipulating station G, the shaft 406 is rotated clockwise, as viewed in FIG. 14, causing the upper and lower spreader shoes 414 and 416, respectively, to overtake the side bottom flaps 380 and 385 and spread them apart slightly, as indicated in FIG. 14. The leading end bottom flap 374 then encounters the disk 400 and is folded inward thereby, and at approximately the same time the rod 442 overtakes the trailing bottom end flap 375 and folds the same inward toward its closing position.

Before the leading end bottom closure flap 374 passes out of engagement with the disk 400, it is engaged by a plate 444 (FIGS. 2B and 4) rigidly mounted upon the frame of the machine by rods 446 extending horizontally

13

inward from the hereinabove mentioned bracket 404. The end 448 of the plate 444 first encountered by the advancing carton is flared outward to smoothly guide the flaps 374 and 375 under the plate as the carton advances.

Before the end bottom flaps 374 and 375 pass out of engagement with the plate 444 the upper and lower side bottom flaps 380 and 385 engage flap folding rails 460 and 460a, respectively (FIGS. 1, 2B, and 15). The upper rail 460 inclines downward and toward the rear of the machine so that as the flap 380 slides along the same the flap is folded downward and inward toward its closed position, wherein it overlies the end closure flaps 374 and 375 as illustrated in FIG. 15. The lower flap folding rail 460a inclines upward and toward the rear of the machine so that as the lower side bottom flap 385 slides along the same the flap is folded upward and inward toward its closed position as is likewise illustrated in FIG. 15. The forward, spread apart ends of the rails 460 and 460a are pivotally mounted for rotary movement about a vertical axis in brackets 462 (FIGS. 1 and 2B) and 462a (FIG. 15), respectively, carried by the hereinbefore mentioned arm 274 and by a vertical bar 274a depending from the arm 274 as best shown in FIG. 4. The rear ends of the rods 460 and 460a are preferably joined, so that together they define a V-shaped arrangement, the after end of which is free to move transversely of the machine for a limited distance for a purpose that will be made clear hereinafter.

Inasmuch as in the present machine the cartons are to be filled through the open side which is destined to become the top side of the carton, means are provided for spreading apart the top end closure flaps 374a and 375a, respectively. The leading top end closure flap 374a is engaged by a bent rod 464 (FIGS. 1, 3B, 4, and 14) similar to the flap folding rod 442 hereinabove described and mounted upon the opposite side of the machine on a vertical shaft 466 mounted in vertically aligned bearings 468 (FIG. 1) and 470 (FIGS. 3B and 4). A pinion gear 472 (FIGS. 3B and 4) rigid with the lower end of the shaft 466 is enmeshed with a rack 474 that is reciprocable longitudinally of the machine within a guide 476 carried by a second lower supplemental frame member 478. One end of a link 480 is pivoted to the rack 474 and its other end is pivoted to the lower end of a lever 482 similar to the hereinabove described lever 430, and similarly carried by a sleeve 484 that is free to turn upon the rigid shaft 358 (FIGS. 3A and 4). The lever 482 carries a cam follower roller (not shown) engaged within a cam groove (not shown) in a face cam 486 (FIG. 4) rigid with the lower countershaft 218, the arrangement being similar to that of the hereinbefore described lever 430 so that as the cam 480 is turned by the countershaft 218, the rack 474 is reciprocated causing the shaft 466 to oscillate carrying with it the flap folding rod 464. The apparatus is so timed that the rod 464 is moved forward at a speed greater than that of the carton and in such timed relation therewith that the rod 464 engages the rear face of the leading top end flap 374a and folds it outward as indicated in FIGS. 14 and 15. The rod 464 remains in engagement with the flap 374a long enough to hold it in its outwardly folded position until the flap passes under a guide plate 488 (FIGS. 3B and 4) rigidly mounted upon an arm 490 (FIG. 4) carried by a bracket 492 rigid with the frame 30.

After the leading top end closure flap 374a has thus been slid under the guide plate 488 the trailing top end closure flap 375a encounters a disk 494 which is similar to the previously described disk 400, and which is similarly mounted upon a vertical stub shaft 496 (FIGS. 1 and 3B) secured to the upper end of the bracket 492. The disk 494, however, is so spaced from the rod 464 that it does not engage the top end closure flap 375 until after the leading top end closure flap 374a has been folded outward and into position behind the guide plate

14

488. Therefore, after the carton X continues to advance and to move out of the carton manipulating station G, both top end closure flaps 374a and 375a are held in their most widely spread position by the guide plate 488.

Loading station

It is apparent, therefore, that as the carton enters the loading station it is lying upon one of its sides. The bottom closure flaps are folded to, or nearly to, their closing arrangement. The two top end closure flaps 374a and 375a, respectively, are spread to their most fully open position where they are held by the plate 488 in sliding engagement therewith and the upper and lower top side closure flaps project horizontally from and in planar alignment with the upper and lower side walls, respectively, of the carton so that the top of the carton is open in readiness for the carton to be filled through the open top of the carton. A carton is illustrated in this condition in FIG. 16. The filling operation is performed by a case loader H which, as illustrated in FIG. 1, is mounted at that side of the machine of the present invention toward which the open top side of the carton faces as the carton enters the loading station and thus moves into alignment with the case loader H. The details of construction and operation of the case loader H form no portion of the present invention. There is no necessity for the inclusion of a detailed description of the same herein. Therefore it will suffice for the purposes of the present disclosure to explain that the case loader H, chosen as an example of the type of loader that can be employed advantageously in this connection, includes a housing 510 into which cans to be filled into the carton are delivered by a series of conveyors 512 and within which the cans are arranged into that pattern that they are to occupy within the carton. The case loader H also includes one or more plungers 514 by which the assembled cans are pushed into the carton through a delivery chute 516 which extends from the housing 510 to a position adjacent one side of the conveyor E of the machine of the present invention. For a more detailed description of a case loader suitable for use with the machine of the present invention, reference may be had to Patent No. 2,650,009 issued to Kerr on August 25, 1953.

The hereinbefore mentioned pusher mechanism J operates when an empty carton arrives in the loading station as hereinabove described, to push the carton laterally toward the case loader H so that the open top of the carton embraces the delivery chute 516 thus facilitating entry of the assembled cans into the carton when the plungers 514 are operated. The pusher mechanism J (FIGS. 1, 2B, and 17) comprises a frame 520 upon the upper end of which a pusher plate 522 is mounted by means of a pin 524 extending through the upper end of the frame 520 and through brackets 526 welded to the outer side of the plate 522. The brackets 526 extend laterally from the upper end of the frame 520 with the inner face of the plate 522 substantially parallel to the longitudinal dimension of the frame 520. The frame 520 is mounted for pivotal movement toward and away from the delivery chute 516 of the case loader H, it being understood that the frame 520 is disposed directly opposite the open discharge end of the chute 516 and across the conveyor E therefrom.

The frame 520 comprises two spaced, parallel legs 528 rigidly interconnected by a web or plate 530 and embracing the outwardly directed flanges 532 of a channel member 534 welded or otherwise secured at its upper end to one of the horizontal channel members 40 of the frame extension 38. The channel member 534 of the pusher mechanism J extends downward from the channel member 40 and the lower ends of the legs 528 are pivoted upon a pin 536 extending through the lower ends of the legs 528 and through the lower ends of the flanges 532. A leg extension 538 is secured to each of the legs 528 by a lower pivot pin 540 and by an upper pin 542. Each of the upper pins 542 is remov-

able so that the leg extensions 538 and the pusher plate 522 carried at the upper end thereof can be swung outward to afford access to the delivery chute 516 of the caser H and to that portion of the conveyor E immediately in front of the same. However, in normal operation the pins 542 remain in position and thus hold the leg extensions 538 in line with the legs 528 as illustrated in FIG. 17.

Means are provided for reciprocating the frame 520 and pusher plate 522 thereon between the full line and dotted line positions illustrated in FIG. 17. The illustrated full line position of the frame 520 and pusher plate 522 is that which these members occupy when they are retracted so as to permit an empty carton to enter the filling station and after having been filled to depart therefrom. The dotted line position is that which the frame 520 and pusher plate 522 occupy after an empty carton has been pushed laterally part way off the conveyor E so as to enter the discharge chute 516 of the case loader H into the open top side of the carton as indicated by the dotted line position of the carton in FIG. 17.

A means for thus reciprocating the frame 520 and the plate 522 comprises a pneumatic cylinder 544 having therein a piston (not shown) whose rod 546 projects through one end of the cylinder and is connected by a crosshead 548 to the upper ends of the legs 528.

A conduit 550 communicates with a suitable source of fluid under pressure, preferably air, and leads to a selector valve 552 whereby the conduit 550 can be connected optionally to either end of the cylinder 544 by a suitable arrangement of ducts (not shown). It will be appreciated, therefore, that when pressure is supplied to one end of the cylinder 544, the frame 520 and pusher plate 522 are pushed to their retracted position shown in full lines in FIG. 17, and when pressure is supplied to the other end of the cylinder 544, the frame 520 and pusher plate 522 are pulled from the full line position and into such engagement with a carton on the conveyor E and registered with the delivery chute 516 that the carton is propelled toward the chute 516 far enough to enter the chute 516 into the open top side of the carton, as illustrated in FIG. 18 and indicated in dotted lines in FIG. 17.

As shown in FIG. 2B, a microswitch 560 is mounted above the conveyor E upon a beam 562 (FIGS. 1 and 2B) that projects rigidly from the after end of the hereinbefore mentioned brace bar 264. The switch 560 is in such position that its actuator 564 is engaged to actuate the switch 560 just as the carton arrives in position of registration with the delivery chute 516 of the caser H. The switch 560 is connected into the circuit (not shown) whereby the motor 94 is energized, in such a manner that when the switch 560 is actuated by a carton arriving in position to be filled, operation of the motor 94 is interrupted so that the conveyor E remains stationary while the empty carton is propelled onto the delivery chute 516 and while the caser H operates to propel a load of cans into the carton.

The parts are so proportioned and arranged that when the plungers 514 (FIG. 1) of the caser H propel the load of cans into the carton they do not cease operating immediately upon engagement of the load of cans with the bottom of the carton. Rather, the plungers 514 continue their forward stroke long enough to propel the carton, now filled with cans, back into position upon the conveyor E, at which time a second microswitch 566 (FIG. 1) is actuated, as by an abutment 568 carried by one of the plungers 514. The switch 566 is likewise connected into the circuit (not shown) of the motor 94 so that when the filled case has been returned to the conveyor E, the motor 94 resumes operation thus causing the conveyor to propel the filled carton out of the filling station.

The switch 560 is likewise connected into a circuit (not shown) whereby the selector valve 552 is operated

so that as the conveyor E comes to rest with an empty carton in alignment with the delivery chute 516 of the caser H, fluid under pressure is supplied to the cylinder 544 in a manner causing the pusher mechanism J to propel the carton onto the chute 516 as hereinabove described. Suitable means (not shown) are provided to relieve the pressure within the cylinder 544 upon the arrival of the carton in receiving relation to the chute 516 so that the carton and the pusher mechanism J are free to be returned into the position in which the carton can resume its progress on the conveyor E, as the final step of the operation of the caser H.

As hereinabove stated, the upper and lower bottom side flap folding rails 460 and 460a, respectively, together form a V-shape structure pivotally mounted to permit the apex 570 of the V to move laterally of the conveyor. One of the brackets 526 whereby the pusher plate 522 is connected to the upper end of the frame 520 serves as an abutment stop limiting outward movement of the V apex 570, this being the bracket 526 nearer the end 572 of the plate 522 first encountered by a carton entering the filling station. This end 572 of the plate 522 is curved outward, as shown in FIG. 1, to receive the inwardly folded upper and lower bottom side flaps of the carton from the rails 460 and 460a, respectively, and thus hold these outer bottom flaps in, or nearly in, their carton closing relation while the carton enters the filling station. The end 572 of the pusher plate 522 has a V-shape notch 574 (FIG. 2B) therein to permit the apex 570 to lie behind the plate 522 and yet in front of the bracket 526 that provides the abutment stop limiting outward movement of the apex 570. Being pivoted at their most widely spread ends for movement about a vertical axis as hereinbefore explained, the rods 460 and 460a can swing inward to accommodate inward movement of the pusher plate 522 as the latter pushes a carton onto the loading chute 516. When the carton is in alignment with the loading chute 516, the outer faces of the upper and lower bottom side flaps of the carton engage the rails 460 and 460a with the result that when the carton is returned to the conveyor E, the carton likewise pushes the rails 460 and 460a back to their operative position in readiness to be engaged by the corresponding flaps of the next successive carton to be fed into the loading station.

As hereinbefore stated, the slide rail 230a terminates at a point considerably short of the terminal end of the opposite slide rail 230. The length of the slide rail 230a, which is the rail nearer the pusher mechanism J, is such that the trailing end of each erected carton passes the end of the rail 230a just before the carton arrives in position of alignment with the loading chute 516. However, the carton retains its horizontal position in spite of the fact that the right-hand side of the carton, viewed in the direction of carton advance, is no longer supported by a slide rail. The reason for this is that the inherent resilience of the carton material causes the inwardly folded bottom flaps to bear against the pusher plate 522 with sufficient pressure to hold the carton horizontal, the carton being empty and, consequently, quite light in weight. However, when the filled carton is returned to the conveyor E, the side of the filled carton which is destined to become the carton bottom drops until the lower side wall of the carton comes to rest upon the flange 236 of the angle bar 238, causing the carton to assume a tilted position as indicated in FIG. 19. This is the position that the carton occupies as it is propelled from the filling station while sliding on the slide rail 230 and the flange 236, the former being somewhat higher than the latter.

The tipping mechanism K

The above described tilted position of the carton is that which the carton occupies as it enters the tipping mechanism K, as illustrated in FIG. 22 and as indicated

in broken lines in FIG. 20. However, the angle bar 238, whose flange 236 provides sliding support for the lower part of the carton as it leaves the filling station, terminates in such a position that as the trailing end of the carton passes out of the filling station, it slides off the end of the angle bar 238. To provide slidable support for the lower side of the carton in lieu of the angle bar 238 as the carton enters the tipping station, a relatively long and narrow plate 580 (FIGS. 20 and 21) is mounted at one of its longer edges upon a pair of sleeves 582 (FIGS. 2B, 20, and 21) that are rigidly secured to a longitudinally extending shaft 584 journaled upon one of the angle members 40 of the frame extension 38. The plate 580 extends tangentially from its supporting sleeves 582 as best shown in FIGS. 20 and 21, and is movable in rotary motion about the axis of the shaft 584 from a lower position wherein it extends longitudinally as a continuation of the flange 236 of the angle bar 238, through an intermediate position wherein it slopes at an angle of approximately 45° outward and downward with respect to the conveyor E and toward the hereinbefore mentioned take-away conveyor L, as shown in broken lines in FIG. 21, and to a substantially vertical position, as shown in full lines in FIG. 21. When the plate 580 is in its lower position, as illustrated in FIG. 20, it is inclined less steeply than when in its upper position so that when the plate 580 is lowered, its plane passes through or slightly above the rail 230 at the opposite side of the conveyor E. Thus, the portion of the rail 230 adjacent the discharge end of the machine serves as the slide that supports the higher side of the carton as it enters the tipping station K.

A torsion spring 588 (FIG. 2B) encircling the shaft 584 is connected at one end to a collar 590 affixed to the shaft 584 and at the other end to one of the bearings 592 whereby the shaft 584 is journaled. This spring 588 permits the plate 580 to turn to its upper position, as illustrated in FIG. 21, but constantly urges the plate 580 to turn in the opposite direction so as to return the same to its lower position, as illustrated in FIG. 20, on completion of each cycle of operation of the tipping mechanism K.

A pair of arms 594 are also secured to the sleeves 582 and since the sleeves are secured to the shaft 584, the arms 594 are thus rigidly interconnected and retained in spaced, coplanar relation extending tangentially from the sleeves 582, as best illustrated in FIGS. 20 and 21. The angle between the plane of the arms 594 and that of the plate 580 is approximately 90°, or possibly a few degrees less. Consequently, when the plate 580 is in its lower position wherein the plane of the plate 580 is substantially parallel to the side of a carton lying upon the plate 580 and upon the rail 230 at the opposite side of the conveyor E, the arms 594 extend upward in position to engage the bottom of the slightly tipped carton, as indicated in FIGS. 20 and 22.

A vertically disposed push rod 596 having a horizontal cross-bar 598 welded or otherwise rigidly secured to its upper end is mounted for longitudinal reciprocation in such position that the cross bar 598 is adapted to engage the under surface of a carton disposed in the above described, slightly tilted position resting simultaneously upon the plate 580 of the rail 230 (FIG. 20). Near its upper end, the push rod 596 is guided by a bracket 600 rigidly secured to the upper horizontal flange 234 of one of the channel members 40 of the frame extension 38. The lower end of the push rod 596 is secured to a yoke 602 (FIGS. 2B, 20, and 21) having a horizontal slot 604 therein and mounted for vertical reciprocation between a pair of peripherally grooved rollers 606, each of which is rotatable upon a pin 608 rigid with and extending from a support plate 610 welded or otherwise rigidly secured to the pedestal 42 that supports the rear end of the frame extension 38. A spac-

ing sleeve 612 is mounted upon each of the pins 608 thus holding the two rollers 606 in coplanar alignment in suitable spaced relation from the support plate 610 so as to maintain the push rod 596 vertical.

Means are provided for vertically reciprocating the yoke 602 and the push rod 596. Such reciprocating means comprises a crank disk 614 having a crank pin 616 thereon which projects into the slot 604 of the yoke 602. The disk 614 is carried by a shaft 618 that is journaled in a suitable bearing 620 carried by the pedestal 42. On the opposite side of the pedestal 42 from the crank disk 614, the shaft 618 carries a pulley 622 that is freely rotatable on the shaft 618 but which is adapted to be connected to the shaft 618 by a single revolution clutch 624 so that whenever the clutch 624 is engaged the pulley 622 drives the shaft 618 through one complete revolution. The pulley 622 is connected by a belt 626 to a driving pulley 628 (FIG. 2B) on the output shaft 630 of a motor and transmission 632. During operation of the apparatus, the motor 632 is constantly energized so that the pulley 622 continues to rotate and thus is in readiness to impart one full revolution to the shaft 618 whenever the single revolution clutch 624 is engaged.

Engagement of the clutch 624 is effected by means of an elongate clutch dog 634 which is pivoted intermediate its ends for rocking movement about a pin 636 carried by the pedestal 42. Since the single revolution clutch 624 is of conventional construction its structural details need not be set forth herein and it will suffice for the purposes of the present disclosure to explain that so long as the lower end of the clutch dog 634 engages a shoulder 638 which constitutes a part of the clutch 624, the clutch is prevented from completing driving connection between the pulley 622 and the shaft 618 but when the clutch dog 634 is withdrawn from engagement with the shoulder 638 the shaft 618 and pulley 622 are interconnected, but only for the time required for the shaft 618 to complete one full turn.

A lever 640 (FIGS. 1, 2B, 20, and 21) is disposed between the two channel members 40 of the frame extension in such position that a roller 642 of the upper end of the lever 640 is engaged by each carton just before the carton reaches the rear end of the conveyor E. The lower end of the lever 640 is rigidly secured to a shaft 644 that is rotatable within bearings 646 (FIGS. 20 and 21) each of which is secured to one of the channel members 40. The shaft 644 extends through one of the channel members 40 and carries upon its outboard end a crank arm 648 that is rigid with the shaft 644 and extends upward therefrom. The upper end of the crank arm 648 is connected by a link 650 to the upper end of the clutch dog 634. Consequently, when a carton engages the roller 642 at the upper end of the lever 640 and moves the lever to the right, as viewed in FIG. 2B, the clutch dog 634 is withdrawn from engagement with the shoulder 638 and the shaft 618 is caused to make one full revolution. This causes the crank pin 616 to move from its lowest position, as illustrated in FIG. 20, to its highest position illustrated in FIG. 21, and to return to its starting position because of its connection to the yoke 602. In this manner, the push rod 596 is propelled upward far enough to tip the carton from its slightly tilted position, illustrated in FIG. 22, to the position illustrated in FIG. 23, wherein the plate occupies the intermediate position shown in broken lines in FIG. 21, and wherein the center of gravity of the filled case has passed the vertical plane that includes the lowermost corner 652 (FIG. 23) of the carton with the result that gravity then causes the carton to complete a substantially 90° tipping movement, so that it comes to rest in right side up position upon the take-away conveyor L.

So that the plate 580 can cooperate with the push rod

596 in tipping the carton from the FIG. 22 position to that illustrated in FIG. 23, the rod 596 is connected to the plate 580 by a lever 654 (FIGS. 20 and 21) and a pushing finger 656 the lower end of which is pivoted to the lever 654 intermediate the ends of the latter. One end of the lever 654 is pivoted on a bracket 658 rigid with the outboard side of one of the channel members 40, which is provided with a suitable clearance opening (not shown) through which the lever 654 extends so that the bifurcated inboard end of the lever 654 can be engaged upon a pin 660 rigid with the push rod 596. The upper end of the pushing finger 656 is guided between the shaft 584 and the upper edge of the channel member 40 to which the bracket 658 is secured and bears against the under surface of the plate 580. Consequently, when the push rod 596 is raised the plate 580 is turned clockwise as viewed in FIGS. 20 and 21 at a rate that maintains it substantially in planar alignment with the cross bar 598 at the upper end of the push rod 596. At the same time the arms 594 are similarly turned. When the center of gravity of the carton passes through the vertical plane that includes the lowermost corner 652, gravity causes the carton to continue its tipping movement so that it finally comes to rest upon the take-away conveyor L. However, descent of the carton onto the take-away conveyor L is yieldably resisted by a dampener mechanism 662 which includes a cylinder 664 pivoted to its lower end upon a bracket 666 rigid with a support plate 668 projecting downward from the associated channel member 40. A piston (not shown) is reciprocable within the cylinder 664 and an orifice 670 of restricted size permits passage of air therethrough but at such a limited rate that movement of the piston within the cylinder 664 is resisted so that the piston cannot move rapidly within the cylinder. The piston rod 672 that moves with the piston extends through the upper end of the cylinder 664 and is connected by a suitable clevis 674 to one of the arms 594 at a point spaced radially from the axis of the shaft 584 so that the downward pivotal motion of the arm 594 caused by the downwardly tipping carton is resisted by the dampener 662. In this manner, the carton is caused to come to rest gently upon the take-away conveyor L.

In view of the fact that the only connection between the push rod 596 and the arms 594 includes the upstanding pusher finger 656 which is not connected to the plate 580 but merely makes abutting engagement with the underside thereof, the push rod 596 can return to its lowest position without causing the arms 594 to return immediately to their upstanding position. Therefore, the carton can remain temporarily upon the conveyor L with the arms 594 still in engagement with the carton, the only requirement in this connection being that the carton should be removed in time to avoid interference with the return of the arms 594 to their upstanding position before the next succeeding carton is ready to be discharged.

Operation

Whereas the manner of operation of each of the constituent parts of the carton handling machine of the invention has been explained hereinabove in connection with the description of the construction thereof, understanding the operation of the entire machine may be facilitated by the following description of the progress of a single carton through the machine.

It will be assumed that both motors 94 and 632 are in operation and that no carton is present in the filling station, i.e., in registry with the caser H. When a pusher lug 90 of the supply magazine conveyor D passes under the front wall 52 of the magazine A the lowermost carton will engage within the notch 92 of that pusher lug, such engagement being facilitated and made more positive by the action of the presser mechanism B, as hereinabove explained. A single folded carton is, therefore, propelled out from under the remainder of the stack of cartons

within the magazine A between the gauge bars 180 and the springs 200, as indicated in FIG. 10, which are effective in preventing more than one carton from leaving the magazine A at a time.

The pusher lug 90 continues to propel the flat, folded carton forward while its leading edge passes the pivoted plate 312 and slides along the rails 230 and 230a and into contact with the carton stop 300. As the carton continues to be propelled in this inclined position, the descending carton-opening blades 330 slidably engage the advancing leading top and bottom end closure flaps 374a and 374 (FIG. 11) so that when the slots 378a and 378 at the terminal ends of these flaps reach the blades 330, the blades pass through the slots and thus come into engagement with the lower top and bottom side closure flaps, as shown in FIG. 12 (only the bottom side closure flap 385 appears in the drawings). At about the time that the trailing edge of the carton passes the ends of the feet 184 of the gauge bars 180, the leaf springs 200 snap the trailing edge of the carton out of engagement with the pusher lug 90; and likewise approximately at this time the leading edge of the carton encounters the stop 300. The next successive pair of carton erecting and propelling fingers 240 then engage the trailing end wall 376a of the carton (FIG. 13) and as the erecting and propelling fingers 240 continue their upward swinging movement, the carton is erected to the squared up condition illustrated in FIG. 13. This action of the arms 240 in erecting the carton is facilitated by the engagement of the blades 330 with the lower side flaps which holds the lower side 384 of the carton down in horizontal position upon the rails 230 and 230a while the end walls of the carton are swung upward to their vertical positions.

When the erecting fingers 240 arrive in their vertical position (FIG. 13), a pair of lugs 266 of the overhead chains 250 engage the upper rear corner of the carton and thus assist the arms 240 in propelling the erected carton out of the opening station F and into the flap manipulating station G, where the bottom closure flaps are folded inward to, or nearly to, their bottom-closing relation by the cooperative actions of the horizontal flap-spreading shoes 414 and 416, the leading end flap folding disk 400, and the trailing end flap folding rod 442. As illustrated in FIG. 14, the upper and lower side closure flaps 380 and 385 are then folded inward to, or nearly to, their folded relation by the inclined rails 460 and 460a, as shown in FIG. 15.

Similarly, the top end closure flaps of the carton are folded outward by the cooperative actions of the leading end flap opening rod 464 and the trailing top end flap abutment disk 494, as hereinabove explained in detail, so that when the carton arrives in the filling station in registry with the caser H, the carton is fully erected and disposed in position lying on one of its longer sides and with the open top of the carton directed toward the delivery chute 516 of the caser H. As shown in FIG. 18, when arriving in this position, the carton encounters the microswitch 560 thus causing the motor 94 to be de-energized and the chains 210 of the main conveyor to come to rest. The result is that the carton remains in registry with the delivery chute of the caser during the operation of the pusher mechanism J in pushing the empty cartons into receiving position with relation to the caser H and during operation of the caser in filling the carton and returning the same into position for resumed advancement of the conveyor E, as hereinabove described.

Of course, this interruption in the operation of the motor 94 will likewise interrupt the operation of the entire machine with the exclusion of the pusher mechanism J and the caser H. However, such interruption has no detrimental effect upon any of the other operations performed on cartons following the one in the filling station other than to cause momentary delay in these several operations.

Upon return of the filled carton to the conveyor E by the plungers 514 of the case H, the switch 566 is actuated, causing the motor 94 to be again energized and the conveyor E to resume its operation, whereupon the filled carton now in the tipped position illustrated in FIG. 19 is advanced into position for engagement by the tipping mechanism K (FIG. 22). Upon arrival of the filled and slightly tipped carton in this position it encounters the tripper lever 640 which actuates the single revolution clutch 624 and thereby causes the tipping mechanism K to experience one full cycle of its operation, during which the filled carton is tipped to its right side up position and is deposited on the take-away conveyor L. The conveyor L carries the filled carton to any suitable point of disposal, as, for example, a machine for completing the closure of the top flaps and gluing or otherwise fastening both the top and bottom flaps in their closed relation.

While a particular embodiment of the present invention has been shown and described it will be understood that the apparatus is capable of modification and variation without departing from the principles of the invention and that the scope of the invention should be limited only by the scope and proper interpretation of the claims appended hereto.

The invention having thus been described, what is believed to be new and desired to be protected by Letters Patent is:

1. A machine for opening folded cartons comprising feeding means engageable with the trailing edge of a flat folded carton and operable to advance the carton to an opening station by pushing against the trailing edge of the folded carton, a movable abutment member adapted to be disposed in a position to engage and retain in a fixed position the leading edge of a flat folded carton being advanced in said opening station while the feeding means continues to advance said trailing edge and thereby partly unfolds the carton, and erecting means connected with said feeding means for operation in timed relation therewith to engage the underside of a trailing portion of the partly unfolded carton and complete the unfolding thereof.

2. A machine for opening folded cartons comprising feeding means engageable with the trailing edge of a flat folded carton and operable to advance the carton by pushing against the trailing edge of the folded carton, a movable abutment member adapted to be disposed in a position to engage and prevent movement of the leading edge of the folded carton while the feeding means continues to advance said trailing edge and thereby partly unfolds the carton, erecting means connected with said feeding means for operation in timed relation therewith to engage the underside of a trailing portion of the partly unfolded carton and complete the unfolding thereof, and means connected with said erecting means for operation in timed relation therewith to withdraw the abutment member from arresting position upon completion of the opening of the carton.

3. A machine for unfolding folded cartons of the type including a first end wall and a top wall in coplanar alignment and superimposed upon a bottom wall and a second end wall in planar alignment with each other, said unfolding machine comprising feeding means for advancing one of the folded cartons by pushing against the trailing edge defined by the fold line between said top wall and said second end wall thereof, a movable abutment member adapted to be disposed in a position to engage the leading edge defined by the fold line between said first end wall and said bottom wall of the carton and to arrest movement of said leading edge while the feeding means continues to advance said trailing edge, and means connected with said feeding means and operative in timed relation therewith to pivot said second end wall upward about the fold line between the same and said bottom wall while the advancing means moves said

trailing edge toward the abutment member to unfold the carton.

4. A machine for unfolding folded cartons of the type including a first end wall and a top wall in coplanar alignment and superimposed upon a bottom wall and a second end wall in planar alignment with each other, said unfolding machine comprising feeding means for advancing one of the folded cartons by pushing against the trailing edge of the folded carton defined by the fold line between said top wall and said second end wall thereof, a movable abutment adapted to be disposed in a position to engage the leading edge of the folded carton defined by the fold line between said first end wall and said bottom wall thereof and to arrest movement of said leading edge while the feeding means continues to advance said trailing edge, means connected with said feeding means and operative in timed relation therewith to pivot said second end wall upward about the fold line between the same and said bottom wall while the advancing means squeezes said trailing edge toward the abutment to unfold the carton, and means connected with said feeding means for operation in timed relation therewith to withdraw said abutment from said position upon completion of the unfolding of the carton.

5. A machine for unfolding folded cartons of the type including a first end wall and a top wall in coplanar alignment and superimposed upon a bottom wall and a second end wall in planar alignment with each other, there being flaps on the upper of said walls that overlie those on the lower walls said unfolding machine comprising feeding means for advancing one of the folded cartons by pushing against the trailing edge defined by the fold line between said top wall and said second end wall thereof, an abutment mounted in position to engage the leading edge of the folded carton defined by the fold line between said first end wall and said bottom wall thereof and to arrest movement of said leading edge while the feeding means continues to advance said trailing edge, means connected with said feeding means and operative in timed relation therewith to pivot said second end wall upward about the fold line between the same and said bottom wall while the advancing means squeezes said trailing edge toward the abutment to unfold the carton, and means cooperatively associated with said pivoting means for sliding between the edges of said upper flaps and into engagement with the flaps of said bottom wall for holding said bottom wall down while the pivoting means pivots said second end wall upward.

6. A machine for unfolding folded cartons of the type including a first end wall and a top wall in coplanar alignment and superimposed upon a bottom wall and a second end wall in planar alignment with each other and a closure flap connected to and projecting from each of said walls, the flaps on the upper of said walls overlying those on the lower of said walls said unfolding machine comprising feeding means for advancing a folded carton by pushing against the trailing edge thereof defined by the fold line between said top wall and said second end wall, an abutment mounted in position to engage the leading edge of the folded carton defined by the fold line between said first end wall and said bottom wall and to arrest movement of said leading edge while said feeding means continues to advance said trailing edge, means connected with said feeding means and operative in timed relation therewith to pivot said second end wall upward about the fold line between the same and said bottom wall while the feeding means squeezes the trailing edge toward the abutment means to unfold the carton, and a hold-down blade movably mounted adjacent the path of advance of the carton in position to enter between the closure flaps of said first end wall and said top wall and to engage the closure flap of said bottom wall to hold said bottom wall down while said pivoting means pivots said second end wall upward.

7. In a machine for erecting a carton having two end

walls, two side walls, and a closure flap hinged along a fold line to each of said walls, a conveyor for advancing the carton in a direction parallel to said side walls with said flaps projecting laterally with respect to the direction of carton movement, rotary means mounted adjacent said conveyor and including shoe means for spreading apart the two opposed flaps connected to said side walls far enough to permit inward folding of the flaps connected to said end walls between the spread apart flaps, means mounted adjacent the conveyor for folding inward the flaps connected to said end walls, and means connected to said conveyor for operation in timed relation to movement of the carton thereon for actuating said spreading means prior to engagement of said folding means with said end wall flaps, said shoe means moving in the same direction as, but faster than, said conveyor.

8. In a machine for erecting cartons of the type having a rectangular body and a closure flap hinged along a fold line to each of the four walls of the body, a conveyor for advancing one of the cartons in a position with two of its walls horizontal and its other two walls vertical and with one of said vertical walls in the lead, a shaft mounted for rotation about a vertical axis spaced laterally from said conveyor, vertically spaced arms projecting radially from said shaft, upper and lower flap spreading shoes carried by said arms, said shoes having surfaces that slope toward each other in their direction of rotation by said shaft and engageable with the upper and lower flaps, respectively, of the horizontal walls of the carton to spread them apart, a flap folding rod projecting radially from said shaft in such angularly spaced relation to said arms that the rod follows the arms as the shaft rotates, said rod being engageable with the trailing vertical flap to fold the same inward while the flaps of the horizontal walls are engaged by said spreading shoes, and means for rotating said shaft in timed relation to said conveyor and at a speed imparting to said shoes and to the outer end of the arm a linear speed greater than that of the carton.

9. A machine for unfolding and feeding cartons of the type including a top wall, a first end wall coplanar with said top wall and connected thereto along a fold line, a bottom wall, a second wall coplanar with said bottom wall and connected thereto along a fold line, said first end wall also being connected to said bottom wall along

a fold line to form a leading edge, said second end wall being connected to said top wall along a fold line to form a trailing edge, said machine comprising feeding means for advancing one of the folded cartons by pushing against the trailing edge thereof, a retractable abutment member adapted to be disposed in a position to engage the leading edge of the folded carton to arrest movement of said leading edge while the feeding means continues to advance said trailing edge to thereby partially erect said carton, means connected with said feeding means and operative in timed relation therewith for engaging the underside of said second end wall to pivot said second end wall upward about its fold line with said bottom wall, means for holding said bottom wall down during erection of the carton, means for retracting said hold down means after the carton is erected, and means operative upon completion of the opening of the carton for advancing said pivoting means in rectilinear movement while engaging said second wall to advance the opened carton along a predetermined path.

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