June 23, 1964 H. R. LOBDELL 3,138,076

CARTON ERECTING AND CLOSING MACHINE

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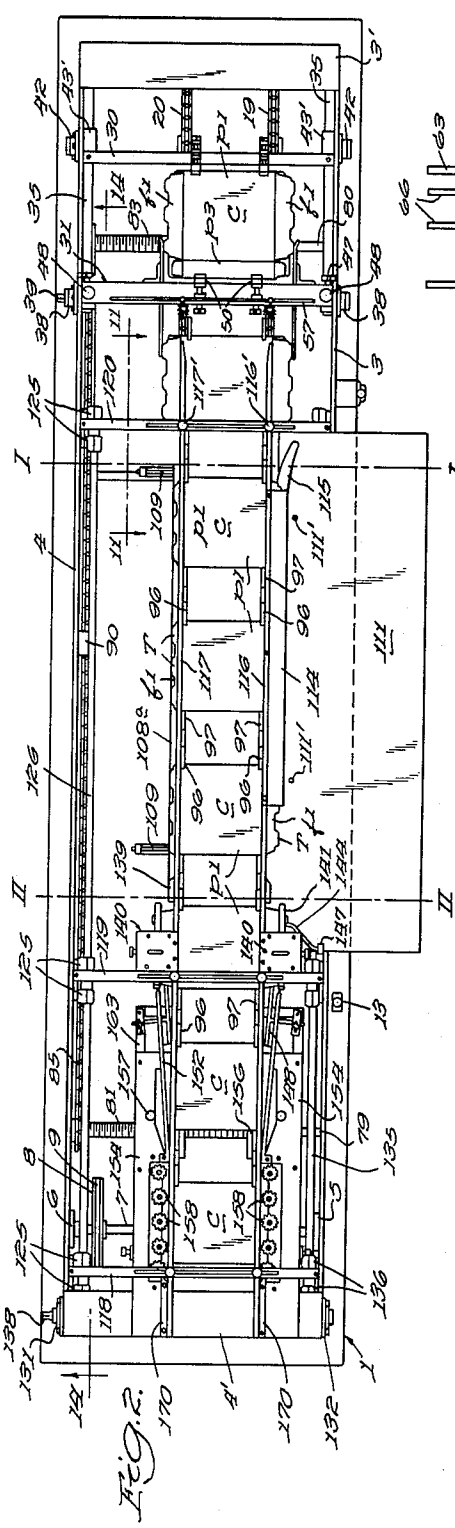


FIG. 2.

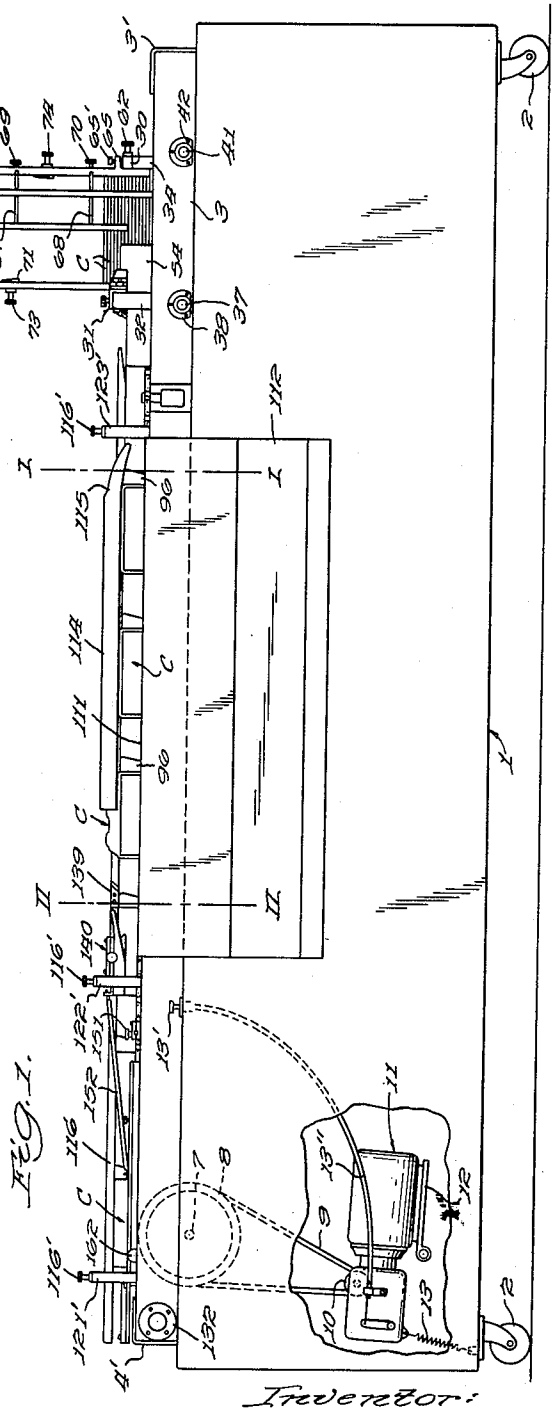


FIG. 1.

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CARTON ERECTING AND CLOSING MACHINE

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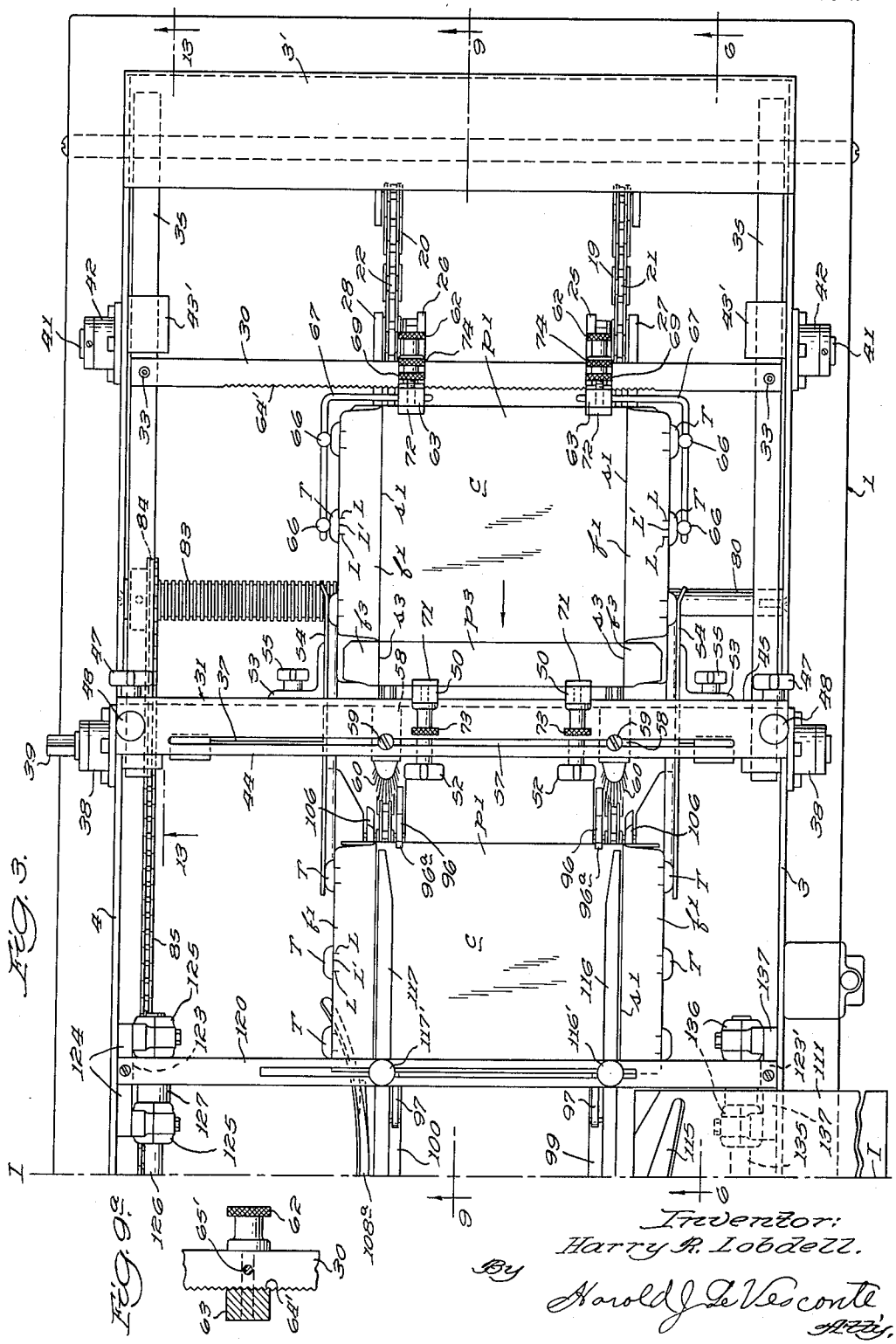


Fig. 3.



Fig. 9a.

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CARTON ERECTING AND CLOSING MACHINE

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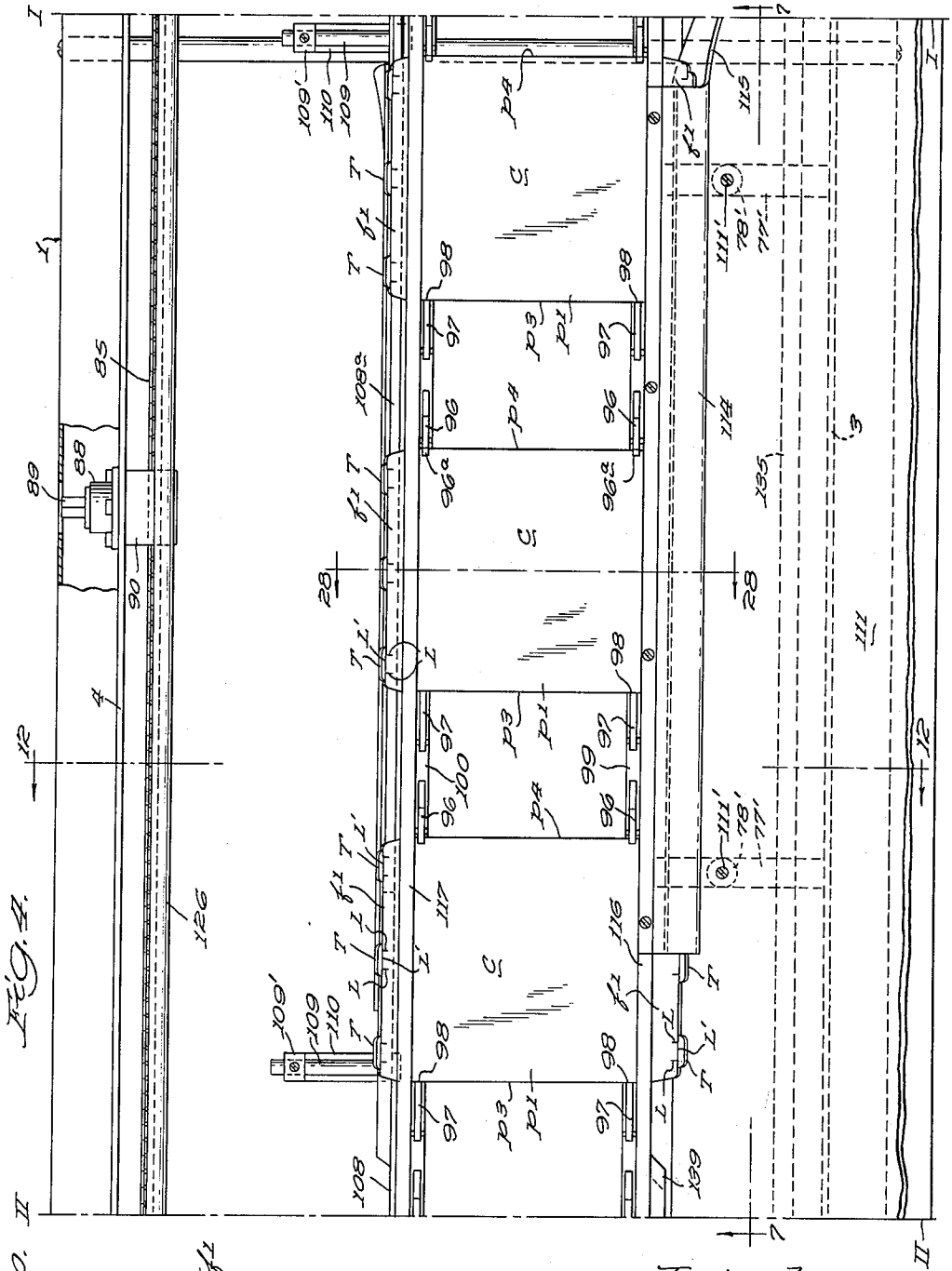


FIG. 4.

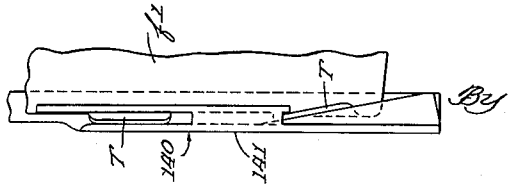


FIG. 20.

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CARTON ERECTING AND CLOSING MACHINE

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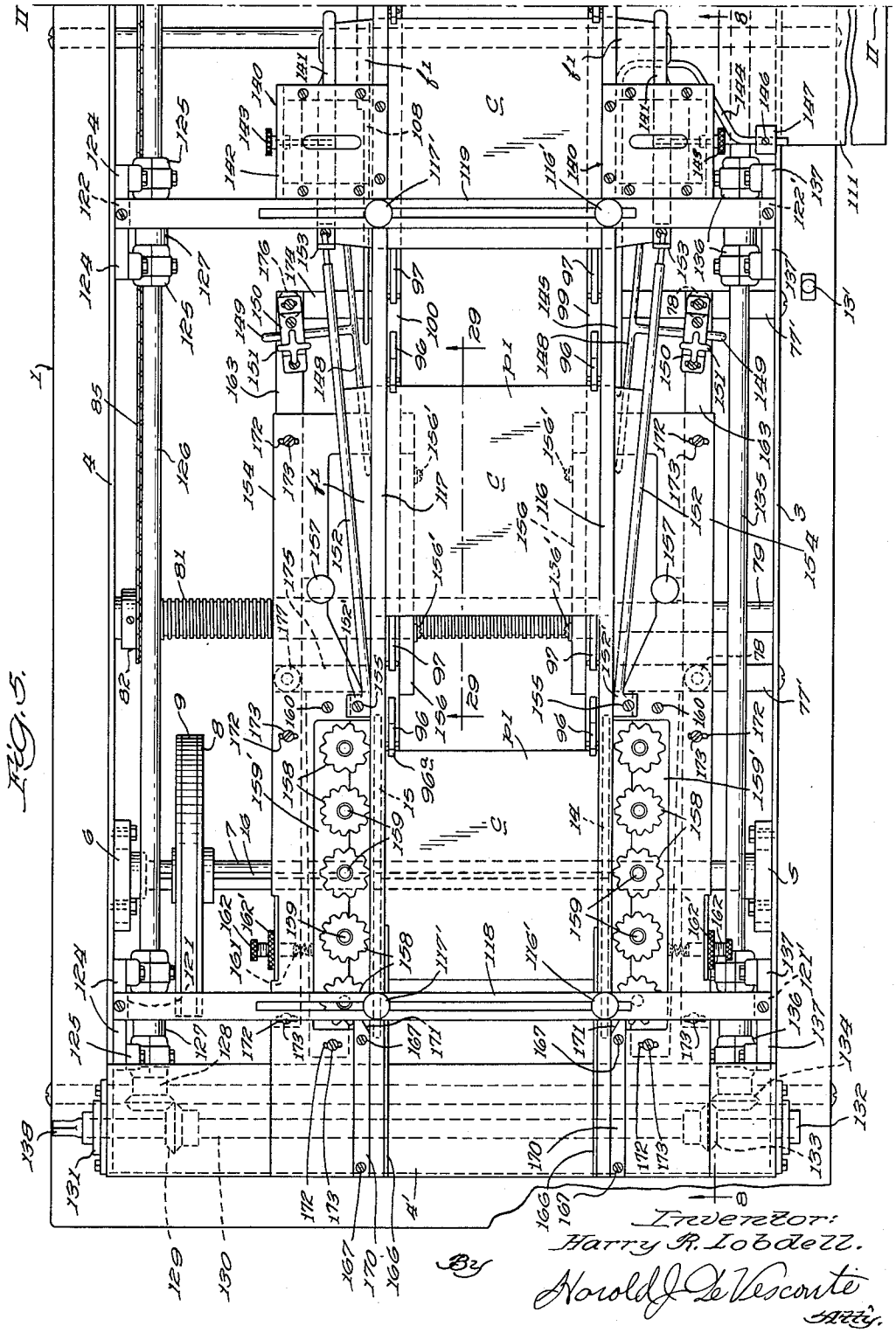


FIG. 5.

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CARTON ERECTING AND CLOSING MACHINE

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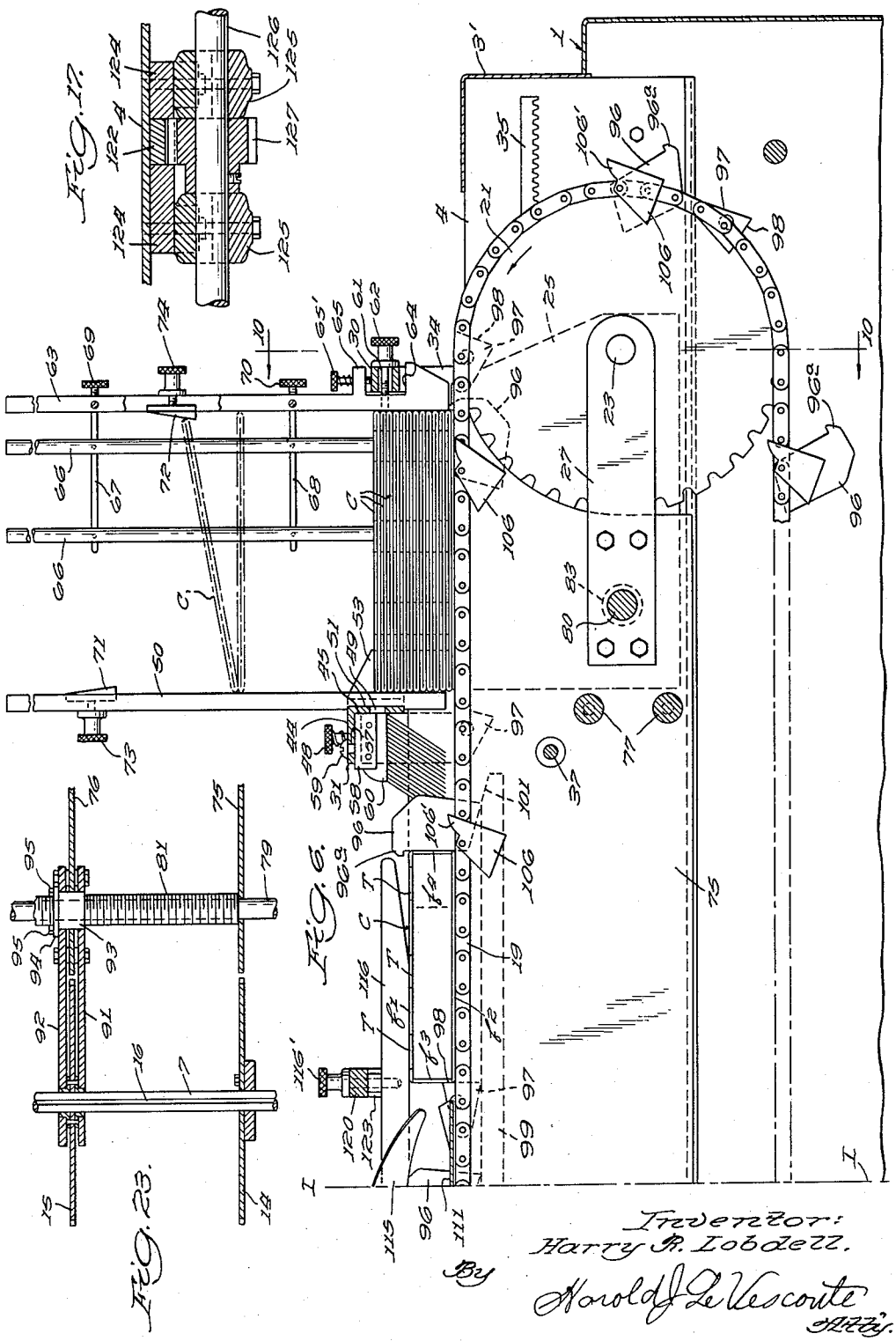


Fig. 17.

Fig. 6.

Fig. 23.

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CARTON ERECTING AND CLOSING MACHINE

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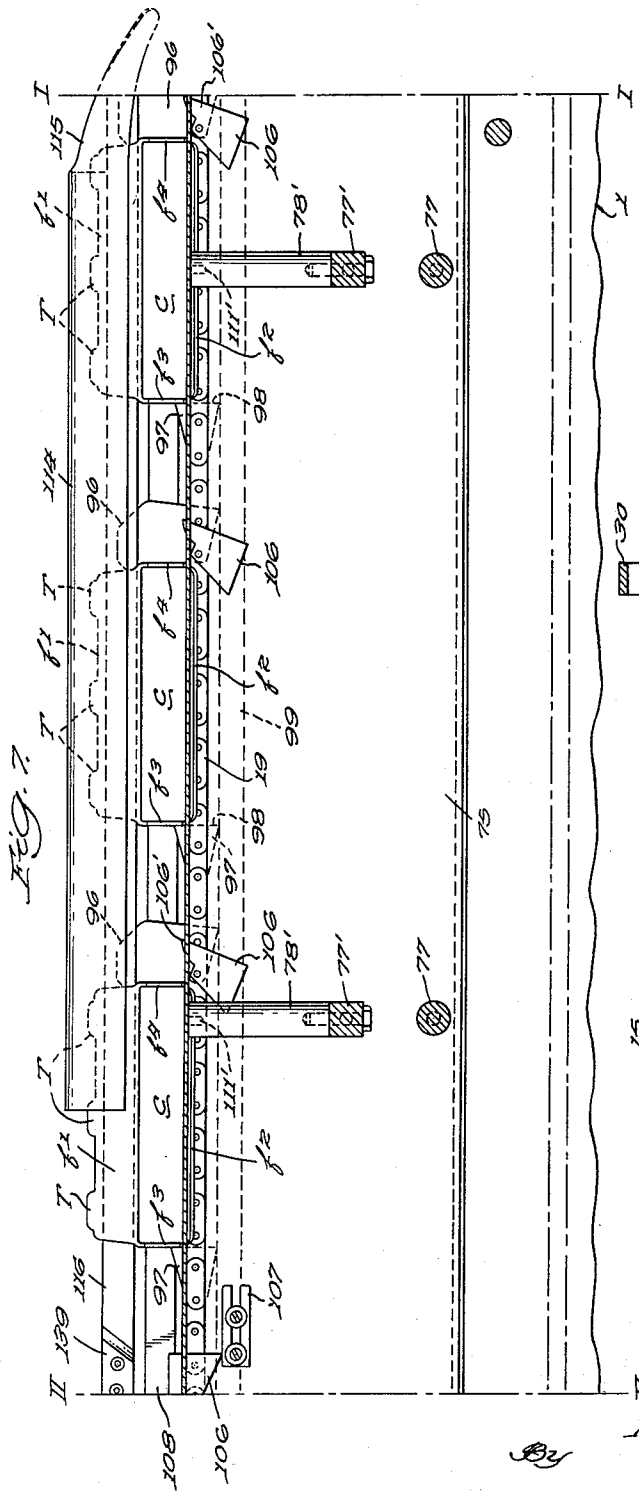


Fig. 14.

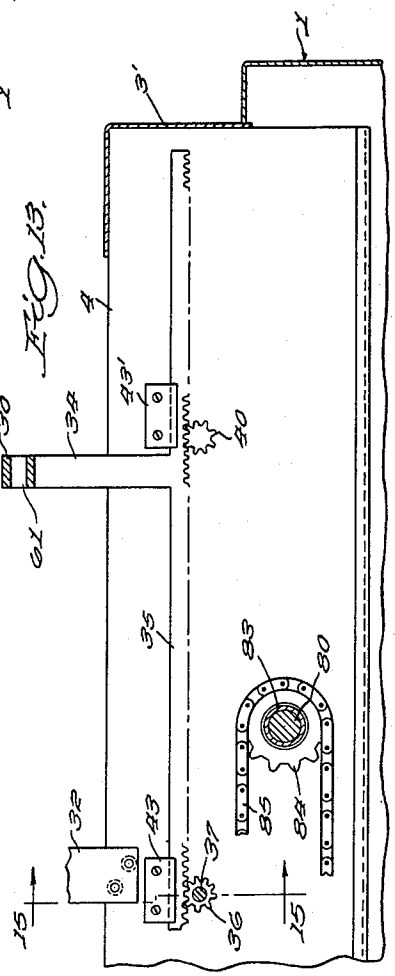
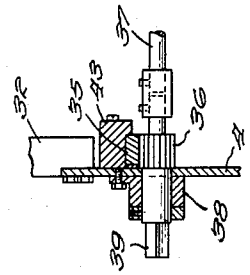


Fig. 15.



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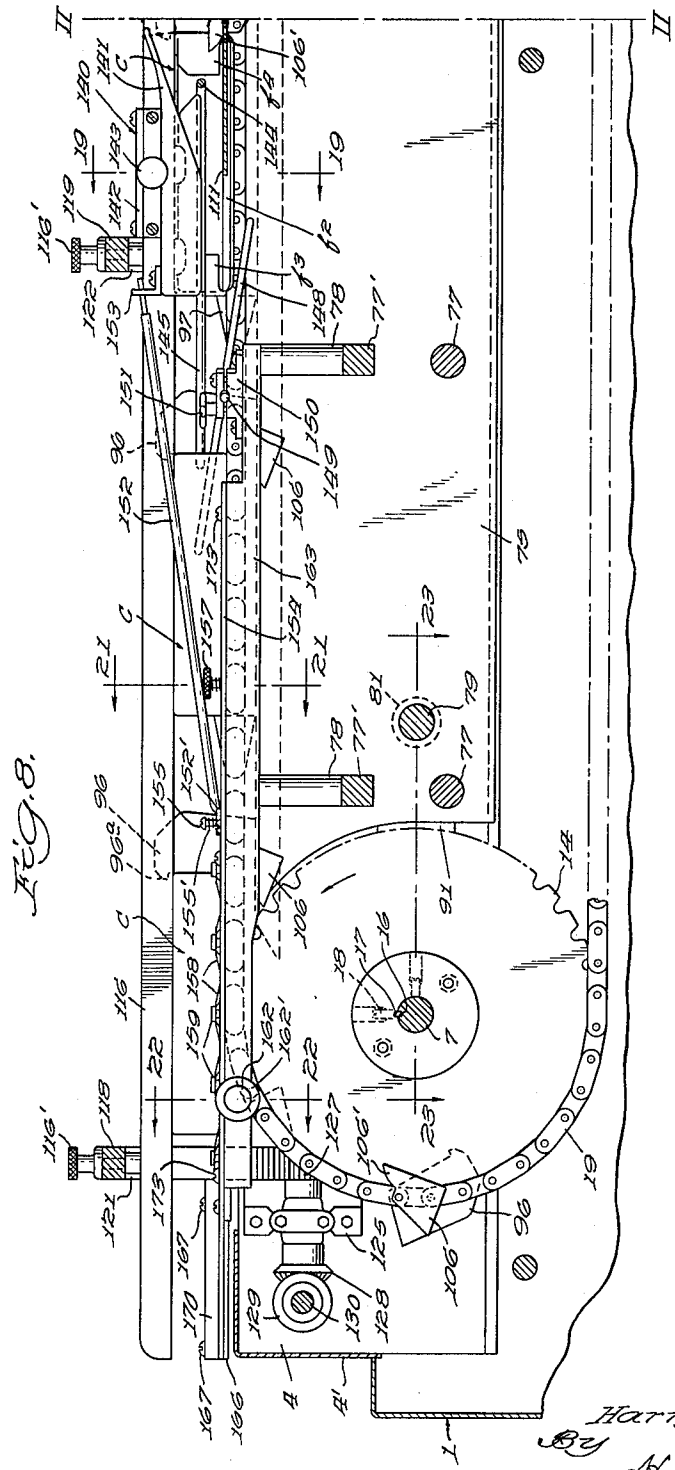


FIG. 8.

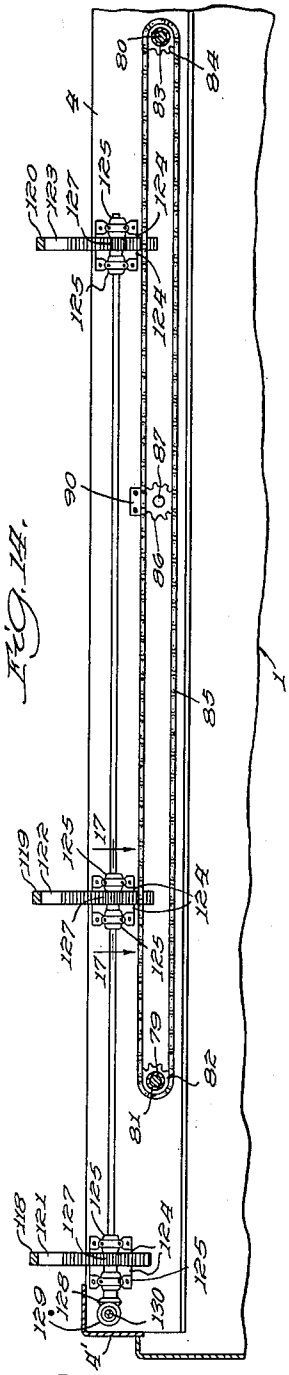


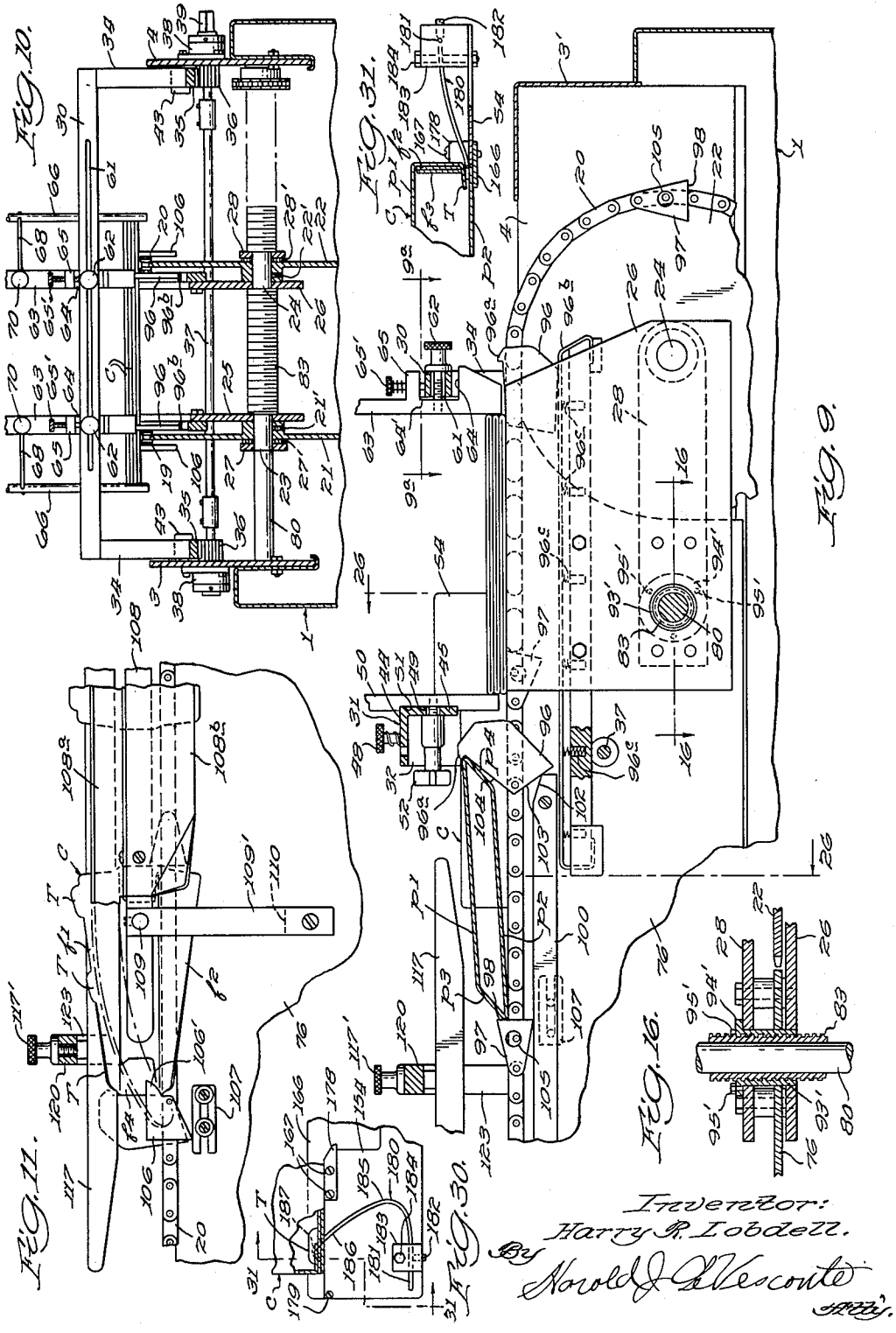
FIG. 12.

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CARTON ERECTING AND CLOSING MACHINE

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CARTON ERECTING AND CLOSING MACHINE

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Fig. 12.

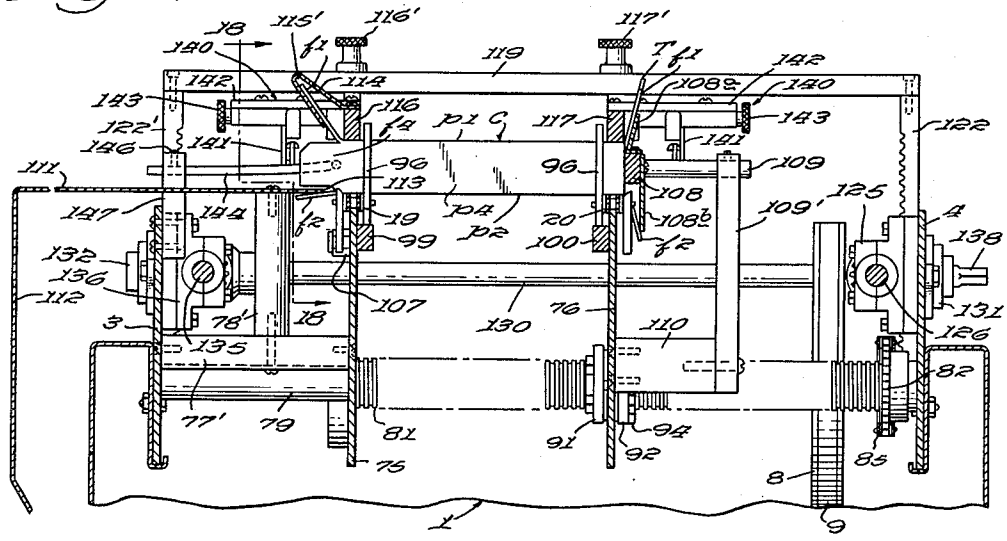


Fig. 18.

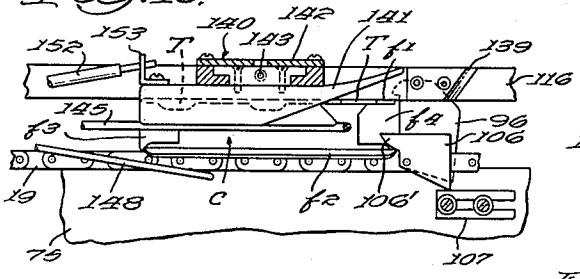


Fig. 19.

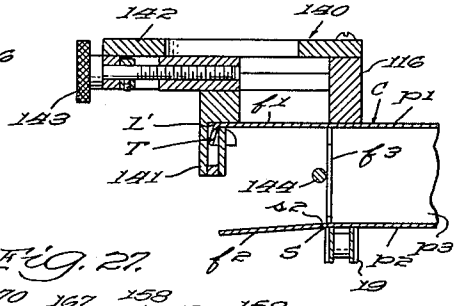


Fig. 21.

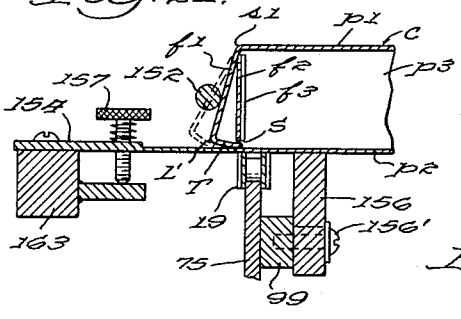


Fig. 27.

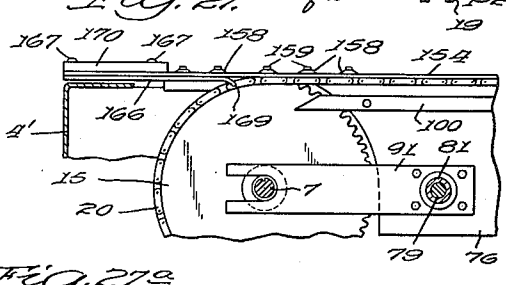


Fig. 27a.

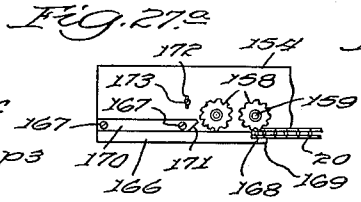


Fig. 27b.

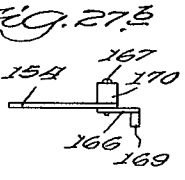
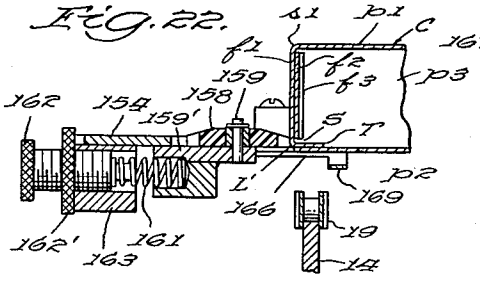


Fig. 22.



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Fig. 26.

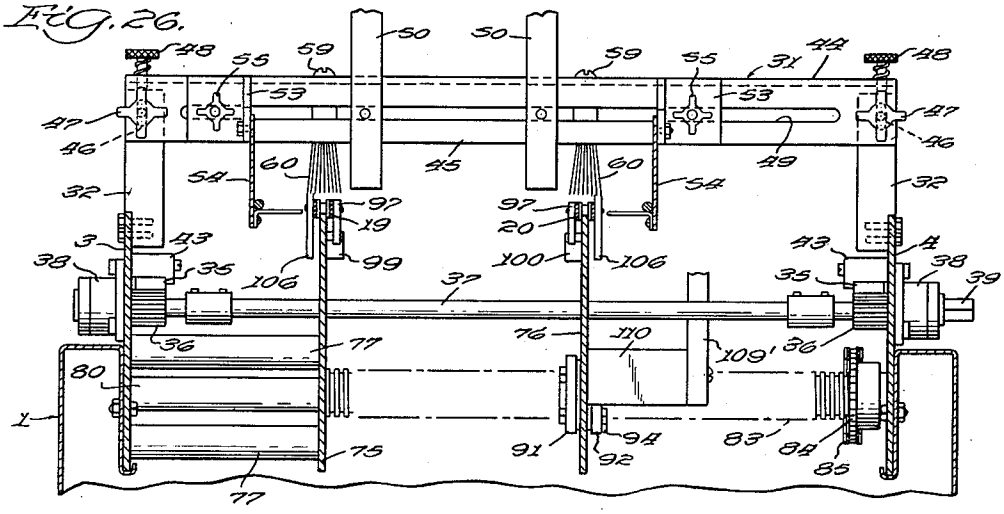


Fig. 28.

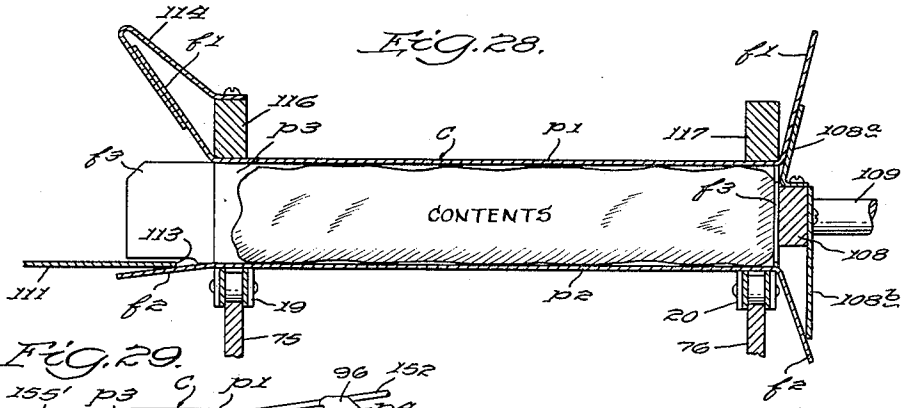



Fig. 29.

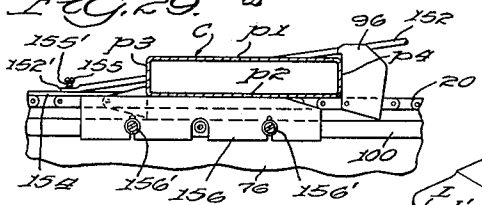


Fig. 24.

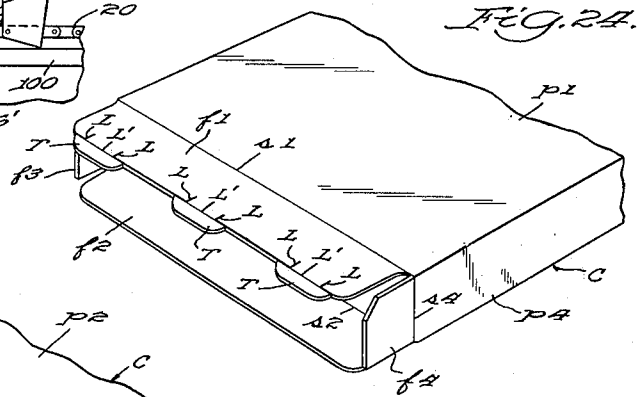
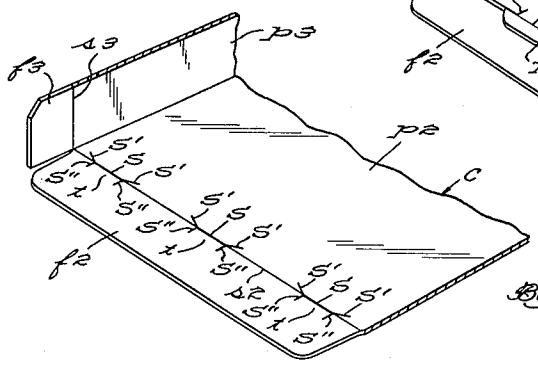


Fig. 25.



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United States Patent Office 3,138,076 Patented June 23, 1964



3,138,076

# CARTON ERECTING AND CLOSING MACHINE

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Filed July 3, 1961, Ser. No. 121,685
33 Claims. (Cl. 93—53)

This invention relates to the art of packaging articles and commodities and more particularly to an improved machine for opening and setting up rectangular cartons from the collapsed or "knocked down" form in which they are supplied to the user and especially for those cartons having at least one end closure formed by flaps for a pair of side flaps formed as extensions of opposite sides of the cartons and completely overlapping each other and interlockingly engaging each other to complete the closure of the carton. In the packaging trade, such cartons are known as "lock bottom" cartons. Also, in the packaging art, the sides of a carton are generally referred to as "panels" and the outermost of the side flaps above referred to constitutes, additionally, an end panel to the carton.

An object of the present invention is to provide a machine for automatically setting up and closing at least one end of knocked down cartons of the type having interlocking enclosure means and including devices for removing the cartons one at a time from a supply carried in a hopper or magazine and in which machine the devices forming the enclosure is achieved in part at least by devices moving with the carton whereby relative movement between the carton and the setting up and closing devices is eliminated with consequent reduction in the possibility of scratched, marked, torn or otherwise mutilated cartons.

Another object of the invention is to provide a machine for setting up and closing cartons of the aforesaid type which is characterized by simple, sturdy construction and which may be employed for setting up cartons and closing either one or both ends thereof and in which, further, means is provided to effect adjustment of the machine for different sizes of cartons.

With the foregoing objects in view, together with such additional objects and advantages as may subsequently appear, the invention resides in the parts, and in the construction, combination and arrangement of parts described, by way of example, in the following specification of certain presently preferred embodiments of the invention, reference being had to the accompanying drawings which form a part of said specification and in which drawings:

FIG. 1 is a side elevational view of a machine for setting up cartons embodying the present invention, a portion of the base being broken away to show the power means,

FIG. 2 is a top plan view of the machine in FIG. 1,

FIG. 3 is an enlarged scale, top plan view of the starting or "hopper" end of the machine to the point represented by the line I—I on FIGS. 1 and 2,

FIG. 4 is an enlarged scale, top plan view of the portion of the machine extending between the lines I—I and II—II on FIGS. 1 and 2,

FIG. 5 is a top plan view on the same scale as FIGS. 3 and 4 showing the portion of the machine extending from the line II—II on FIGS. 1 and 2 to the package discharge end of the machine,

FIG. 6 is an enlarged, side elevational view, partly in section, taken on the line 6—6 of FIG. 3,

FIG. 7 is a side elevational view, partly in section, taken on the line 7—7 of FIG. 4,

FIG. 8 is a side elevational view, partly in section, taken on the line 8—8 of FIG. 5,



FIG. 9 is a side elevational view generally similar to FIG. 6 but showing the interaction of the parts to effect the carton setting up action of the machine,

FIG. 9*a* is a fragmentary, enlarged, top plan sectional view taken on the line 9*a*—9*a* of FIG. 9,

FIG. 10 is a transverse, sectional view taken on the line 10—10 of FIG. 6,

FIG. 11 is a side elevational sectional view taken on the line 11—11 of FIG. 2,

FIG. 12 is a transverse sectional view taken on the line 12—12 of FIG. 4,

FIG. 13 is a fragmentary side elevational sectional view taken on the line 13—13 of FIG. 3,

FIG. 14 is a reduced scale, fragmentary, longitudinal sectional view taken on the line 14—14 of FIG. 2 showing details of the means for adjusting the carton end manipulating devices for the height or thickness of the cartons,

FIG. 15 is an enlarged scale, fragmentary, sectional view taken on the line 15—15 of FIG. 13,

FIG. 16 is a fragmentary top plan sectional view of a portion of the width adjusting means to accommodate the length of package or carton; the view being taken on the line 16—16 of FIG. 9,

FIG. 17 is a fragmentary, sectional view on the line 17—17 of FIG. 14,

FIG. 18 is a fragmentary, longitudinal sectional view of the enclosure flap manipulating instrumentalities,

FIG. 19 is a fragmentary sectional view taken on the line 19—19 of FIG. 8 showing the locking tab breaker construction,

FIG. 20 is a bottom plan view showing further details of the locking tab breaker means,

FIG. 21 is a transverse, sectional view on the line 21—21 of FIG. 8 showing the means for forcing the locking tab into the slots on the panel member extending from the other side of the carton,

FIG. 22 is a fragmentary, sectional view showing the adjustment for the star wheel means for finally effecting the locking of the carton end,

FIG. 23 is a fragmentary, top plan sectional view taken on the line 23—23 of FIG. 8,

FIG. 24 is a perspective view of one end of a carton showing particularly the end panel having the locking tabs, the carton being shown as initially set up by the machine for the reception of the contents to be placed therein prior to the closing of the carton end,

FIG. 25 is a view similar to FIG. 24 but that the upper portion of the carton is broken away to show the details of the locking tab engaging slots,

FIG. 26 is a fragmentary, transverse, sectional view taken on the staggered line 26—26 of FIG. 9.

FIG. 27 is a fragmentary, side elevational view showing details of the means for effecting lateral adjustment of one of the driving sprockets,

FIG. 27*a* is a fragmentary top plan view of one side of the carton discharge means,

FIG. 27*b* is an end elevational view of the portion of the carton discharge means shown in FIG. 27*a*,

FIG. 28 is a fragmentary, transverse, sectional view taken on the line 28—28 of FIG. 4 showing the relation of the parts and the carton at the time of inserting the contents in the erected carton,

FIG. 29 is a fragmentary, side elevational view taken on the line 29—29 of FIG. 5 showing the carton supporting means employed at one stage of effecting the closing of the carton end,

FIG. 30 is a top plan, fragmentary view of one side of the carton discharge end of the machine showing a modification comprising an auxiliary carton tab locking device for optional use on the machine, and,

FIG. 31 is a sectional view taken on the line 31—31 of FIG. 30.

Referring to the drawings, the illustrated embodiment of the machine comprises generally an elongated, hollow, rectangular base 1 open at the top and bottom and supported for dirigibility on casters 2 at each corner thereof. The top of the base 1 supports the carton storage and manipulation means which is slightly less length and width than the base and includes parallel, longitudinally extending side members 3 and 4 connected by end members 3' and 4'. Mounted in bearings 5 and 6 in the side members 3 and 4 adjacent the carton discharge end of the machine is a transversely extending driveshaft 7 provided with a belt pulley 8 which is connected by a belt 9 to the driving pulley 10 of a combined motor and speed reduction unit 11 mounted on a pivoted bracket 12 carried by the body or frame 1. A spring 13 tends constantly to bias said bracket and unit for movement in counterclockwise direction as viewed in FIG. 1 with resultant maintenance of sufficient tension on the belt for effective driving of the machine and a manually operated button 13' operating through a Bowden cable 13'' controls the speed ratio of the speed reduction unit. The shaft 7 carries a first driving sprocket 14 fixed thereto adjacent the inner end of the bearing 5 and also carries a second driving sprocket 15 identical to the sprocket 14 except that it is slidable along the shaft 7 to adjusted positions in the space between the first sprocket 14 and the inner face of the bearing 6; said adjustment being an incident to accommodation of the machine to different lengths of cartons as will be later referred to in detail. The shaft 7 carries a longitudinally extending keyway 16 and the sprockets 14 and 15 are locked for rotation in unison with the shaft by keys such as shown at 17 and a set screw 18 effective to lock the key in the keyway.

The driving sprockets 14 and 15 each engage one each of a pair of conveyor chains 19 and 20 trained thereover and over idler sprockets 21 and 22 fixed by set screws 21' and 22' to stub shafts 23 and 24 mounted in bearings in the laterally spaced carton support plates 25 and 26 and associated outboard bearing brackets 27 and 28 to which further reference will later be made, endwise movement of the sprockets being prevented by engagement of the sprocket hubs with the carton support plates and the opposite faces of the sprockets with thrust washers 27' and 28' interposed between said opposite faces and the brackets 27 and 28.

To provide identification for the various portions of the carton as reference thereto will be made in the detailed description of the machine, reference will first be made to FIGS. 24 and 25. These figures show an end of a carton as erected by the machine and prior to the closing of that end by the machine. The illustrated carton C is of rhomboidial configuration and comprises a body bounded by top and bottom panels *p1* and *p2* and leading and trailing side panels *p3* and *p4*; each of said panels having respectively, correspondingly end closing flaps designated as *f1*, *f2*, *f3* and *f4*. The panels are all provided with score lines *s1*, *s2*, *s3* and *s4* at the ends thereof so that the flap components thereof will readily bend at the said score lines in forming the closure of the carton end. Additionally, the bottom flap *f2* is provided with one or more slits S having a central portion coincident with the score line for that flap and having short, slightly oppositely divergent ends S' which extend into the adjacent surface of the panel *p2* as well as with a pair of short parallel slits S'' extending into the flap *f2* normal to the score line *s2* to form a tongue *t*. The flap *f1* along the distal edge thereof is provided with mating locking tabs T projecting beyond said distal edge and defined in a T-configuration by oppositely disposed L-shaped slits L and further having score lines L' which are coincident with the said distal edge of the flap *f1*. As will be explained in detail, these tabs are inserted in the slits S and effect a self-locking interengagement with the inner face of the flap *f2* to complete the closure of the carton end.

*Carton Hopper*

The stack of the cartons which are to be carried through the machine is contained in the hopper means comprising a rear cross rail 30 and a front cross rail 31, the front cross rail being supported on posts 32, 32 attached to and rising from the side members 3 and 4. The rear cross rail 30 is secured by screws 33, 33 to the upper ends of post members 34, 34 rising from horizontal racks 35, 35 and which are preferably formed integrally with said racks. The racks 35, 35 at the forward ends thereof slidingly supported on the inner faces of the side members 3 and 4 by a pair of actuating pinions 36, 36 carried by a transverse adjusting shaft assembly 37 mounted in bearings 38, 38 carried respectively by the members 3 and 4 and said shaft, externally of the side member 4, terminating in a rectangular end 39 for engagement by a crank or wrench. The rear ends of the racks 35, 35 are supported on separate idler pinions 40, 40 carried by stub shafts 41, 41 journaled in bearings 42, 42 carried by the side members 3 and 4 rearwardly of the shaft 37 and disposed in the horizontal plane of the pitch lines of the rack teeth. Guide blocks 43, 43 slidably engage the upper face and inner faces of the racks 35, 35 above the pinions 36, 36 and corresponding guide blocks 43', 43' similarly engage the upper end inner faces of the rack 35 above the pinions 40, 40 and in rear of the posts 34, 34. Thus, it will be seen that by rotation of the shaft 37, the rear cross rail and the portions of the hopper carried thereby can be moved forwardly and rearwardly toward and away from the front cross rail of the hopper and hte members carried by that rail to accommodate the width of the collapsed cartons.

The front cross member 31 of the hopper comprises a length of angle iron having a horizontal leg 44 extending over the top of the posts 32, 32 and a vertical leg 45 in rear of and adjacent to the rear face of the posts 32, 32. Opposite each of the posts 32, 32 each end of the vertical leg 45 is provided with a vertically extending slot 46 through which a screw operated by a hand knob 47 extends to secure the cross rail in adjusted position vertically on the posts 32. The opposite ends of the horizontal leg 44 of the cross rail 31 carry vertically disposed screws 48, 48 which engage the upper ends of the posts 32, 32 to afford means for adjusting the vertical position of the cross rail 31 above the posts 32, 32.

The vertical leg 45 of the cross rail member 31 is provided with a horizontal slot 49 extending almost from end to end thereof. Mounted on the outer or rear face of the leg 45 and inwardly adjacent the vertical planes containing the chains 19 and 20, are the front hopper posts 50, 50; said posts having shallow transverse slots 51, 51 formed in the face thereof embracing the leg 45 of the cross rail 31 and being secured in laterally adjusted position on said rail by hand screws 52, 52 extending through the slot 49 and threadedly engaging the lower ends of the posts 50, 50 whereby said posts may be adjusted to desired positions along the cross rail 31. Exteriorly of each of the chains, the cross rail 31 also carries bracket members 53, 53 carrying carton flap guide plates 54, 54 disposed beneath the cross rail 31 and extending both forwardly and rearwardly therefrom. Handscrews 55, 55 extending through the slot 49 afford means for adjusting the position of the guide plates 54, 54 relative to the chains and to the stacks of cartons and to which further reference will hereinafter be made. The top leg 44 of the cross rail 31 is provided with a slot 57 extending substantially from end to end thereof along which a pair of brackets 58, 58 are adjustably secured to the under side of said top leg by screws 59, 59 and carry brushes 60, 60 disposed one each directly above each of the chains 19 and 20; said brushes operating yieldingly to hold the cartons down against the chains as they are stripped off from the bottom of the stack of cartons.

The rear hopper cross rail 30 is provided with a longitudinally extending horizontal slot 61 through which thumb screws 62, 62 extend to threadedly engage the lower ends of the rear hopper guide posts 63, 63, said posts each having a deep notch 64 along their end which is considerably wider than the vertical dimension of the cross rail 30, the upper face of said notch being formed by a rearwardly extending lug 65 through which a set screw 65' extends to engage the upper face of the cross rail 30 to afford vertical adjustment of the post 63; the width of the slot 61 affording sufficient clearance for this vertical adjustment. As shown in FIG. 9*a* the meeting faces of the posts 63, 63 and the cross rail 30 are provided with vertically extending, complementary serrations 64' to prevent lateral tilting of the posts. Each of the rear posts 63 carries end guide means comprising a pair of vertical rods 66, 66 carried on angle bracket members 67, 67 at the upper ends thereof and corresponding angle brackets 68, 68 at the lower ends thereof; said angle brackets being secured for lateral adjustment in the posts 63 by set screws 69 and 70, respectively. From the foregoing it will be seen that by appropriate adjustment of the various components of the hopper means, it can be adjusted both laterally and longitudinally of the machine for a wide range of sizes of collapsed or "knocked down" cartons.

Each of the hopper posts 50 and 63 is provided with a longitudinally extending vertical slot for the vertically adjustable mounting thereon of retainer members 71 and 72 by thumb screws 73 and 74 for delaying the descent of cartons through the hopper so that the quantity resting upon the chains at any one time does not exceed a desired maximum amount.

*Lateral Adjustment of Chains*

The upper reaches of the chains 19 and 20 ride on the upper edges of longitudinally extending rails comprising a fixed rail 75 supporting the upper reach of the chain 19 and a laterally adjustable rail 76 correspondingly supporting the upper reach of the chain 20. The rail 75 is secured or mounted on the frame side member 3 in laterally spaced, parallel, horizontal relation thereto by a series of bracket members 77 at spaced points throughout the length thereof and certain of said bracket members 77', 77' also carry vertically extending posts 78, 78 for supporting certain carton flap manipulating instrumentalities and other devices to be later described in detail.

Means for adjusting the rail 76 laterally toward and away from the rail 75 comprises a pair of horizontal, parallel cylindrical bars 79 and 80 supported by and extending between the frame members 3 and 4 adjacent the carton discharge and hopper ends of the machine, respectively. Freely rotatably mounted on the cross bar member 79 and extending between the facing surfaces of the frame member 4 and the rail 75 is an externally threaded sleeve member 81 carrying a sprocket 82 at the end thereof adjacent the frame member 4. The cross bar 80 similarly carries an externally threaded sleeve member 83 freely rotatable thereon and extending between the adjacent faces of the frame member 4 and the rail 75, said second sleeve member 83 carrying a sprocket 84 adjacent the frame member 4 which is identical to the sprocket 82. A sprocket chain 85 is trained over and interconnects the sprockets 82 and 84 and a sprocket 86 carried by a stub shaft 87 journaled in a bearing 88 on the frame member 4 and terminating in a rectangular crank engagable end 89 externally of the member 4 engages both reaches of the sprocket chain 85. A guide block 90 on the inner face of the frame member 4 serves to hold the upper reach of the chain 85 in engagement with the sprocket 86.

The end of the rail 76 adjacent the carton discharge end of the machine carries a pair of fork members 91 and 92 on opposite sides thereof and threadedly engaging the threads of the sleeve member 81 and extending through the rail 76 and the fork members 91 and 92 is a nut 93 having a flange 94 secured by screws 95 to the outer face of the fork member 92. Thus, as the sleeve member 81 is rotated in one direction or the other the nut member will move axially thereof and will carry the sprocket 15 with it along the shaft 60 by reason of the engagement of opposite sides of the sprocket 15 by the fork members 91 and 92. The carton support plate 25 and outboard bearing bracket member 27 are fixed to the end of the rail 75 adjacent the hopper end of the machine and therefore hold the sprocket 14 against lateral movement. The carton support member 26 and the outboard bracket member 28 as well as the corresponding end of the rail 76 are penetrated by a threaded nut 93' engaging the threads of the threaded sleeve 83; said nut having a flange 94' secured to the outer face of the bracket 28 by screws 95' and since the threaded sleeve 83 will rotate in synchronism with the threaded sleeve 81 and the pitch of the threads thereon being the same, the rail 76 will remain in parallelism with the rail 75 while moving toward and away from it carrying the sprockets 15 and 22 with it as well as the chain 20. Thus it is that the chains and associated mechanism can be adjusted to accommodate varying lengths of cartons.

*Carton Moving Means*

The bottom of the hopper means is formed by the top surfaces of the carton supporting bars 25 and 26 which are disposed parallel to and just inside of the upper surface of the upper reaches of the chains 19 and 20 beneath the carton retaining means of the hopper structure; said bars being spaced away from the adjacent side faces of the chains sufficiently to allow passage between each of the bars and the adjacent face of the associated chain of carton engaging and propelling means comprising pick up lugs 96 and stop members 97. The pick up lugs 96 are pivotally mounted on spaced ones of the hinge pins of the chains and as the chains pass over the sprockets 21 and 22 present a hook portion 96*a* which engages the rear edge of the lowermost carton in the stack and pulls the carton out from beneath the stack, the leading edge of the carton being held down against the respective chains by the brushes 60, 60. Incident to their passage beneath the cartons in the hopper (see FIG. 9), the rear faces of the pick up lugs 96 ride on a rail 96*b* which is upwardly spring biased by springs 96*c* to urge the pick up lugs upwardly, yieldingly to engage the underside of the said lowermost carton and thus assure that the carton will be properly engaged thereby.

The same inner faces of the chain at predetermined points in advance of the pairs of pick up lugs 96, 96 carry stop members 97 pivotally mounted on the cross pins of the chain and having vertical faces 98 adapted to engage the leading edges of the cartons. The inner faces of each of the rails 75 and 76 carry, respectively, longitudinally extending cam members 99 and 100, said cams having a leading sloping edge such as shown at 101 and 102 in FIGS. 6 and 9. Referring for a moment to FIG. 9, it will be noted that the stop member 97 at the extreme left of that figure has engaged the cam member 100 and has been caused to extend upwardly in front of the carton which has been pulled out from under the stack of cartons by the next following pick up lug member 96. In that figure, this pick up member 96 is shown with a bottom surface 103 which has engaged the end of the cam 100 causing the pick up lug 96 as it moves to the left with the chain on which it is mounted, to swing about the hinge pin of the chain on which it is mounted in a counterclockwise direction as viewed in that figure, and to tend to compress the carton between it and the stop member 97 causing the carton to be erected; the distance between the carton engaging faces 98 of the stop member and 104 of the pick up lug being that which will hold the carton in its completely erected position. As will be noted, these members, after first picking the carton from the bottom of the stack in the hopper and then erecting it as shown

in FIG. 9, proceed thereafter both to hold and to carry the carton in its erected or set up condition completely through the machine until it is discharged from the machine. The stop member **97** is pivoted on one of the links of the chain and is provided with an opening **105** into which the next rearwardly positioned pin of the chain extends; the dimension of the opening **105** limiting the swinging movement of the stop member **97** to the extent necessary to hold the carton when elevated by the cam and to ride level with the top of the chain as it passes beneath the hopper.

In addition to the carton pick up, erecting and holding means above described, the chains on the outer sides thereof each carry a pivotally mounted tucker **106** which is disposed adjacent the trailing side of each carton and which normally hangs clear of the carton at the trailing edge thereof. As the carton reaches a point thereon at which the closing of the end or ends is to be effected, this tucker element **106** engages a stationary cam **107** on the outer face of the rail with which it is associated and by such engagement, a flap engaging point or cam element **106'** on the tucker engages the trailing edge flap *f4* and quickly causes it to be infolded across the end of the carton prior to the infolding of the top and bottom flaps to secure the end flaps in position as will be later described.

Practically as soon as the advancing carton has been caused to assume its erected position by the members **96** and **97**, the top and bottom flaps at each end thereof are spread apart by instrumentalities presently to be described. At the end of the carton adjacent the chain **19**, this spreading is to facilitate the filling of the carton while at the other end of the carton, this spreading of the flaps permits the end of the carton to be engaged by a backup bar **108** extending parallel to the path of travel of the carton and operating to prevent contents inserted at the other end of the carton from being pushed through the carton. The bar **108** is carried by horizontal arms **109, 109** adjustable transversely to the path of travel of the carton on posts **109', 109'** which are mounted on and extend vertically upwardly from brackets **110, 110** extending laterally outwardly from the outer face of the rail member **76**. The opposite side of the machine generally opposite the backup bar **108** is provided with a table **111** disposed at the level of the inner bottom face of the carton and on which the contents to be placed in the carton are received and pushed into the open cartons as they traverse this space, the backup bar **108**, as previously noted, serving to hold the articles against being pushed entirely through the carton; said table being secured by screws **111', 111'** on two of the posts **78', 78'** (see FIG. 7) and having a depending apron **112** at the outer edge thereof. In this connection it should be noted that as the advancing carton engages the backup bar **108**, the leading edge flap *f3* at that end of the carton is infolded by engagement with the backup bar. The complement of the cam **107** is mounted on the rail **106** in advance of the bar **108** to actuate the tuckers associated with the chain **20** to infold the trailing edge flaps *f4* of the cartons before they engage the backup bar **108** as shown in FIG. 11. The outer face of the backup bar **108** carries a plate having an upwardly extending edge **108***a* effective to hold the top flap *f1* at that end of the carton clear of the bar and a lower edge **108***b* operative similarly to deflect the complementary bottom flap *f2* downwardly.

*Flap Manipulating Means*

As the erected cartons pass filling area comprising the table **111**, they are filled by an attendant from materials deposited on the table. In traversing this filling area (generally shown in FIGS. 4 and 7) the end of the carton adjacent the table is held open by means including the inner edge **113** of the table **111** which acts as a deflector engaging the bottom flap *f2* and carrying it beneath the table and a deflector member **114** having a flap engaging lip **115** and a longitudinally extending groove **115'** which houses and holds the top flap *f1* raised up and protected as best shown at the left hand side of FIG. 12. The deflector **115** is mounted for vertical adjustment with the various means which manipulate the top flap of the cartons; said means comprising a pair of supporting bars **116** and **117** and secured by thumb screws **116'** and **117'** to the under sides of slotted cross bars **118, 119** and **120** for lateral adjustment on said cross bars. One end of each of said cross bars is mounted on a series of three racks **121, 122** and **123** guided for vertical movement on the inner face of the frame member **4** by guides **124, 124** on each side of each of said racks. Associated with each of said guides is a bearing **125**, all of said bearings being axially aligned to receive a shaft **126** carrying pinions **127** meshing with each of said racks so that upon rotation of said shaft all of said racks will be moved vertically in the same direction and to the same extent. Adjacent the carton discharge end of the machine, the shaft **126** is provided with a bevel gear **128** which meshes with a second bevel gear **129** carried by a cross shaft **130** journaled in bearings **131** and **132** in the members **4** and **3**, respectively. Adjacent to the frame member **3**, the shaft **130** carries a bevel gear **133** meshing with a bevel gear **134** carried by a shaft **135** extending inside and parallel to the frame member **3** in mirror image relation to the shaft **126**, said shaft **135** being journaled in corresponding pairs of bearings **136** and guide members **137** and carrying pinions by which the vertically extending racks **121', 122'** and **123'** which support the opposite ends of the cross bars **118, 119** and **120** are raised and lowered in synchronism with the racks **121, 122** and **123**. The shaft **130** protrudes through the bearing **131** and is provided with a rectangular end **138** for detachable engagement by an adjusting crank or equivalent means.

Since the actual means for folding the various flaps forming the opposite ends of the carton are mirror image replicas of each other, a description of one will serve for both. As the carton leaves the area in which it is filled and the top flap *f1* emerges from the retaining means **114**, the top flap engages a deflecting cam surface **139** fixed to the outer side of the bar **116** which causes it to be moved to an approximately horizontal position. The outer or tab carrying end of this flap then engages a tab "breaking" device **140** which includes a folding means **141** operative during the traverse of the top flap therethrough to cause the tabs T thereof to be folded along their score line L' and to be doubled over against the inner side of the flap. As these tabs are released from the folding device, they recover to an approximately right angle position with respect to the flap. Preferably, this tab breaking device includes screw means for effecting close lateral adjustment thereof including a bracket member **142** and an adjusting screw **143** operative to move the folding means **141** toward and away from the end of the carton.

As this is occurring, the end flap tucker **106** carried by the chain **19** is engaging the cam **107** on the rail **75** and is actuated in a counterclockwise direction thereby as an incident to its movement with the chain and is caused to tuck the trailing edge end flap *f4* across the open carton end. At the same time, the advancing leading edge of the carton has brought the leading edge end flap *f3* into engagement with the end flap plow **144** comprising a rod disposed slightly outside of the open end of the carton and at a slight angle to the end of the carton effective to cause the leading edge end flap *f3* to be folded across the end of the carton substantially simultaneously with the infolding of the end flap *f4* by the tuck member **106**; it being recalled that this end flap infolding occurs at this time only at the end of the carton through which it was filled; the opposite end flap *f4* having been previously infolded. From its trailing end **145**, the end flap plow **144** extends toward

the hopper end of the machine to a point substantially beneath the tuck breaking means 140 and thence extends outwardly and is secured by a screw 146 in a post 147 carried by the frame member 3.

As the bottom flap *f2* emerges from the deflector 113 at the inner edge of the table 111, it engages an upwardly and inwardly inclined plow element 148 which causes it to move upwardly across the open end of the carton said plow 148 having a shank 149 secured in a clamping means 150 by hand screw 151 and being adjustable both axially about the shank endwise of the shank in said clamping means.

As the top flap *f1* issues from the tab breaker 140 it encounters a downwardly and inwardly extending plow element 152 comprising a rod having one end loosely mounted in an opening in a bracket 153 carried by the rear end of the tuck breaker 141 the bar thence extending downwardly and inwardly toward the carton discharge end of the machine and causing the said top flap *f1* to be folded down over the previously upturned bottom end flap *f2*, both of the end flaps *f3* and *f4* having previously been inturned beneath both of these flaps as has already been described. The other end of the top flap plow 152 is loosely secured to the top surface of the tuck guide plate 154 by a screw 155 surrounded by a light compression spring 155' interposed between the head of the screw and the flattened end 152' of the plow 152 through which the screw extends. The action of the plow 152 on the carton is resisted by the supporting plate 156 mounted for vertical adjustment on inner face of each of the cam members 99 and 100 by a pair of screws 156' (see FIG. 29). As this top flap is brought down across the end of the carton, the tucks T thereof engage the top surface of the tuck guide plate 154, said plate being vertically adjustable by a screw 157 (see FIG. 21) so that the top surface thereof is brought exactly flush with the top surface of the bottom panel of the carton and so that the top flap plow 152 will surely cause the tuck ends T thereof to enter the slits S in the bottom end flap *f2* which has previously been folded upwardly across the end of the carton.

The locking of the tabs T within the carton is achieved by a series of star wheels 158 freely mounted for rotation on axle pins 159 carried by a bracket 159' pivotally mounted at 160 to the tuck guide plate 154 and being urged toward the path of the carton at the carton discharge end of the tuck guide plate by a compression spring 161 adjustably biased as to pressure exerted by an adjusting screw 162 mounted on the tuck guide plate 154 and secured in adjusted position by a locknut 162', the lower surfaces of said star wheels being disposed just above the plane of the upper surface of the bottom panel *p1* of the carton and operating to exert sufficient pressure against the carton without marking the carton to cause the ends of the tabs T to go beyond the diverging slits S' and to lock against the inner face of the bottom end flap *f2* in the manner best shown in FIG. 22. Preferably, these star wheels have a narrow outer face and are thicker at the hub to give increased bearing surface on the axle pins.

The tuck guide plate 154 and the above described associated devices is carried by a longitudinally extending bar 163 on the upper ends of the posts 78, 78, said bar also supporting the clamping means 150 for the bottom flap plow 148. The cams 99 and 100 terminate just in advance of the engagement of the chains 19 and 20 with the driving sprockets 14 and 15, allowing the stop members 97 to drop down out of the path of the carton. The pickup lugs are, however, still maintained in erect position by the top surface of these cams and operate to propel the cartons forward on to a pair of discharge plates 166, 166 which are secured to the under sides of the rear ends of the tuck guide plates 154, 154 by screws 167 and project inwardly beyond the inner edges of the tuck guide plates from a point slightly beyond the vertical plane of the axial line of the driving sprockets to the said discharge end; said discharge plates having clearance notches 168 for the chains and sprockets and downwardly curved lips 169 for initial engagement with the advancing cartons. The screws 167, additionally secure carton end guide members 170 to the upper faces of the inner edge portions; said end guide members being beveled as at 171 at the carton of the tuck guide plates. Each tuck guide plate (receiving end thereof) 154 is provided with a plurality of transverse slots 172 through each of which one each of a plurality of screws 173 extends to secure the guide plate to the bar 163 with capacity for lateral adjustment to accommodate the ends of the carton. As the pickup lugs reach the ends of the cams 99 and 100, they drop back about their pivotal mounting on the chains out of contact with the carton, but by that time, the carton has been pushed onto the discharge plates 166, 166 and is lightly frictionally engaged by the end guide elements 170, 170 and is pushed out of the machine by the next carton or cartons depending on the dimensions of the cartons relative to the length of the guide elements and discharge plates.

As previously stated, the end closing means at each end of the carton are mirror images of the corresponding means at the other end, the only difference being that instead of being mounted on the frame structure, those instrumentalities associated with the adjustable rail member 76 are mounted on brackets 174 and 175 extending laterally outwardly from said rail member and which, in turn, support posts 176 and 177 to which the corresponding bar 163 is attached to support the tuck guide plate and parts carried thereby so that adjustment of the rail 76 automatically effects corresponding adjustment of the flap manipulating instrumentalities at that end of the carton.

Referring finally to FIGS. 30 and 31, there is shown an alternative means for insuring the locking engagement of the tabs on cartons formed from material which may, at times, fail to become locked by the action of the wheels 158 thereon. This alternative means comprises replacing the carton end guide elements 170 with corresponding elements 178 which are secured by the screws 167 and are shorter to provide clearance for the said alternative tab locking means; the distal end of the discharge plate 166 being secured to the tuck guide plate 154 by a shorter screw 179. The alternative means for insuring locking of the tuck tabs comprises a spring finger 180 formed of wire and including a shank portion 181 secured by a setscrew 182 in a hole in a block 183 secured to the outer edge of the plate 154 adjacent the distal end of the plate by a screw 184; said shank portion being disposed horizontally above the surface of the plate 154 and parallel to the path of travel of the cartons. From the said shank end, the finger extends in a curve 185 to a distal end portion 186 extending diagonally and rearwardly toward the path of travel of the carton and terminating in a right angle bend 187 resting on the plate 154 and normally extending across the path of travel of the carton end for a distance which is at least equal to the distance that the slits S' extend inwardly from the score line *s2*. As the cartons push one another past this finger, the bias thereof causes it to enter between the outer face of the infolded tabs T and the adjacent face of the panel *p2* tending to momentarily spread them apart and thus insure that the tab ends will be caused to lock against the inner face of the end flap *f2*.

While the foregoing specification has disclosed presently preferred embodiments of the invention, it will be understood that such disclosure is by way of example wherefore, the invention is not to be deemed to be limited to the forms thereof so disclosed, and it will be understood that the invention includes as well, all such changes and modifications in the parts, and in the construction, combination and arrangement of parts as shall come within the purview of the appended claims.

I claim:

1. A machine for erecting and subsequently closing at least one end of knocked down cartons of the type having an end closed by flap components formed as ex-

tensions of at least two oppositely disposed panels of the carton body and including at least one locking tab element on one of said flap components insertable through complementary slit means in the other of said flap components for interlocking engagement therewith; said machine comprising in combination, a frame structure, an open bottom hopper means for containing a supply of knocked down cartons carried by said frame structure, a pair of endless flexible members mounted on said frame structure in horizontally laterally spaced, parallel relation to each other for synchronous, unidirectional movement along a horizontal path having one end thereof disposed at the under side of said hopper means and thence extending to the discharge end of the machine, power actuated means for driving said flexible members, carton edge engaging members carried by said flexible members adapted to engage the edge of the lowermost one of a stack of cartons in said hopper means and move it from beneath the hopper means, and spring biased means carried by said frame structure and disposed beneath said hopper means effective to engage said carton engaging members during the excursion thereof beneath the stack of cartons and to exert yielding upward pressure of said members to insure the engagement thereof with the said lowermost carton.

2. A machine for erecting and subsequently closing at least one end of knocked down cartons of the type having an end closed by flap components formed as extensions of at least two oppositely disposed panels of the carton body and including at least one locking tab element on one of said flap components insertable through complementary slit means in the other of said flap components for interlocking engagement therewith; said machine comprising in combination, a frame structure, an open bottom hopper means for containing a supply of knocked down cartons carried by said frame structure, a pair of endless flexible members mounted on said frame structure in horizontally laterally spaced, parallel relation to each other for synchronous, unidirectional movement along a horizontal path having one end thereof disposed at the under side of said hopper means and thence extending to the discharge end of the machine, power actuated means for driving said flexible members, carton edge engaging members carried by said flexible members adapted to engage the edge of the lowermost one of a stack of cartons in said hopper means and move it from beneath the hopper means, spring biased means carried by said frame structure and disposed beneath said hopper means effective to engage said carton engaging members during the excursion thereof beneath the stack of cartons and to exert yielding upward pressure of said members to insure the engagement thereof with the said lowermost carton, other carton engaging means carried by said flexible members cooperating with said first named members to carry a carton engaged therebetween to said discharge end of the machine, and carton end closing means carried by said frame structure adapted to engage and interfold the flap components of said two panels and to project the tab element of said one flap component through the slit means of and into interlocking engagement with said other flap component.

3. A machine for erecting and subsequently closing at least one end of knocked down cartons of the type having an end closed by flap components formed as extensions of at least two oppositely disposed panels of the carton body and including at least one locking tab element on one of said flap components insertable through complementary slit means in the other of said flap components for interlocking engagement therewith; said machine comprising in combination, a frame structure, an open bottom hopper means for containing a supply of knocked down cartons carried by said frame structure, a pair of endless flexible members mounted on said frame structure in horizontally laterally spaced, parallel relation to each other for synchronous, unidirectional movement along a horizontal path having one end thereof disposed at the under side of said hopper means and thence extending to the discharge end of the machine, power actuated means for driving said flexible members, carton edge engaging members carried by said flexible members adapted to engage the edge of the lowermost one of a stack of cartons in said hopper means and move it from beneath the hopper means, spring biased means carried by said frame structure and disposed beneath said hopper means effective to engage said carton engaging members during the excursion thereof beneath the stack of cartons and to exert yielding upward pressure of said members to insure the engagement thereof with the said lowermost carton, other carton engaging means carried by said flexible members cooperating with said first named members to carry a carton engaged therebetween to said discharge end of the machine, and carton end closing means carried by said frame structure adapted to engage and interfold the flap components of said two panels and to project the tab element of said one flap component through the slit means therefor in the other of said flap components and to effect interlocking engagement of said tab element with said other flap component.

4. A machine for erecting and subsequently closing at least one end of knocked down cartons of the type having an end closed by flap components formed as extensions of at least two oppositely disposed panels of the carton body and including at least one locking tab element on one of said flap components insertable through complementary slit means in the other of said flap components for interlocking engagement therewith, said machine comprising in combination, a frame structure, an open bottom hopper means for containing a supply of knocked down cartons carried by said frame structure, a pair of endless flexible members mounted on said frame structure in horizontally laterally spaced, parallel relation to each other for synchronous, unidirectional movement along a horizontal path having one end thereof disposed at the under side of said hopper means and thence extending to the discharge end of the machine, power actuated means for driving said flexible members, carton edge engaging members carried by said flexible members adapted to engage the edge of the lowermost one of a stack of cartons in said hopper means and move it from beneath the hopper means, spring biased means carried by said frame structure and disposed beneath said hopper means effective to engage said carton engaging members during the excursion thereof beneath the stack of cartons and to exert yielding upward pressure of said members to insure the engagement thereof with the said lowermost carton, other carton engaging means carried by said flexible members cooperating with said first named members to carry a carton engaged therebetween to said discharge end of the machine, and carton end closing means carried by said frame structure adapted to engage and interfold the flap components of said two panels and to project the tab element of said one flap component through the slit means of and into interlocking engagement with said other flap component; said end closing means comprising devices effective to bend the tab element into substantially right angle relation to the plane of the flap component from which it extends, other devices for separately engaging each of said two flap components and interfolding them across the end of the carton with incident projection of the tab element of said one flap component through the slit means of the other of said flap components and other devices exerting yielding pressure against the closed end of the carton adjacent to the interengaged tab element and slit means operative to insure interlocking engagement of the tab element with the inner face of said other flap component.

5. A machine for erecting and subsequently closing at

least one end of knocked down cartons of the type having an end closed by flap components formed as extensions of at least two oppositely disposed panels of the carton body and including at least one locking tab element on one of said flap components insertable through complementary slit means in the other of said flap components for interlocking engagement therewith; said machine comprising in combination, a frame structure, an open bottom hopper means for containing a supply of knocked down cartons carried by said frame structure, a pair of endless flexible members mounted on said frame structure in horizontally laterally spaced, parallel relation to each other for synchronous, unidirectional movement along a horizontal path having one end thereof disposed at the under side of said hopper means and thence extending to the discharge end of the machine, power actuated means for driving said flexible members, carton edge engaging members carried by said flexible members adapted to engage the edge of the lowermost one of a stack of cartons in said hopper means and move it from beneath the hopper means, spring biased means carried by said frame structure and disposed beneath said hopper means effective to engage said carton engaging members during the excursion thereof beneath the stack of cartons and to exert yielding upward pressure of said members to insure the engagement thereof with the said lowermost carton, other carton engaging means carried by said flexible members cooperating with said first named members to carry a carton engaged therebetween to said discharge end of the machine, and carton end closing means carried by said frame structure adjacent to at least one end of said carton and including devices separately engageable with each of said two flap components incident to the excursion of the carton past said devices and effective to interfold said flap components and to project said tab element of said one flap component through the slit means therefor in the other of said flap components and to effect interlocking engagement of said tab element with said other flap component; said end closing means comprising devices effective to bend the tab element into substantially right angle relation to the plane of the flap component from which it extends, other devices for separately engaging each of said two flap components and interfolding them across the end of the carton with incident projection of the tab element of said one flap component through the slit means of the other of said flap components and other devices exerting yielding pressure against the closed end of the carton adjacent to the interengaged tab element and slit means operative to insure interlocking engagement of the tab element with the inner face of said other flap component.

6. A machine for erecting and subsequently closing at least one end of knocked down cartons of the type having an end closed by flap components formed as extensions of at least two oppositely disposed panels of the carton body and including at least one locking tab element on one of said flap components insertable through complementary slit means in the other of said flap components for interlocking engagement therewith; said machine comprising in combination, a frame structure, an open bottom hopper means for containing a supply of knocked down cartons carried by said frame structure, a pair of endless flexible members mounted on said frame structure in horizontally laterally spaced, parallel relation to each other for synchronous, unidirectional movement along a horizontal path having one end thereof disposed at the under side of said hopper means and thence extending to the discharge end of the machine, power actuated means for driving said flexible members, pickoff lug members carried by said flexible members and arranged thereon for simultaneous engagement with the rear edge of the lowermost carton in said hopper means, yielding means carried by said frame structure below said hopper means and adjacent to each of said flexible members operative to cause said pickoff lug members to engage the said lowermost carton and move it along said path, stop members carried by said flexible members in advance of each of said pickoff lug members, stationary cam means carried by said frame structure disposed in the path of travel of said pickoff lug members and said stop members operative upon engagement therewith to cause movement of said members relative to said flexible members and to each other effective to transform the carton from its knocked down condition to erected condition, and guide means extending parallel to said path and disposed above said flexible members effective to hold the erected carton down on said flexible members during its traverse of said path.

7. A machine for erecting and subsequently closing at least one end of knocked down cartons of the type having an end closed by flap components formed as extensions of at least two oppositely disposed panels of the carton body and including at least one locking tab element on one of said flap components insertable through complementary slit means in the other of said flap components for interlocking engagement therewith; said machine comprising in combination, a frame structure, an open bottom hopper means for containing a supply of knocked down cartons carried by said frame structure, a pair of endless flexible members mounted on said frame structure in horizontally laterally spaced, parallel relation to each other for synchronous, unidirectional movement along a horizontal path having one end thereof disposed at the under side of said hopper means and thence extending to the discharge end of the machine, power actuated means for driving said flexible members, pickoff lug members carried by said flexible members and arranged thereon for simultaneous engagement with the rear edge of the lowermost carton in said hopper means, yielding means carried by said frame structure below said hopper means and adjacent to each of said flexible members operative to cause said pickoff lug members to engage the said lowermost carton and move it along said path, stop members carried by said flexible members in advance of each of said pickoff lug members, stationary cam means carried by said frame structure disposed in the path of travel of said pickoff lug members and said stop members operative upon engagement therewith to cause movement of said members relative to said flexible members and to each other effective to transform the carton from its knocked down condition to erected condition, guide means extending parallel to said path and disposed above said flexible members effective to hold the erected carton down on said flexible members during its traverse of said path, and carton end closing means carried by said frame structure adapted to engage and interfold the flap components of said two panels and to project the tab element of said one flap component through the slit means of and into interlocking engagement with said other flap component.

8. A machine for erecting and subsequently closing at least one end of knocked down cartons of the type having an end closed by flap components formed as extensions of at least two oppositely disposed panels of the carton body and including at least one locking tab element on one of said flap components insertable through complementary slit means in the other of said flap components for interlocking engagement therewith; said machine comprising in combination, a frame structure, an open bottom hopper means for containing a supply of knocked down cartons carried by said frame structure, a pair of endless flexible members mounted on said frame structure in horizontally laterally spaced, parallel relation to each other for synchronous, unidirectional movement along a horizontal path having one end thereof disposed at the under side of said hopper means and thence extending to the discharge end of the machine, power actuated means for driving said flexible members, pickoff lug members carried by said flexible members and arranged thereon for simultaneous engagement with the rear edge of the lowermost carton in said hopper means, yielding means carried by said frame structure below said hopper means and adjacent to each of said flexible mem-

bers operative to cause said pickoff lug members to engage the said lowermost carton and move it along said path, stop members carried by said flexible members in advance of each of said pickoff lug members, stationary cam means carried by said frame structure disposed in the path of travel of said pickoff lug members and said stop members operative upon engagement therewith to cause movement of said members relative to said flexible members and to each other effective to transform the carton from its knocked down condition to erected condition, guide means extending parallel to said path and disposed above said flexible members effective to hold the erected carton down on said flexible members during its traverse of said path, and carton end closing means carried by said frame structure adjacent to at least one end of the carton as it is conveyed by said flexible members and including devices separately engageable with each of said two flap components incident to the excursion of the carton along said path and effective first to interfold said flap components across the carton end and then to project the tab element of said one flap component through the slit means of and into interlocking engagement with the other flap component.

9. A machine for erecting and subsequently closing at least one end of knocked down cartons of the type having an end closed by flap components formed as extensions of at least two oppositely disposed panels of the carton body and including at least one locking tab element on one of said flap components insertable through complementary slit means in the other of said flap components for interlocking engagement therewith; said machine comprising in combination, a frame structure, an open bottom hopper means for containing a supply of knocked down cartons carried by said frame structure, a pair of endless flexible members mounted on said frame structure in horizontally laterally spaced, parallel relation to each other for synchronous, unidirectional movement along a horizontal path having one end thereof disposed at the under side of said hopper means and thence extending to the discharge end of the machine, power actuated means for driving said flexible members, pickoff lug members carried by said flexible members and arranged thereon for simultaneous engagement with the rear edge of the lowermost carton in said hopper means, yielding means carried by said frame structure below said hopper means and adjacent to each of said flexible members operative to cause said pickoff lug members to engage the said lowermost carton and move it along said path, stop members carried by said flexible members in advance of each of said pickoff lug members, stationary cam means carried by said frame structure disposed in the path of travel of said pickoff lug members and said stop members operative upon engagement therewith to cause movement of said members relative to said flexible members and to each other effective to transform the carton from its knocked down condition to erected condition, guide means extending parallel to said path and disposed above said flexible members effective to hold the erected carton down on said flexible members during its traverse of said path, and carton end closing means carried by said frame structure adapted to engage and interfold the flap components of said two panels and to project the tab element of said one flap component through the slit means of and into interlocking engagement with said other flap component; said end closing means comprising devices effective to bend the tab element into substantially right angle relation to the plane of the flap component from which it extends, other devices for separately engaging each of said two flap components and interfolding them across the end of the carton with incident projection of the tab element of said one flap component through the slit means of the other of said flap components and other devices exerting yielding pressure against the closed end of the carton adjacent to the interengaged tab element and slit means operative to insure interlocking engagement of the tab element with the inner face of said other flap component.

10. A machine for erecting and subsequently closing at least one end of knocked down cartons of the type having an end closed by flap components formed as extensions of at least two oppositely disposed panels of the carton body and including at least one locking tab element on one of said flap components insertable through complementary slit means in the other of said flap components for interlocking engagement therewith; said machine comprising in combination, a frame structure, an open bottom hopper means for containing a supply of knocked down cartons carried by said frame structure, a pair of endless flexible members mounted on said frame structure in horizontally laterally spaced, parallel relation to each other for synchronous, unidirectional movement along a horizontal path having one end thereof disposed at the under side of said hopper means and thence extending to the discharge end of the machine, power actuated means for driving said flexible members, pickoff lug members carried by said flexible members and arranged thereon for simultaneous engagement with the rear edge of the lowermost carton in said hopper means, yielding means carried by said frame structure below said hopper means and adjacent to each of said flexible members operative to cause said pickoff lug members to engage the said lowermost carton and move it along said path, stop members carried by said flexible members in advance of each of said pickoff lug members, stationary cam means carried by said frame structure disposed in the path of travel of said pickoff lug members and said stop members operative upon engagement therewith to cause movement of said members relative to said flexible members and to each other effective to transform the carton from its knocked down condition to erected condition, and guide means extending parallel to said path and disposed above said flexible members effective to hold the erected carton down on said flexible members during its traverse of said path; said guide means comprising a pair of rail members disposed one each parallel to and above one each of said flexible members, and supporting means for said rail members mounted on said frame structure including a single manually operable element and devices operated thereby effective to vary the vertical spacing of said guide means above said flexible members to accommodate different heights of erected cartons.

11. A machine for erecting and subsequently closing at least one end of knocked down cartons of the type having an end closed by flap components formed as extensions of at least two oppositely disposed panels of the carton body and including at least one locking tab element on one of said flap components insertable through complementary slit means in the other of said flap components for interlocking engagement therewith; said machine comprising in combination, a frame structure, an open bottom hopper means for containing a supply of knocked down cartons carried by said frame structure, a pair of endless flexible members mounted on said frame structure in horizontally laterally spaced, parallel relation to each other for synchronous, unidirectional movement along a horizontal path having one end thereof disposed at the under side of said hopper means and thence extending to the discharge end of the machine, power actuated means for driving said flexible members, pickoff lug members carried by said flexible members and arranged thereon for simultaneous engagement with the rear edge of the lowermost carton in said hopper means, yielding means carried by said frame structure below said hopper means and adjacent to each of said flexible members operative to cause said pickoff lug members to engage the said lowermost carton and move it along said path, stop members carried by said flexible members in advance of each of said pickoff lug members, stationary cam means carried by said frame structure disposed in the path of travel of said pickoff lug members and said

stop members operative upon engagement therewith to cause movement of said members relative to said flexible members and to each other effective to transform the carton from its knocked down condition to erected condition, guide means extending parallel to said path and disposed above said flexible members effective to hold the erected carton down on said flexible members during its traverse of said path, and carton end closing means carried by said frame structure adapted to engage and interfold the flap components of said two panels and to project the tab element of said one flap component through the slit means of and into interlocking engagement with said other flap component; said guide means comprising a pair of rail members disposed one each parallel to and above one each of said flexible members, and supporting means for said rail members mounted on said frame structure including a single manually operable element and devices operated thereby effective to vary the vertical spacing of said guide means above said flexible members to accommodate different heights of erected cartons.

12. A machine for erecting and subsequently closing at least one end of knocked down cartons of the type having an end closed by flap components formed as extensions of at least two oppositely disposed panels of the carton body and including at least one locking tab element on one of said flap components insertable through complementary slit means in the other of said flap components for interlocking engagement therewith; said machine comprising in combination, a frame structure, an open bottom hopper means for containing a supply of knocked down cartons carried by said frame structure, a pair of endless flexible members mounted on said frame structure in horizontally laterally spaced, parallel relation to each other for synchronous, unidirectional movement along a horizontal path having one end thereof disposed at the under side of said hopper means and thence extending to the discharge end of the machine, power actuated means for driving said flexible members, pickoff lug members carried by said flexible members and arranged thereon for simultaneous engagement with the rear edge of the lowermost carton in said hopper means, yielding means carried by said frame structure below said hopper means and adjacent to each of said flexible members operative to cause said pickoff lug members to engage the said lowermost carton and move it along said path, stop members carried by said flexible members in advance of each of said pickoff lug members, stationary cam means carried by said frame structure disposed in the path of travel of said pickoff lug members and said stop members operative upon engagement therewith to cause movement of said members relative to said flexible members and to each other effective to transform the carton from its knocked down condition to erected condition, guide means extending parallel to said path and disposed above said flexible members effective to hold the erected carton down on said flexible members during its traverse of said path, and carton end closing means carried by said frame structure adjacent to at least one end of the carton as it is conveyed by said flexible members and including devices separately engageable with each of said two flap components incident to the excursion of the carton along said path and effective first to interfold said flap components across the carton end and then to project the tab element of said one flap component through the slit means of and into interlocking engagement with the other flap component; said guide means comprising a pair of rail members disposed one each parallel to and above one each of said flexible members, and supporting means for said rail members mounted on said frame structure including a single manually operable element and devices operated thereby effective to vary the vertical spacing of said guide means above said flexible members to accommodate different heights of erected cartons.

13. A machine for erecting and subsequently closing at least one end of knocked down cartons of the type having an end closed by flap components formed as extensions of at least two oppositely disposed panels of the carton body and including at least one locking tab element on one of said flap components insertable through complementary slit means in the other of said flap components for interlocking engagement therewith; said machine comprising in combination, a frame structure, an open bottom hopper means for containing a supply of knocked down cartons carried by said frame structure, a pair of endless flexible members mounted on said frame structure in horizontally laterally spaced, parallel relation to each other for synchronous, unidirectional movement along a horizontal path having one end thereof disposed at the under side of said hopper means and thence extending to the discharge end of the machine, power actuated means for driving said flexible members, pickoff lug members carried by said flexible members and arranged thereon for simultaneous engagement with the rear edge of the lowermost carton in said hopper means, yielding means carried by said frame structure below said hopper means and adjacent to each of said flexible members operative to cause said pickoff lug members to engage the said lowermost carton and move it along said path, stop members carried by said flexible members in advance of each of said pickoff lug members, stationary cam means carried by said frame structure disposed in the path of travel of said pickoff lug members and said stop members operative upon engagement therewith to cause movement of said members relative to said flexible members and to each other effective to transform the carton from its knocked down condition to erected condition, and carton end closing means carried by said frame structure adapted to engage and interfold the flap components of said two panels and to project the tab element of said one flap component through the slit means of and into interlocking engagement with said other flap component.

14. A machine for erecting and subsequently closing at least one end of knocked down cartons of the type having an end closed by flap components formed as extensions of at least two oppositely disposed panels of the carton body and including at least one locking tab element on one of said flap components insertable through complementary slit means in the other of said flap components for interlocking engagement therewith; said machine comprising in combination, a frame structure, an open bottom hopper means for containing a supply of knocked down cartons carried by said frame structure, a pair of endless flexible members mounted on said frame structure in horizontally laterally spaced, parallel relation to each other for synchronous, unidirectional movement along a horizontal path having one end thereof disposed at the under side of said hopper means and thence extending to the discharge end of the machine, power actuated means for driving said flexible members, pickoff lug members carried by said flexible members and arranged thereon for simultaneous engagement with the rear edge of the lowermost carton in said hopper means, yielding means carried by said frame structure below said hopper means and adjacent to each of said flexible members operative to cause said pickoff lug members to engage the said lowermost carton and move it along said path, stop members carried by said flexible members in advance of each of said pickoff lug members, stationary cam means carried by said frame structure disposed in the path of travel of said pickoff lug members and said stop members operative upon engagement therewith to cause movement of said members relative to said flexible members and to each other effective to transform the carton from its knocked down condition to erected condition, and carton end closing means carried by said frame structure adjacent to at least one end of the carton as it is conveyed by said flexible members and including devices separately engageable

with each of said two flap components incident to the excursion of the carton along said path and effective first to interfold said flap components across the carton end and then to project the tab element of said one flap component through the slit means of and into interlocking engagement with the other flap component.

15. A machine for erecting and subsequently closing at least one end of knocked down cartons of the type having an end closed by flap components formed as extensions of at least two oppositely disposed panels of the carton body and including at least one locking tab element on one of said flap components insertable through complementary slit means in the other of said flap components for interlocking engagement therewith; said machine comprising in combination, a frame structure, an open bottom hopper means for containing a supply of knocked down cartons carried by said frame structure, a pair of endless flexible members mounted on said frame structure in horizontally laterally spaced, parallel relation to each other for synchronous, uni-directional movement along a horizontal path having one end thereof disposed at the under side of said hopper means and thence extending to the discharge end of the machine, power actuated means for driving said flexible members, pickoff lug members carried by said flexible members and arranged thereon for simultaneous engagement with the rear edge of the lowermost carton in said hopper means, yielding means carried by said frame structure below said hopper means and adjacent to each of said flexible members operative to cause said pickoff lug members to engage the said lowermost carton and move it along said path, stop members carried by said flexible members in advance of each of said pickoff lug members, stationary cam means carried by said frame structure disposed in the path of travel of said pickoff lug members and said stop members operative upon engagement therewith to cause movement of said members relative to said flexible members and to each other effective to transform the carton from its knocked down condition to erected condition, and carton end closing means carried by said frame structure adapted to engage and interfold the flap components of said two panels and to project the tab element of said one flap component through the slit means of and into interlocking engagement with said other flap components; said end closing means comprising devices effective to bend the tab element into substantially right angle relation to the plane of the flap component from which it extends, other devices for separately engaging each of said two flap components and interfolding them across the end of the carton with incident projection of the tab element of said one flap component through the slit means of the other of said flap components and other devices exerting yielding pressure against the closed end of the carton adjacent to the interengaged tab element and slit means operative to insure interlocking engagement of the tab element with the inner face of said other flap component.

16. A machine for erecting and subsequently closing at least one end of knocked down cartons of the type having the end to be closed provided with flap components formed as extensions of at least the panels constituting the upper and lower sides of the carton as it passes through the machine; said machine comprising in combination, an elongated frame structure including parallel side walls and having a front end from which the cartons are discharged and a rear end at which the knocked down cartons are supplied to the machine, an open bottom hopper means for containing a supply of knocked down cartons carried by and disposed above said rear end of said frame structure, conveyor means for propelling cartons one by one along a path extending below said hopper means to said discharge end of said frame structure; said conveyor means comprising a pair of endless sprocket chains disposed in laterally spaced, horizontal relation to each other, a pair of driving sprockets each engaging one end of one each of said chains, a pair of idler sprockets engaging one each of the other end of said chains, a pair of horizontal rails each supporting one each of the upper reaches of said chains between the driving and idler sprockets thereof, carton pickup lug members mounted on said chains having portions adapted to engage the rear edge of the lowermost knocked down carton in said hopper means, stationary, resilient means disposed in the path of travel of and engaging said pickup lug members beneath said hopper operative to insure engagement of the carton thereby, stop members carried by said chains positioned to engage the forward edge of a carton, means carried by said rails engaged by said pickup lug members and said stop members operative to effect movement thereof relative to each other and to said chain with resultant transformation of the carton from the knocked down to the erected condition, and a second pair of rails disposed one each parallel to and above each of said chains effective to engage the top surface of the erected carton and hold it down against said chains while traversing said path.

17. A carton erecting and closing machine as claimed in claim 16 in which said second named pair of rails is mounted on said frame structure by means including manually operable devices for effecting vertical adjustment thereof to accommodate different heights of erected cartons.

18. A carton erecting and closing machine as claimed in claim 16 including devices carried by said frame structure adjacent to said one end of the carton as it traverses said path effective to successively engage the upper and lower flap components and fold them across the end of the carton and in which the device for engaging the upper flap of the carton is attached both to said frame structure and to a portion of the mouning means for said second named pair of rails for movement therewith for automatic compensatory adjustment of said device for different heights of cartons.

19. A machine for erecting and subsequently closing rectangular, knocked down cartons of the type having the opposite ends thereof closed by interlocking flaps formed as extensions of the panels constituting the top and bottom of the carton and other flaps formed as extensions of the leading and trailing sides of the carton as it is processed by the machine; said machine comprising a frame structure, a conveyor means mounted on said frame structure operative to convey cartons along a path extending from a supply source to a discharge point, a hopper means constituting said supply source mounted on said frame structure and disposed above said conveyor means at a point on said path remote from said discharge point, carton engaging means carried by said conveyor means and cooperating with non-moving means carried by said frame structure operative to remove a knocked down carton from said hopper means, transform the carton to erected condition and carry the erected carton to said discharge point, flap engaging devices carried by and moving with said conveyor means disposed at the trailing side of the carton, cam means on said frame structure engageable with said flap engaging devices incident to movement of said conveyor means effective to cause said flap engaging devices to fold the flaps of the trailing side of the carton across the carton ends and other flap engaging devices carried by said frame structure and positioned to be engaged by the other end closing flaps incident to travel of the carton on said conveyor means and operative by said engagement to fold the other flaps across the carton end and to effect the interlocking interengagement of the top and botom flaps.

20. A machine as claimed in claimed 19 in which said frame structure includes deflecting guide means engaging the top and bottom flaps and deflects them outwardly away from each other while the carton traverses a portion of said path extending from the point at which it is erected to the engagement of the deflected flaps folding means therefor.

21. A machine as claimed in claim 20 in which said frame structure includes hold down rail means ex-

tending parallel to and above said conveyor means effective to hold the erected cartons on said conveyor means until discharged therefrom.

22. A machine as claimed in claim 21 in which the portions of said deflecting guide means engaging the top flaps are vertically adjustable to accommodate different heights of erected cartons.

23. A machine as claimed in claim 21 in which said hold down rail means is vertically adjustable and in which the portions of said deflecting means engaging the top flaps is mounted on said hold down rail means for simultaneous vertical adjustment therewith.

24. A machine for erecting and subsequently closing rectangular, knocked down cartons of the type having the opposite ends thereof closed by interlocking flaps formed as extensions of the panels constituting the top and bottom of the carton and other flaps formed as extensions of the leading and trailing sides of the carton as it is processed by the machine; said machine comprising a frame structure, a conveyor means mounted on said frame structure operative to convey cartons along a path extending from a supply source to a discharge point, a hopper means constituting said supply source mounted on said frame structure and disposed above said conveyor means at a point on said path remote from said discharge point, carton engaging means carried by said conveyor means and cooperating with non-moving means carried by said frame structure operative to remove a knocked down carton from said hopper means, transform the carton to erected condition and carry the erected carton to said discharge point, flap deflecting guide means mounted on said frame structure positioned to engage and deflect the top and bottom flaps of the erected carton outwardly away from each other while the carton traverses a portion of said path immediately following the point at which it is erected, a bar carried by said frame structure extending parallel to said path and engaging one end of the erected carton as it traverses said portion of said path, flap engaging devices carried by and moving with said conveyor means disposed at the trailing side of the carton, cam means on said frame structure engagable with said flap engaging devices incident to movement of said conveyor means effective to cause said flap engaging devices to fold the flaps of the trailing side of the carton across the carton ends and other flap engaging devices carried by said frame structure and positioned to be engaged by the other end closing flaps incident to travel of the carton on said conveyor means and operative by said engagement to fold the other flaps across the carton end and to effect the interlocking interengagement of the top and bottom flaps.

25. A machine as claimed in claim 24 in which said frame structure at the side thereof opposite the side adjacent to said carton end engaging bar is provided with a table disposed substantially at the plane of the top surface of the bottom panel of the erected carton and substantially longitudinally coextensive with said portion of said path from which contents are inserted in the carton as it traverses said portion of said path; said carton end engaging bar serving to prevent the inserted contents from projecting beyond the other end of the carton.

26. A machine as claimed in claim 24 in which the operating cam means for the one of said flap engaging devices carried by said conveyor means for infolding the trailing side flap at the end of the carton engaged by said bar is positioned to efffect infolding of that side flap before engagement thereof by said carton end engaging bar.

27. A machine for erecting and subsequently closing rectangular, knocked down cartons of the type having the opposite ends thereof closed by flaps formed as extensions of the panels constituting the sides of the carton and in which the top flaps are provided with locking tab elements insertable through receiving slits in the bottom flaps for interlocking, non-removable engagement therewith; said machine comprising a frame structure, a conveyor means mounted on said frame structure operative to convey cartons along a path extending from a supply source to a discharge point; said conveyor means comprising a pair of parallel sprocket chains and driving means therefor, means for mounting one of said chains in fixed relation to said frame structure, means for mounting the other of said sprocket chains for adjustment toward and away from said one sprocket chain to accommodate different lengths of cartons, a hopper means disposed above said chains at one end of said path constituting said supply source, carton engaging means carried by said chains and cooperating with devices carried by non-moving means on said frame structure operative, incident to travel of said chains, to remove a knocked down carton from said hopper means, transform the carton to erected condition and carry the erected carton to said discharge point, means for infolding the flaps of the trailing side of the carton across the carton ends comprising members pivotally mounted on said chains and cam means carried by said frame structure in the path of said pivotally mounted members effective to move said members to infold the trailing side flaps, inwardly inclined plow means engaging and infolding the leading side flaps, inwardly and upwardly inclined plow means effective to fold the bottom flaps upwardly across the carton ends, means engaging the tab elements of the top flaps and bending them to a substantially right angle relation to the top flaps, plow means extending inwardly and downwardly effective to fold the top flaps down over the upturned bottom flap, means for guiding the tab elements of the top flap into the receiving slit means in the bottom flaps, and means for applying yielding pressure against the lower end of the infolded top flaps to push the tab elements completely through the bottom flap slit means with resultant locking interengagement of the tab elements with the inner face of the bottom flap.

28. A machine as claimed in claim 27 in which said means for applying yielding pressure comprises a series of toothed wheels rotatable about vertical axes disposed generally parallel to said path and successively, yieldingly engaging the lower edge of the carton end above the horizontal plane of the top face of the bottom panel of the carton.

29. A machine as claimed in claim 27 in which said means for applying yielding pressure included devices for varying the amount of pressure so applied.

30. A machine as claimed in claim 27 including spring finger means disposed between said pressure applying means and said discharge point effective to yieldingly enter between the lower face of the inserted tab element and the upper face of the bottom panel of the carton to insure the interlocking engagement of the tab elements with the bottom flap.

31. A machine as claimed in claim 27 in which the means for closing the end of the carton adjacent to the adjustable one of said chains is mounted on the same mounting means as said adjustable chain for simultaneous lateral adjustment therewith.

32. A machine as claimed in claim 27 in which includes a pair of vertically adjustable carton hold down rails and mounting means therefor disposed one each parallel to and above each of said chains, and in which the plow means for the top flaps of the carton ends have one end mounted on said mounting means for said hold down rails and the other ends thereof on relatively fixed portions of said frame structure.

33. A machine as claimed in claim 28 in which said toothed wheels at each end of the carton are mounted on vertical axle pins carried by a horizontal member pivotally mounted for movement about a fixed vertical axis; said pins being disposed in a line extending from said pivotal mounting toward said discharge end and generally parallel to the path of the adjacent carton end and

in which a manually variable spring means operates on the end of said horizontal member remote from said pivotal mounting to yieldingly press said end inwardly toward said path with resultant increasing pressure on the carton ends by said toothed wheels as the cartons approach the discharge end of the machine.

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