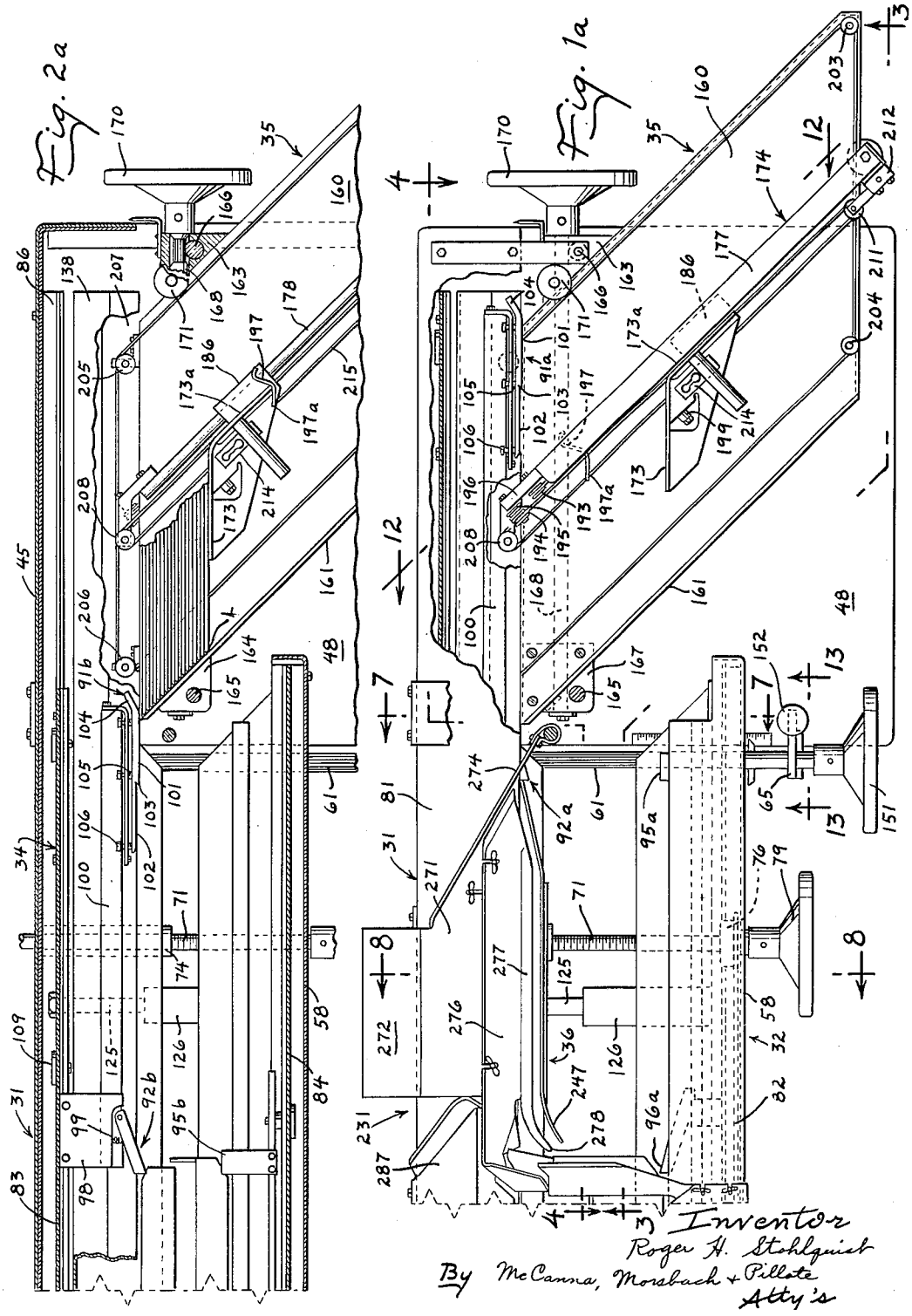
Nov. 9, 1965 R. H. STOHLQUIST 3,216,175

CARTON ERECTING AND CLOSING MACHINE

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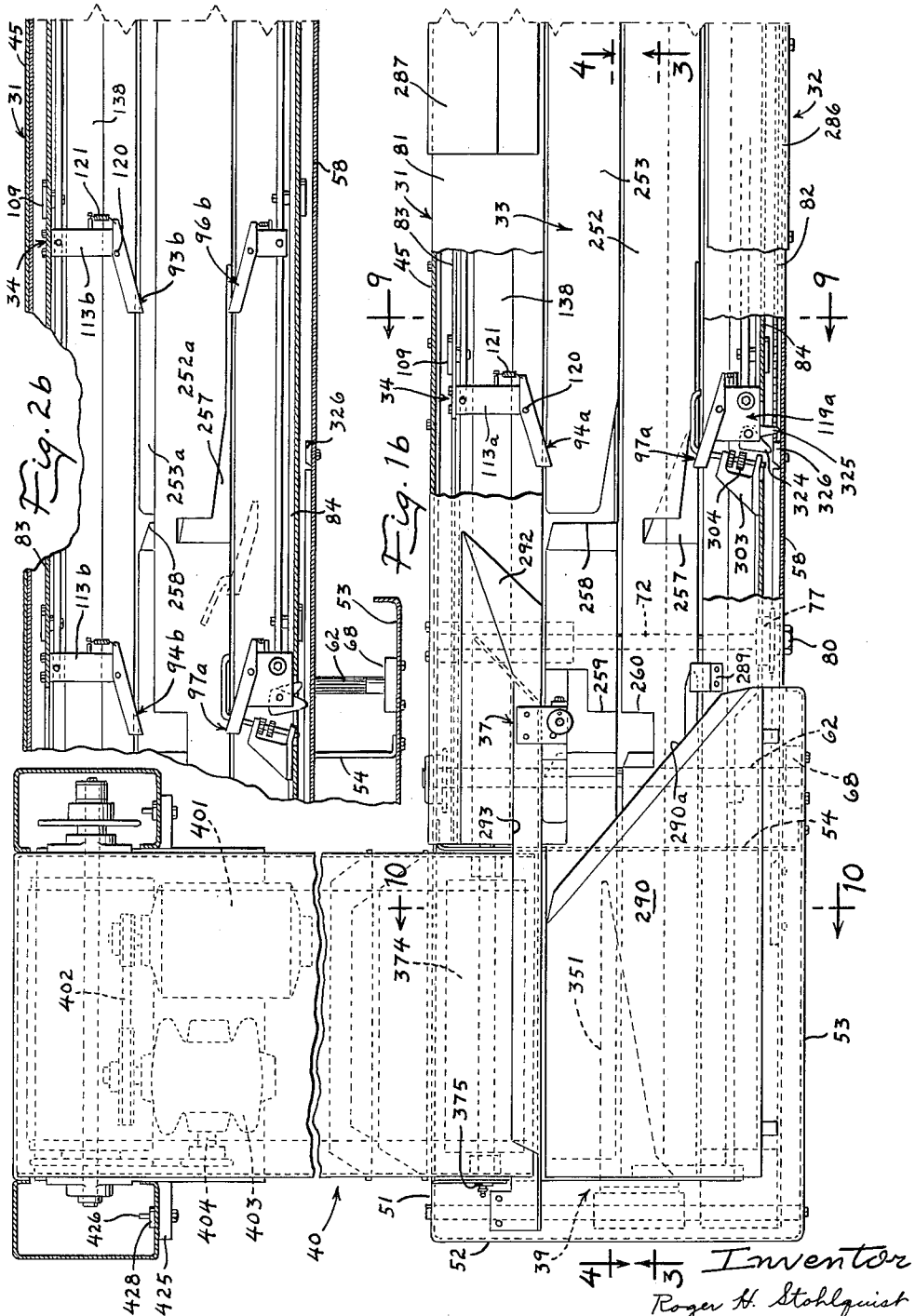


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CARTON ERECTING AND CLOSING MACHINE

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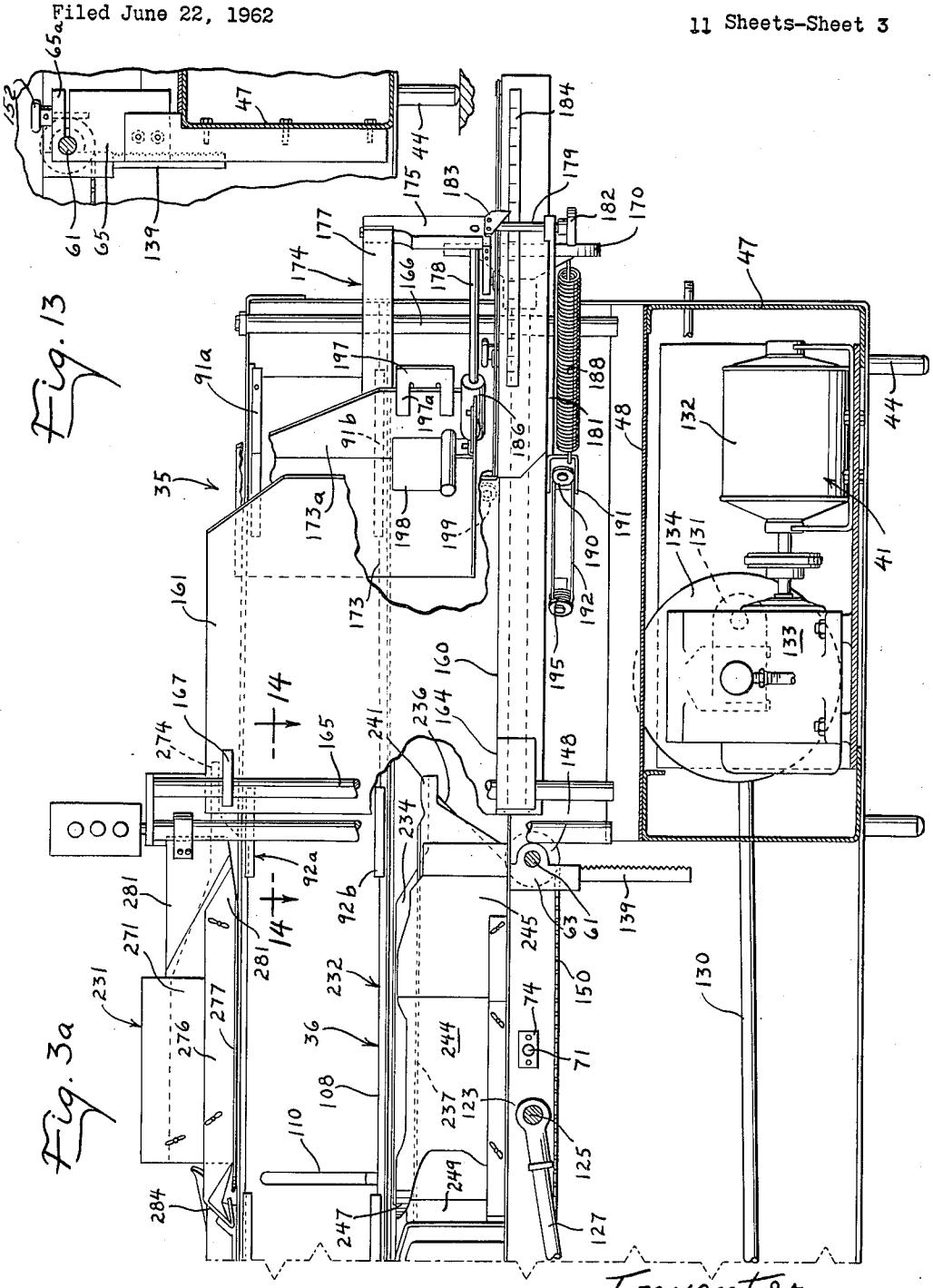


Fig. 13

Fig. 3a

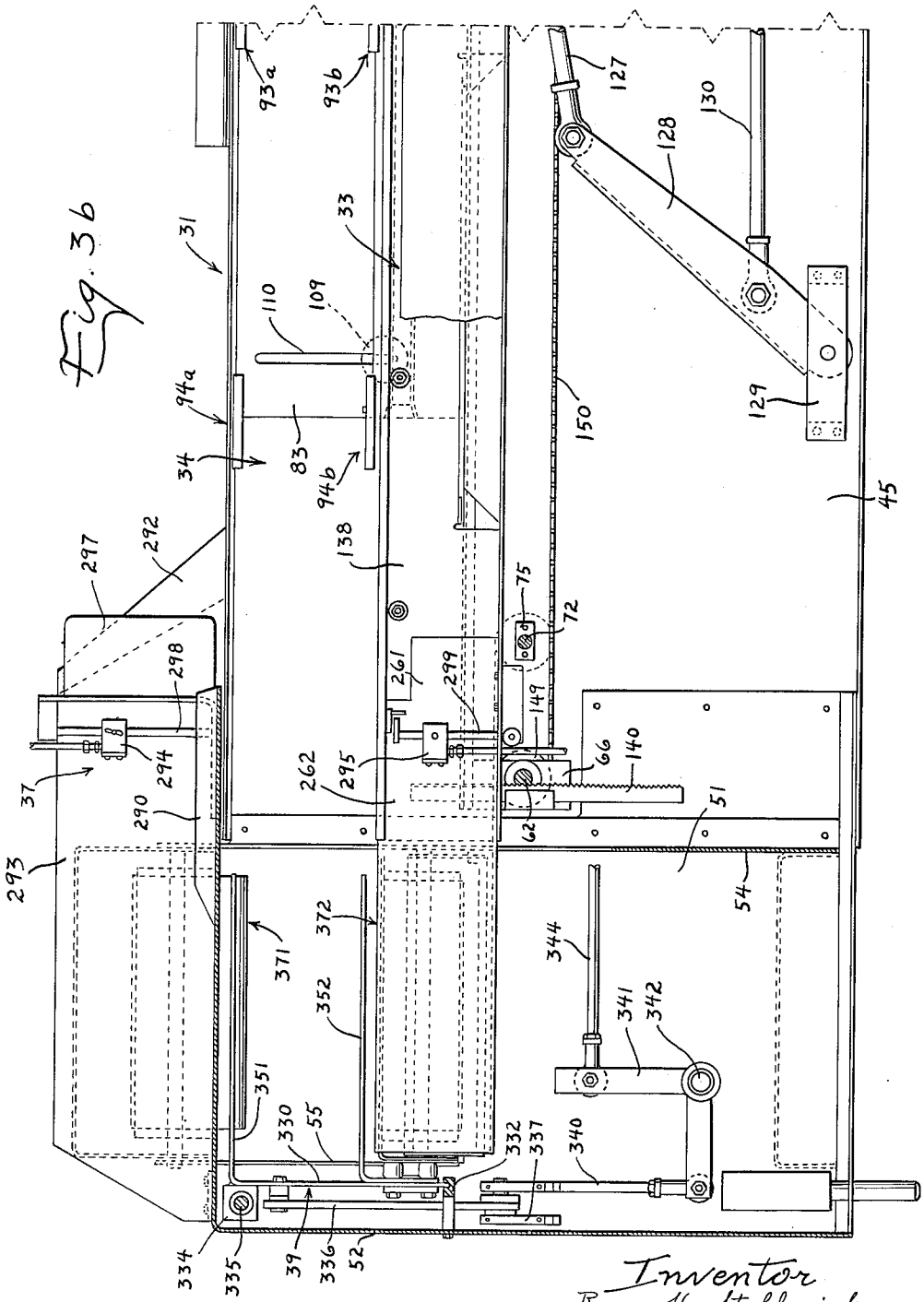
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Fig. 36



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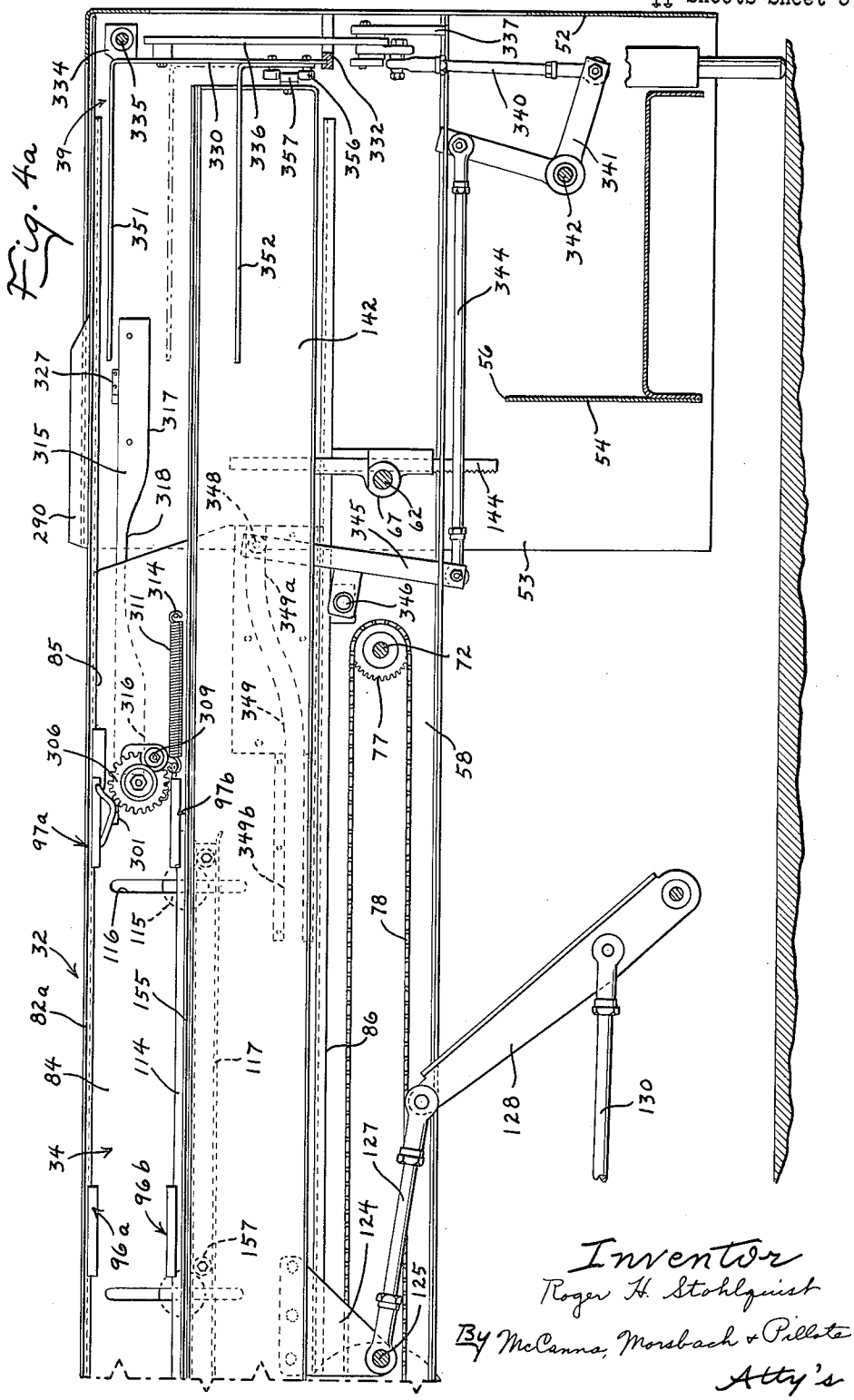
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Fig. 4a



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Fig. 4b

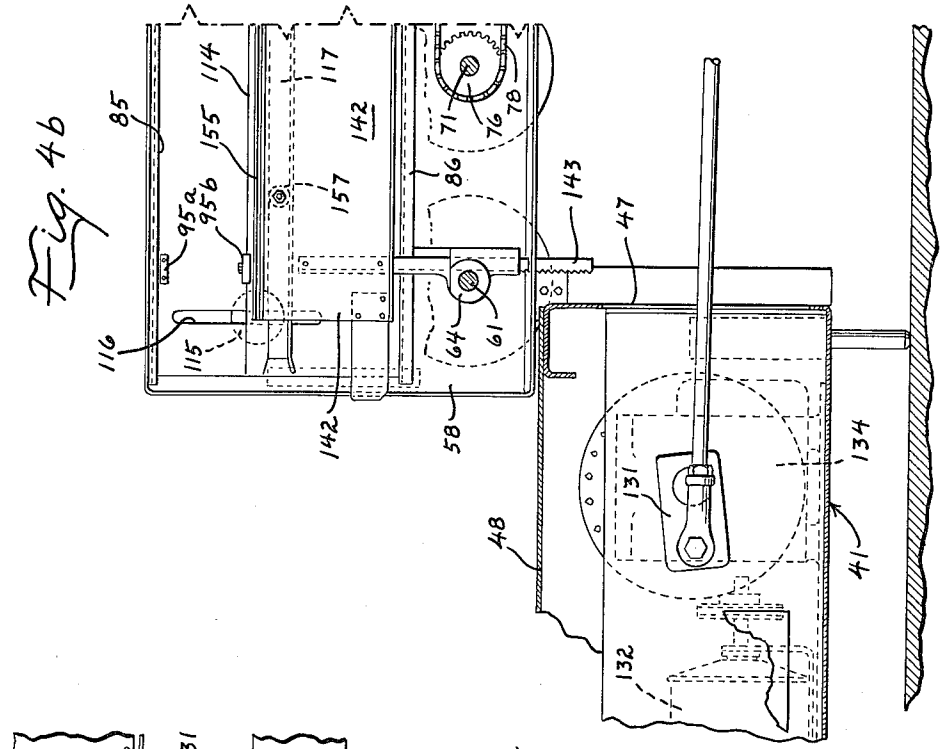
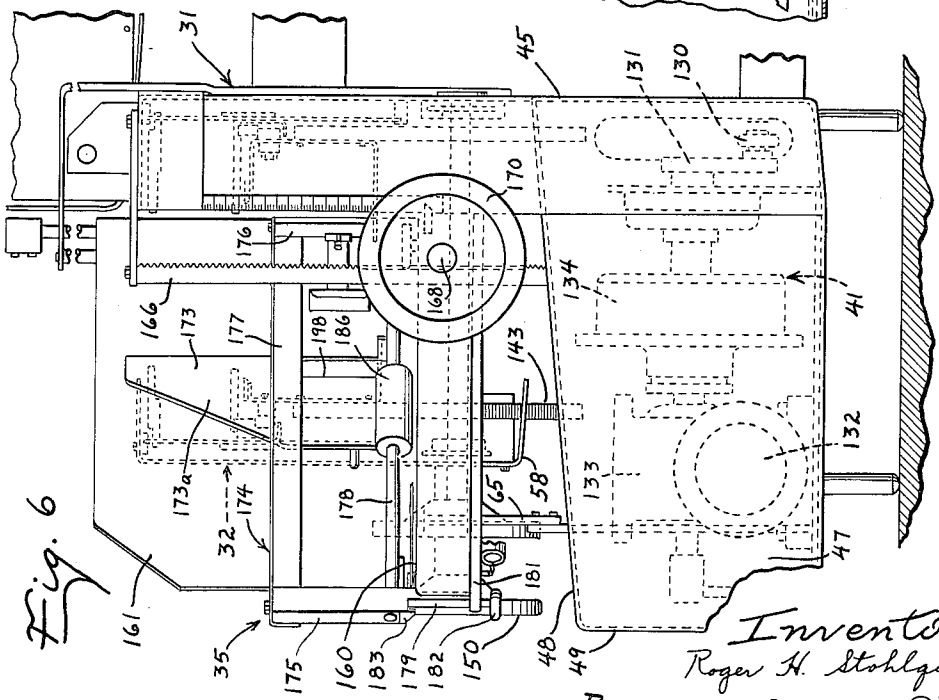


Fig. 6



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CARTON ERECTING AND CLOSING MACHINE

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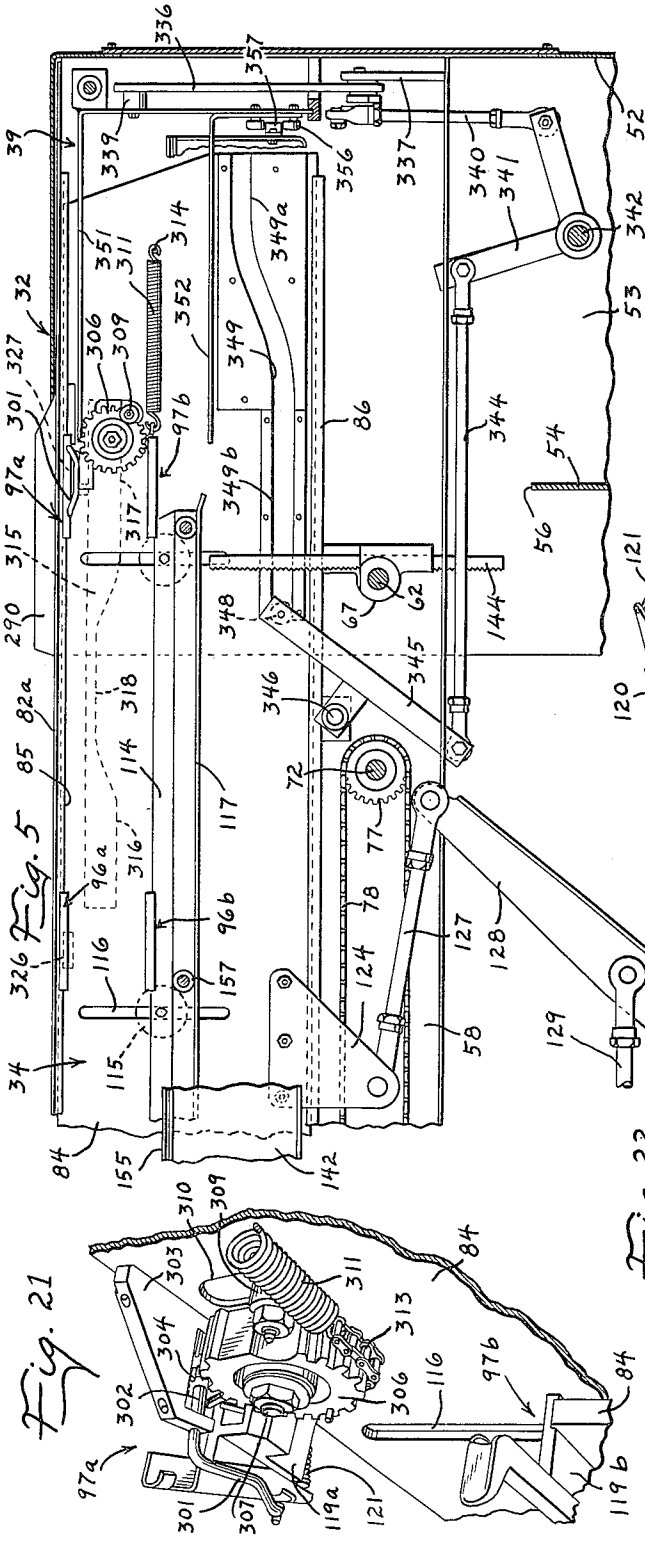


Fig. 5

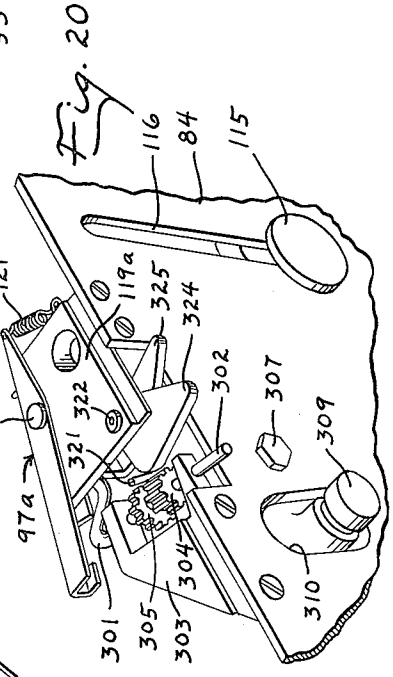


Fig. 20

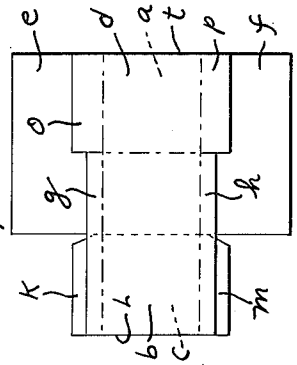


Fig. 22

Fig. 21

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Fig. 7

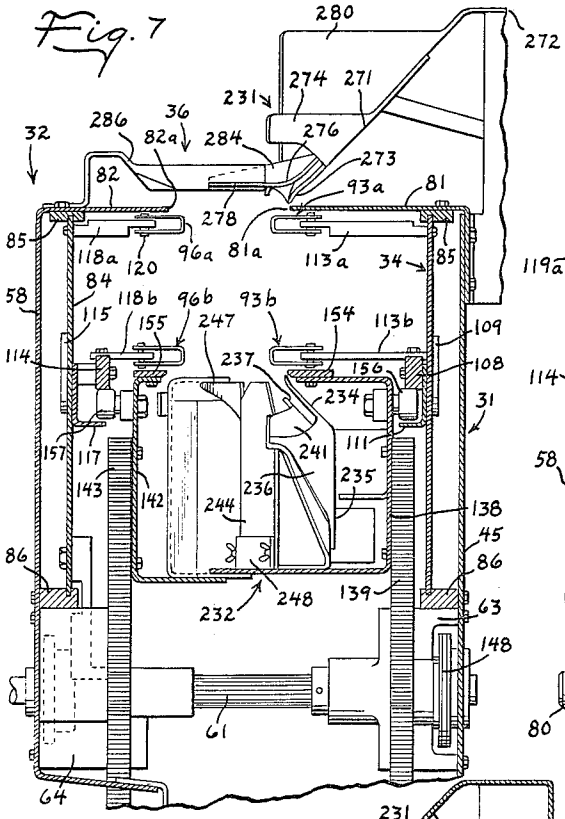


Fig. 9

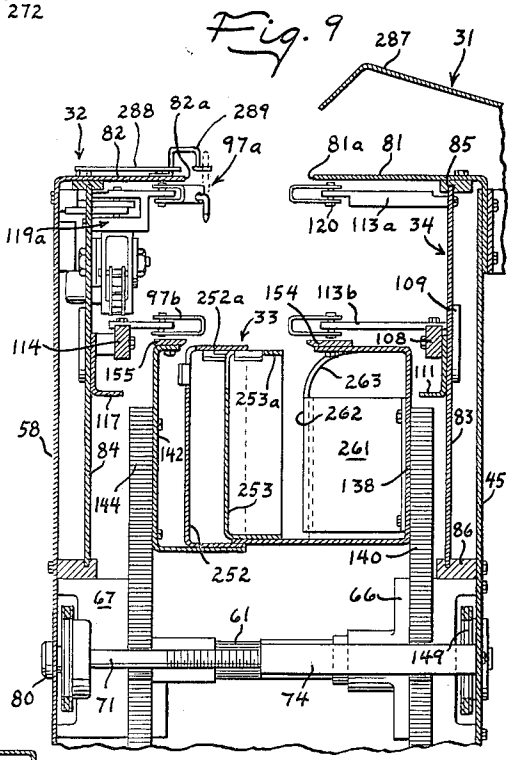


Fig. 8

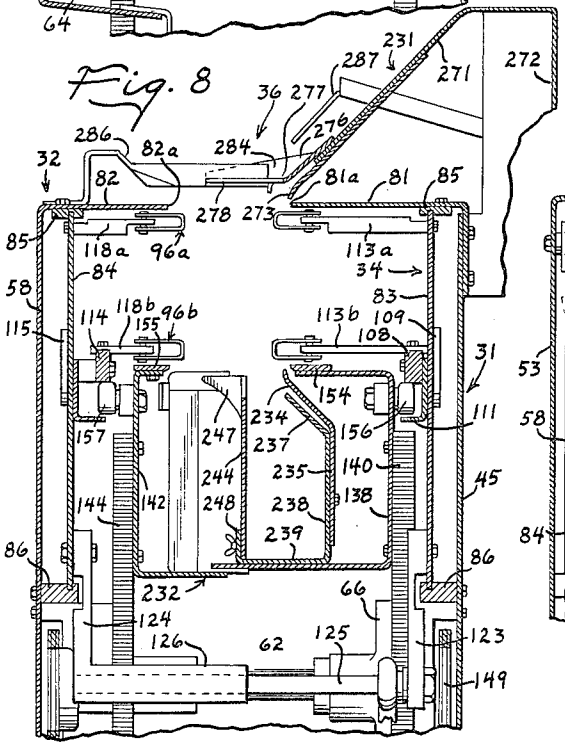
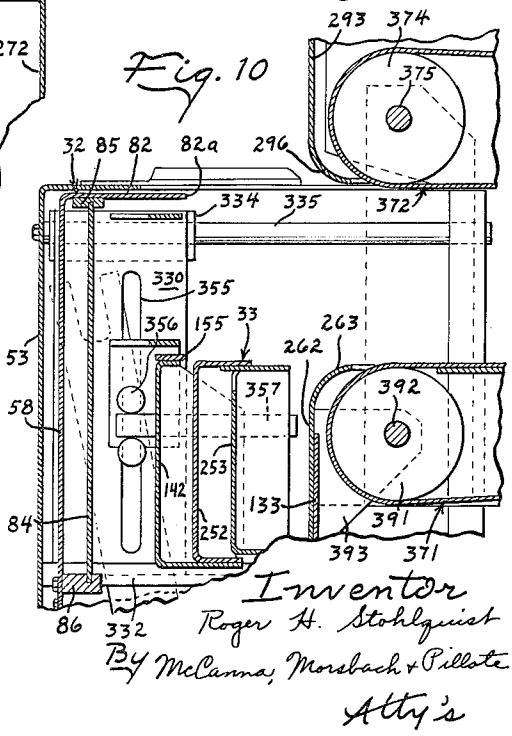


Fig. 10



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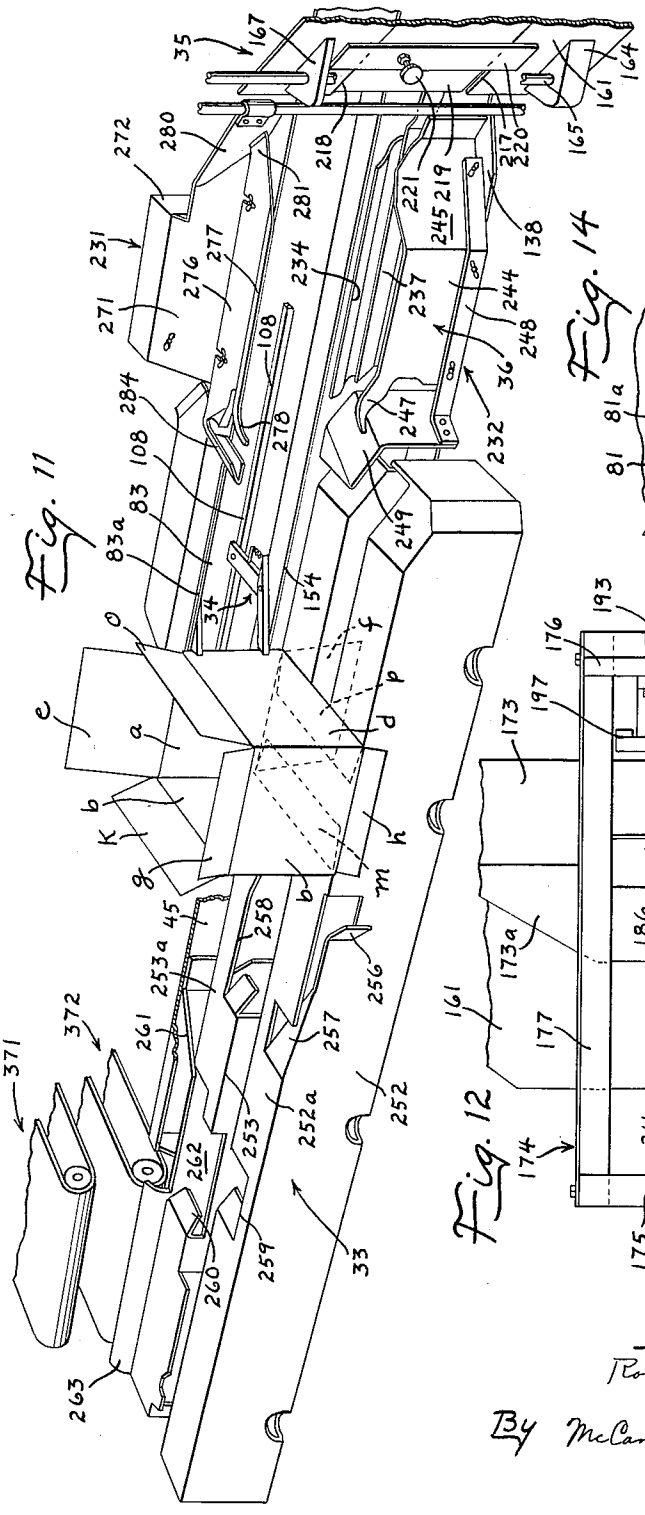


Fig. 11

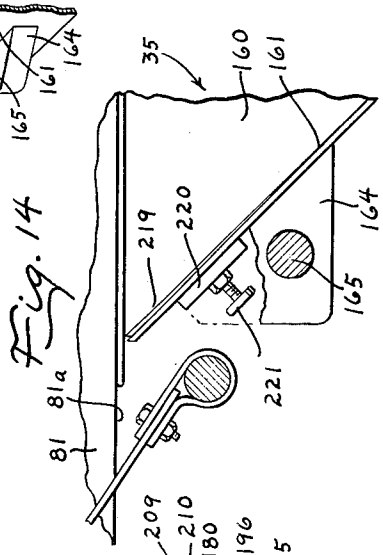


Fig. 14

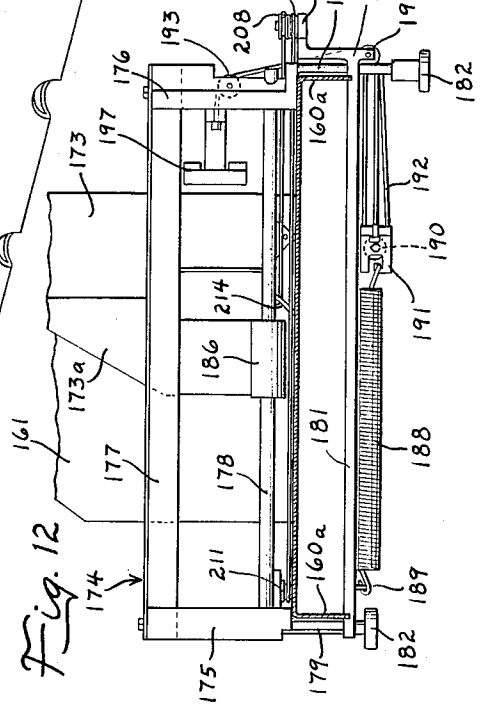


Fig. 12

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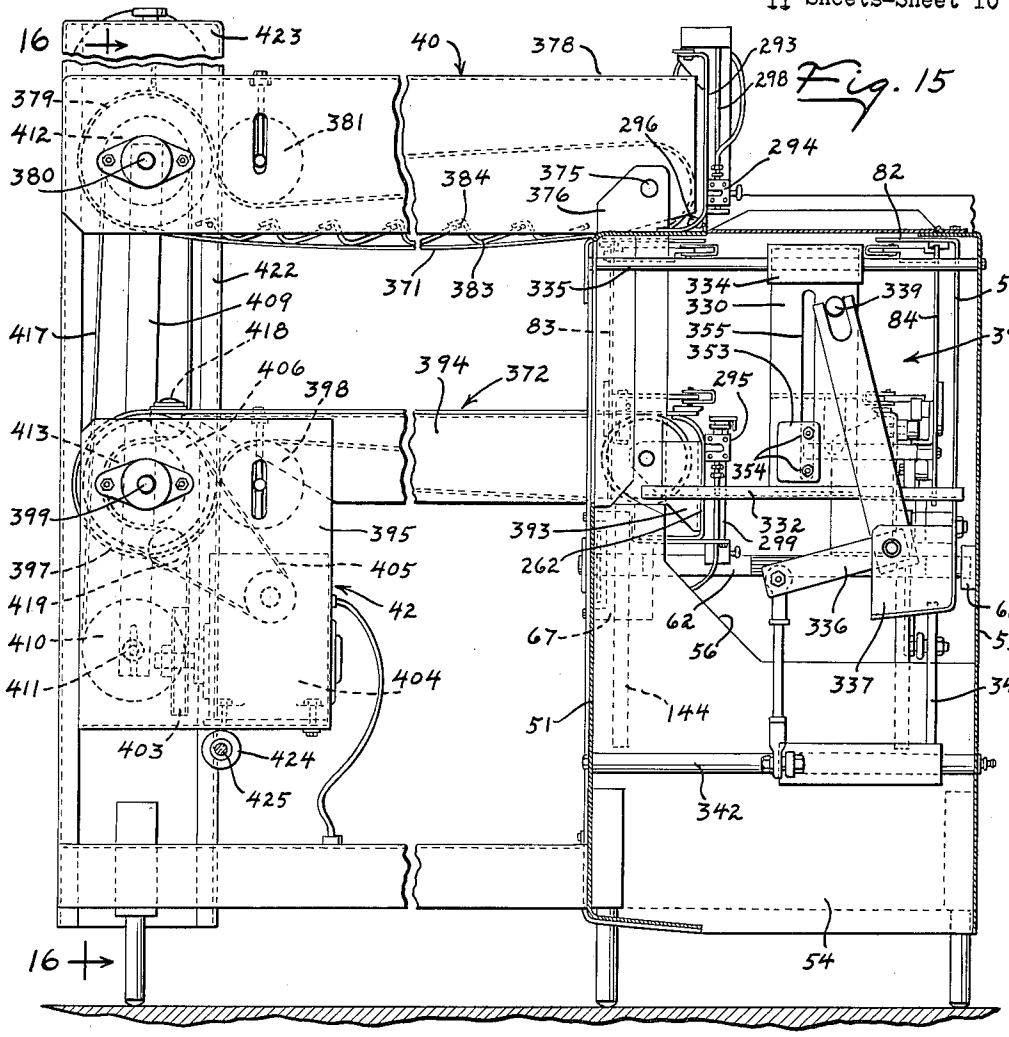


Fig. 15

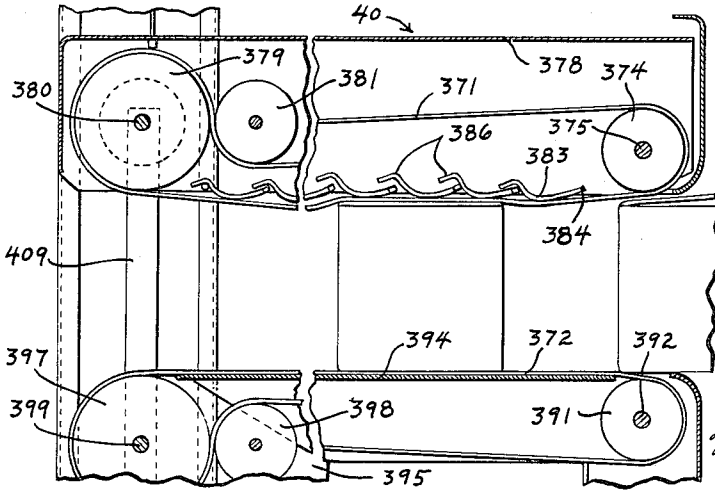


Fig. 17

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Fig. 19

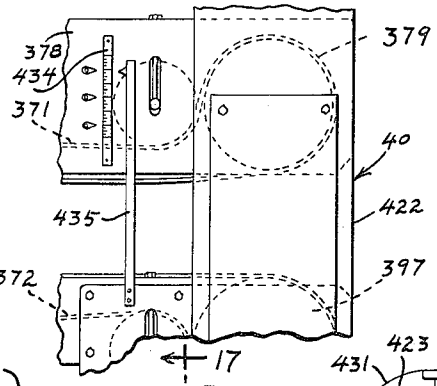


Fig. 16

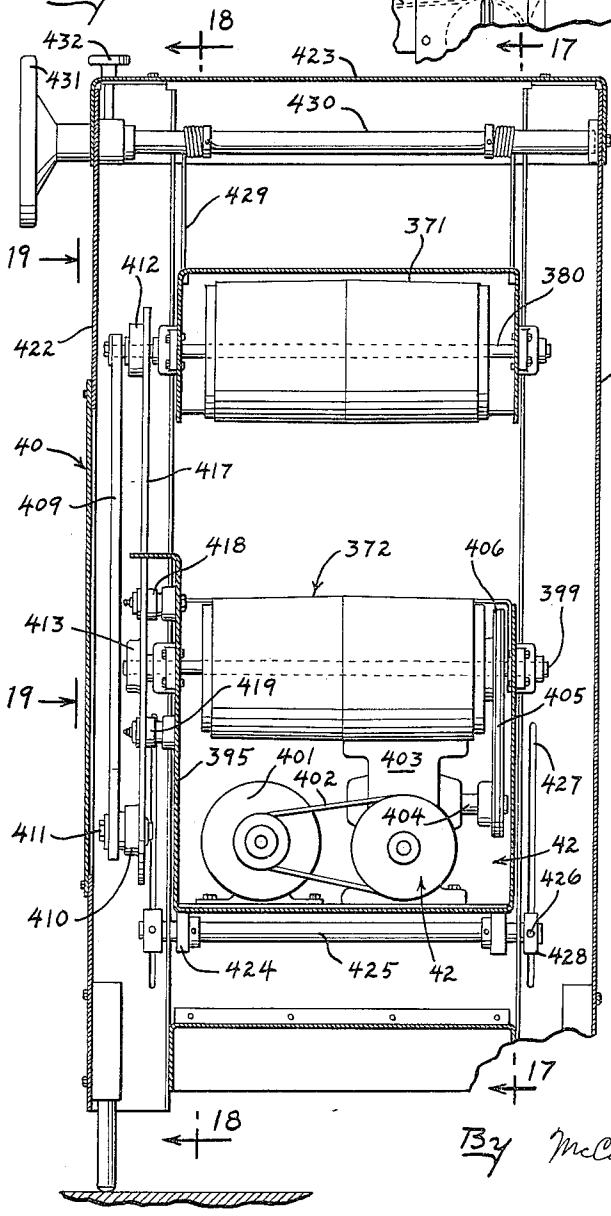
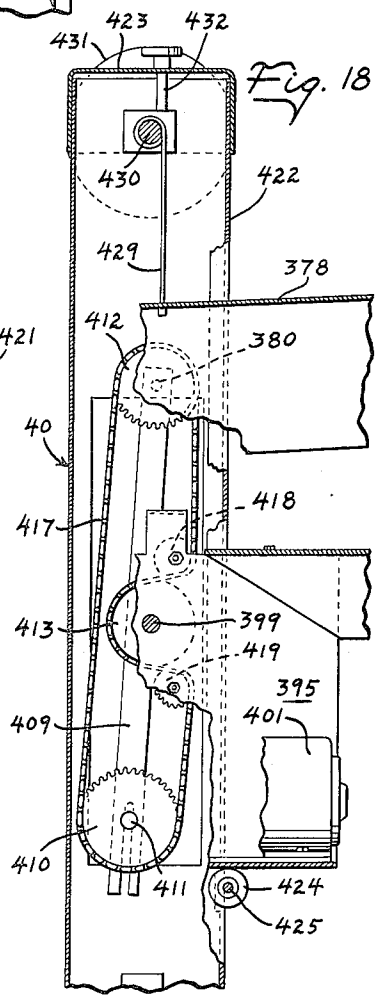


Fig. 18



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United States Patent Office 3,216,175 Patented Nov. 9, 1965

3,216,175 CARTON ERECTING AND CLOSING MACHINE

Roger H. Stohlquist, Rockford, Ill., assignor to Anderson Bros. Mfg. Co., Rockford, Ill., a corporation of Illinois

Filed June 22, 1962, Ser. No. 204,322
26 Claims. (Cl. 53—186)

This invention relates to a packaging machine and particularly to a machine which will automatically strip a flattened carton from a stack; open and erect the flattened carton; advance the carton past a filling station to a discharge station; and fold the flaps on the top and bottom ends of the carton as it is advanced through the machine to close the carton.

An important object of this invention is to provide a packing machine which is adapted to handle cartons of widely different size and particularly cartons of different height as well as cartons of different cross-sectional dimension.

Another object of this invention is to provide a packaging machine for erecting and folding cartons of different height, and in which the carton transfer means for advancing cartons through the packaging machine has upper and lower sets of container engaging fingers which are adjustable in accordance with the different size cartons to maintain the upper and lower carton engaging fingers respectively adjacent the upper and lower edges of the carton.

Yet another object of this invention is to provide a packaging machine which is adjustable while the machine is in operation to facilitate fine adjustment of the machine to the cartons under actual operating conditions and to also accommodate minor variations in the size of different batches of cartons.

Still another object of this invention is to provide a packaging machine for erecting flattened cartons and for folding and gluing the carton flaps which is adjustable to accommodate cartons of different height, and which has a carton compressor for compressing the ends of the carton after the flaps have been glued and closed to effect a seal, and which carton compressor is also adjustable with the packaging machine to handle different size cartons.

A further object of this invention is to provide a packaging machine for erecting and folding flattened cartons having an improved apparatus for supporting the stack of flattened cartons and for advancing the flattened cartons to a carton stripping apparatus and wherein the stack supporting and advancing apparatus is arranged to facilitate loading of the flattened cartons into the machine and to continue feeding of the cartons during the loading operation.

A still further object of this invention is to provide a packaging machine for erecting and folding flattened cartons wherein the apparatus for supporting and feeding flattened cartons to the carton stripping apparatus is readily adjustable to accommodate flattened cartons of different size and having closure flaps of different size and shape.

An additional object of this invention is to provide a packaging machine for erecting and folding flattened cartons and which has an improved apparatus for folding the trailing flap on the carton as the carton is advanced through the packaging machine.

An important feature of the packaging machine resides in the provision of a carton support means which is mounted for vertical adjustment to accommodate cartons of different height and a main transfer means having upper and lower sets of carton engaging fingers for advancing containers along the support means, together

with means engageable with the lower set of carton engaging fingers for vertically adjusting the lower set relative to the upper set while permitting movement of the transfer means in a direction longitudinally of the carton support.

Another feature of the packaging machine resides in the provision of a cross transfer means on the packaging machine for moving cartons off the carton support means and which cross transfer means has upper and lower carton engaging arms and means operatively connected to the lower arm for vertically adjusting the lower arm relative to the upper arm as the carton support means of the machine is vertically adjusted for different size cartons.

Still another feature of the packaging machine resides in the provision of a carton compressor having upper and lower conveyors for compressing the cartons as they are moved off the carton support means to seal the cartons and in which the lower conveyor of the carton compressor is vertically adjustable with the carton support means of the packaging machine to accommodate cartons of different height.

Still another feature of the packaging machine resides in the provision of an improved drive for the compressor conveyors to drive the upper and lower conveyors in unison in all adjusted positions thereof.

A further feature of the packaging machine resides in the provision of a carton transfer means in the form of spaced slides mounted for reciprocation on laterally adjustable frame sections to accommodate cartons of different widths, and a means for reciprocating the slides in unison in all laterally adjusted positions of the frame sections.

Yet another feature of the packaging machines resides in the provision of a folding mechanism for the trailing flap on the carton and which folding mechanism is movable with the main transfer means to fold the trailing flap on the carton while the carton is moving through the machine.

A still further feature resides in the provision of means for automatically shifting the flap folding mechanism out of the path of movement of the cartons during retraction of the transfer means to avoid obstructing movement of the cartons through the machine.

An additional feature of the packaging machine resides in the provision of an apparatus for supporting a stack of flattened cartons adjacent one end of the main transfer means and which has a main feed plate engageable with the stack of cartons for feeding the same to a carton stripping mechanism on the transfer means, and an auxiliary feed plate which is detachable from the main feed plate and engageable with the stack of flattened cartons to continue feeding of the cartons when the main feed plate is retracted for reloading.

Another feature resides in the provision of an apparatus for supporting and feeding a stack of flattened cartons to the carton stripper on the transfer means, and which stack feed apparatus has an improved arrangement for supporting the carton flaps as they are advanced to the stripper mechanism.

These, together with other objects and advantages of this invention will be more readily appreciated as the same becomes better understood by reference to the following detailed description when taken in connection with the accompanying drawings wherein:

FIGURES 1*a* and 1*b* are respectively right and left parts of a top plan view of the packaging machine, with parts broken away to illustrate details of construction;

FIGS. 2*a* and 2*b* are respectively right and left parts of a fragmentary horizontal sectional view through the packaging machine;

FIGS. 3*a* and 3*b* are respectively right and left parts

of a longitudinal sectional view taken on the plane 3—3—3 of FIGS. 1*a* and 1*b*;

FIGS. 4*a* and 4*b* are respectively right and left parts of a longitudinal sectional view taken on the plane 4—4—4 of FIGS. 1*a* and 1*b*;

FIG. 5 is a fragmentary longitudinal sectional view taken on the plane 4—4 of FIG. 1*b*, with parts broken away to illustrate details of construction;

FIG. 6 is an end elevational view of the inlet end of the packaging machine;

FIG. 7 is a fragmentary transverse sectional view taken on the plane 7—7 of FIG. 1*a*;

FIG. 8 is a fragmentary transverse sectional view taken on the plane 8—8 of FIG. 1*a*;

FIG. 9 is a fragmentary transverse sectional view taken on the plane 9—9 of FIG. 1*b*;

FIG. 10 is a fragmentary sectional view taken on the plane 10—10 of FIG. 1*b*;

FIG. 11 is a perspective view of the carton erecting, supporting and folding apparatus;

FIG. 12 is a fragmentary sectional view on the plane 12—12 of FIG. 1*a*;

FIG. 13 is a fragmentary view taken on the plane 13—13 of FIG. 1*a*;

FIG. 14 is a fragmentary sectional view taken on the plane 14—14 of FIG. 3*a*;

FIG. 15 is an end elevational view of the outlet end of the packaging machine with parts of the housing broken away to illustrate details of construction;

FIG. 16 is a sectional view taken on the plane 16—16 of FIG. 15;

FIG. 17 is a fragmentary sectional view through the carton compressor unit taken on the plane 17—17 of FIG. 16;

FIG. 18 is a fragmentary vertical sectional view through the carton compressor unit taken on the plane 18—18 of FIG. 16 and illustrating the drive therefor;

FIG. 19 is a fragmentary view taken on the plane 19—19 of FIG. 16 illustrating the height gauge for the compressor unit.

FIG. 20 is a fragmentary perspective view of the trailing flap folding mechanism as viewed from above;

FIG. 21 is a fragmentary perspective view of the rear flap folding mechanism, as viewed from below; and

FIG. 22 is a view of knocked down carton of the type adapted to be erected, folded and sealed by the packaging machine.

The packaging machine of the present invention is specifically designed for packaging articles such as confection bars, it being understood that the machine is adapted for packaging different articles and may also be adapted for packaging fluent products when suitable cartons are employed. The packaging machine in general includes a main frame section 31 extending lengthwise of the machine; a laterally adjustable frame section 32, herein sometimes referred to as a front frame section, mounted for movement toward and away from the main frame section to accommodate cartons of different cross sections; a carton support 33 mounted on the frame sections for vertical adjustment relative thereto to support cartons of different height; a main transfer apparatus 34 mounted on the frame sections for advancing cartons along the support; a stack support apparatus 35 at the inlet of the packaging machine for supporting a stack of knocked down cartons and for feeding the cartons to the main transfer apparatus; a carton opening and erecting apparatus 36; a sealing apparatus 37; an outlet transfer apparatus 39 adjacent the outlet end of the machine for moving cartons off the carton support; and a carton compressor 40 at the outlet end of the packaging machine for compressing the ends of the carton to hold the flaps firmly closed until they are sealed. A drive apparatus 41 is mounted on the main frame section for driving the packaging machine, and a compressor drive mechanism 42 is provided for driving the conveyors of the compressor unit.

The packaging machine is arranged to erect, fold and close cartons of the type shown in flattened condition in FIG. 22. The machine is adapted to handle cartons of widely different height, width and length. The cartons in general include side walls designated *a* and *b* interconnected along fold lines by lead and trailing end walls *c* and *d*. The side wall *a* has upper and lower side closure flaps *e* and *f* and the side wall *b* has upper and lower flaps *g* and *h*. The lead end wall *c* has upper and lower lead flaps *k* and *m*, and the trailing end wall has upper and lower trailing flaps *o* and *p*. The machine is arranged to handle cartons of widely different size and the size and relative proportion of the various walls can be modified as desired. In addition, the proportions of the flaps on the end walls can also be modified.

The frame

The frame of the packing machine is best shown in FIGS. 1*a*–1*b*, 3*a*–3*b*, and 4*a*–4*b*. The main frame 31 may be of any suitable construction, and, as shown, includes a generally upright main frame panel 45 that extends lengthwise of the machine at one side thereof. A base housing is attached to the main frame panel 45 at one end and extends forwardly therefrom, which base housing includes spaced side walls 47, a top wall 48 and a forward end wall 49 to enclose the packing machine drive mechanism 41. The main frame also includes an end housing at the other end of the main frame panel 45, which end housing has a rear extension panel 51 attached to the main frame panel 45 and forming an extension thereof; and end panel 52 attached to the extension panel 51; a front panel 53 at the forward end of the end panel, and an intermediate panel 54 which extends between the front panel 53 and the main frame panel 45. The rear extension panel 51 has an outlet opening 55 (FIG. 3*b*) adjacent its upper end to permit lateral discharge of the cartons as described hereinafter, and the intermediate panel 54 has the upper and forward portion cut away at 56 as shown in FIG. 15, to provide clearance for the main transfer apparatus 34.

The adjustable frame section 32 is supported for movement toward and away from the main frame section 31 and includes an adjustable frame panel 58 which extends longitudinally of the machine at the front side thereof. One suitable arrangement for adjustably supporting the frame section 32 on the main frame section is shown in the drawings and includes shafts 61 and 62 which extend between the frame sections adjacent relatively opposite ends. As best shown in FIG. 7, the shaft 61 is rotatably suported by a bearing bracket 63 on the main frame panel 45 and rotatably extends through a bearing bracket 64 on the adjustable frame panel 58. The forward end of the shaft 61 is rotatably supported by means of a bracket 65 on the base housing, as best shown in FIG. 13. The other shaft 62 is rotatably supported in a bearing bracket 66 on the main frame panel 51 (FIGS. 3*b* and 8) and extends forwardly through a bearing bracket 67 secured to the adjustable frame panel 58 (FIGS. 4*a*, 5 and 9). The forward end of the shaft 62 is rotatably supported in a bearing 68 on the front panel 53 of the end housing (see FIG. 2*b*). Thus, the shafts 61 and 62 are supported at their rear ends on the main frame panel 45 and are respectively supported at their forward ends by the bracket 65 and the bearing 68 on the base housing and the end housing respectively. The adjustable frame section 32 is slidably supported by bearing brackets 64 and 67 on the shafts 61 and 62 intermediate their ends for movement toward and away from the main frame section. Positive and accurate lateral adjustment of the adjustable frame section 32 is conveniently achieved by a pair of screws 71 and 72 which are non-slidably but rotatably attached to the adjustable frame panel 58 and which engage internally threaded followers 74 and 75 secured to the main frame panel 45. The screws 71 and 72 are advantageously turned in

unison to simultaneously adjust both ends of the adjustable frame **32** and for this purpose have sprockets **76** and **77** thereon which are interconnected by a chain **78** (see FIGS. 4*a* and 4*b*). A crank wheel **79** or the like is attached to one of the shafts such as **71** to enable manual rotation of the same. As is apparent from FIG. 1*a*, the sprocket **76** and crank wheel **79** are conveniently arranged to engage opposite sides of the panel **58** to non-slidably but rotatably connect the screw **71** to the adjustable frame section and, as shown in FIG. 1*b*, the sprocket **77** and cap screw **80** cooperate to non-slidably connect the screw **72** to that panel.

Main transfer apparatus

As best shown in FIGS. 7–10, the frame panels **45** and **58** are conveniently formed with inwardly extending shelves designated **81** and **82** respectively. The shelves overlie and enclose the main transfer apparatus **34** and the edges of the shelves are disposed in relatively parallel opposed relation to define upper carton guides **81***a* and **82***a* for laterally guiding the carton as it is moved through the packaging machine. The main transfer apparatus **34** is advantageously of the reciprocable type which advances the cartons in stepped fashion through the machine. As shown, the transfer apparatus **34** includes slide plates **83** and **84** which are respectively mounted on the frame **31** and the adjustable frame **32**, as by upper and lower grooved guides **85** and **86**. The slide plate **83** has upper and lower carton stripping elements **91***a* and **91***b* adjacent one end, and a plurality of carton engaging fingers at spaced points therealong. As shown herein, three pair of carton engaging fingers are provided and include upper and lower carton engaging fingers **92***a*, **92***b*; **93***a*, **93***b*; and **94***a*, **94***b*. The slide plate **84** includes upper and lower carton pusher elements **95***a* and **95***b* aligned crosswise of the machine with fingers **92***a*, **92***b*, and upper and lower carton engaging fingers **96***a*, **96***b* and **97***a*, **97***b* which are respectively aligned with fingers **93***a*, **93***b* and **94***a*, **94***b*. As best shown in FIG. 2*a*, the fingers **92***a* and **92***b* are each pivotally mounted on blocks **98** attached to the slide plate **83** and are yieldably urged to a position extending outwardly and forwardly into the path of movement of the cartons by means of a spring **99**. The stripper elements **91***a* and **91***b* are mounted on bars **100** conveniently secured to the blocks **98**. As will be noted, the stripper elements **91***a* and **91***b* have stepped faces **101** and **102** which are offset from each other a distance substantially equal to the thickness of a flattened carton to define a shoulder **103**. The face **102** is arranged to engage the end carton in a stack so that the shoulder **103** engages the trailing edge of the carton to move the same off the stack with the face **101** engaging the next succeeding carton. The trailing ends **104** of the stripper elements are inclined away from the face of the carton stack to guide the stripper element over the stack during retraction of the slide. As best shown in FIGS. 1*a* and 2*a*, the stripper elements **91***a* and **91***b* are advantageously resiliently mounted on the bars **100** for limited movement laterally thereof, and for this purpose springs **105** are interposed between the stripper elements and the bars to yieldably urge the stripper elements laterally away from the bars and headed screws **106** are provided to guidably support the stripper elements and to limit outward movement of the stripper elements away from the bars.

The packing machine is intended for use with cartons of different height and, in accordance with the present invention, the upper and lower carton engaging fingers are arranged for vertical adjustment relative to each other to accommodate cartons of different height. As previously described, the carton engaging fingers **92***a* and **92***b* are mounted on upper and lower blocks **98**. The upper block **98** is fixedly secured to the slide plate **83** adjacent its upper edge. The lower block **98** is attached to a rail **108** that extends along the front face of the slide plate **83**. The rail is mounted on the slide plate for vertical adjustment relative thereto, as by pins **109** which are attached to the rail at spaced points therealong and which guidably project through vertically extending slots **110** in the slide plate. The pins have heads or flanges at their outer ends which engage the rear face of the plate **83** to guidably support the rail. For reasons described hereinafter, an L-shaped strip **111** is attached to the rail for movement therewith, to define a trackway with the underside of the rail, as is clearly shown in FIGS. 7–9. The upper pusher fingers **94***a* and **95***a* are similarly mounted at fixed points along the upper edge of the slide plate **83**, as by brackets **113***a* and the lower carton engaging fingers **94***b* and **95***b* are mounted on the rail **108**, as by brackets **113***b*. The other slide plate **84** is similarly provided with a vertically adjustable rail **114** which is mounted by pins **115** in vertically extending slots **116** formed in the side plate **84**. An L-shaped strip **117** is attached to the rail **114** to form a trackway at the underside of the rail. The upper carton pusher element **95***a* is attached to the slide plate **84** adjacent its upper ends and the upper carton engaging fingers **96***a* and **97***a* are similarly mounted at fixed points along the slide plate by brackets **118***a* and **119***a*. The lower carton pushing element **95***b*, and the lower carton engaging fingers **96***b* and **97***b* are mounted on the rail **114** as by brackets **118***b* and **119***b*. The carton engaging fingers may be of any suitable construction which will yieldably project the fingers into the path of movement of the cartons as the slides are extended, to advance the cartons, and which will automatically retract the fingers as the slides are retracted. As shown, the fingers have a U-shaped cross-section and are pivotly mounted as by a pin **120** intermediate their ends. A spring **121** is arranged to urge the nose portion on the lead end of the fingers into the path of movement of the cartons to advance the cartons as the slides are extended. During retraction of the slides, the fingers are cammed outwardly against the bias of the springs **121** by engagement with the next succeeding carton to pass therearound.

The slide plates **83** and **84** are arranged to be extended and retracted in unison with each other. Since the side frames and the slides **83** and **84** carried thereby are laterally adjustable relative to each other to accommodate cartons of different cross-section, the slides are interconnected by brackets **123** and **124** attached to the slide plates **83** and **84** and which brackets have relatively telescoping portions **125** and **126** to accommodate lateral movement of the slides. Any suitable means may be provided for reciprocating the slides and, as shown, the slides are connected through a link **127** to an arm **128** pivotally attached by a bracket **129** (FIG. 3*b*) on the main frame panel **45**. The arm is connected by a link **130** to a crank **131**. The crank is driven by a motor **132** through a speed reducer **133** and may be operated continuously if desired, or through a one-revolution clutch such as **134** controlled either manually or through an automatic cycle control.

The carton support means **33** is mounted on the frame sections **31** and **32** for vertical adjustment relative thereto to accommodate cartons of different height, and is also arranged to accommodate the lateral adjustment of the frame sections relative to each other. The carton support means **33** includes a first channel shaped member **138** which is mounted as by spaced rack bars **139** and **140** on the brackets **63** and **66** carried by the main frame panel **45**. A second channel shaped member **142** is attached as by spaced rack bars **143** and **144** to the brackets **64** and **67** carried by the front side panel **58**. Gear teeth are formed on the shafts **61** and **62** and mesh with the rack bars **139**, **140**, **143** and **144** to raise and lower the channels as the shafts are rotated. The gear teeth have a sliding fit with the forward rack bars **143** and **144** to accommodate adjustment of the frame sections relative to each other, and the shafts are rotated in unison as by sprockets **148** and **149** on the shafts **61** and **62**, and a chain **150** which interconnects the same. A crank wheel **151** is at-

tached to the outer end of the shaft **61** to rotate the same and the shaft **61** preferably extends through a split bearing **65***a* (FIG. 13) on the bracket **65** to enable locking of the shaft against rotation as by a knob **152**. Guide strips **154** and **155** are attached to the upper legs of the channels **138** and **142** and are spaced apart a distance corresponding to the spacing between the guide edges **81***a* and **82***a* on shelves **81** and **82** to provide lateral guides for the lower ends of the cartons. The lower carton engaging fingers and the lower stripper bar carried by the rails **108** and **114** are adjusted in unison with the carton support means **33** to maintain the fingers at a level adjacent the lower ends of the cartons. As best shown in FIGS. 7–9, this is achieved by rollers **156** and **157** carried by the channel members **138** and **142** respectively, and which rollers engage the trackways formed at the underside of the rails **108** and **114** respectively. With this arrangement, the channels **138** and **142** of the carton support means can be selectively elevated and lowered and will simultaneously raise and lower the sets of carton engaging fingers without impeding the reciprocation of the fingers with the slide, and even while the slide is in operation. This enables fine adjustment of the packaging machine to the cartons under actual operating conditions and also enables adjustment to accommodate minor variations in the size of different batches of cartons. As will be noted from FIGS. 7–9, the lower legs of the channels **138** and **142** are vertically offset a short distance so as to overlap when the side frames are adjusted into closely spaced relation. The lower legs are arranged to support the lower carton erecting mechanism and the lower carton supporting and flap folding shoes, to be described hereinafter.

Stack supporting apparatus

The apparatus **35** for supporting the stack of flattened cartons and for feeding the same to the stripper mechanism on the transfer means is located adjacent the inlet end of the machine. This apparatus includes a generally horizontally disposed platform **160** of generally trapezoidal configuration, and which has a vertically disposed plate **161** disposed along one side. The stack of flattened cartons is adapted to be supported on the platform **160** with the leading edges L engaging the plate **161** so that the trailing edges T (FIG. 22) of the cartons are staggered slightly relative to each other to facilitate stripping of the cartons off the stack, one at a time. The stack supporting apparatus is made vertically adjustable to accommodate cartons of different height. One suitable arrangement is illustrated in the drawings and includes blocks **163** and **164** attached to the platform **160** and slidably supported on the upright rods **165** and **166** mounted on the base housing. The plate **161** is also conveniently formed with a guide block **167** (FIG. 3*a*) which is slidably supported on the rod **165** to aid in vertically guiding the plate. Positive adjustment of the elevation of the support platform **160** is achieved by a shaft **168** which is rotatably supported in the blocks **163** and **164** and which has gear teeth thereon which mesh with rack teeth formed on the shafts **165** and **166** to thereby raise and lower the platform as the shaft is rotated. A handwheel **170** is provided on the shaft for raising and lowering the platform and a lock means such as the screw **171** is provided to lock the shaft and the platform in its adjusted position.

The stack of flattened cartons are advanced along the platform **160** to the stripper by means of a feed plate **173** which is guidably supported on a frame **174**. While the frame may be of any suitable construction, it is conveniently formed of spaced end posts **15** and **176** (FIG. 12) having an upper guide bar **177** and a lower guide rod **178** extending therebetween. Bolts **179** and **180** are threadedly connected to extend from the posts **175** and **176** downwardly alongside opposite edges of the platform **160**. The platform **160** has downwardly extending flanges **160***a* and a strap **181** is notched to slidably engage the flanges at the front and rear of the platform. The strap is mounted on the lower ends of the bolts **179** and **180** and is adapted to guide the frame **174** on the platform for adjustment toward and away from the plate **161** and to lock the frame in its adjusted position when the bolts are tightened. Knobs **182** are conveniently provided on the bolts to facilitate tightening and loosening the same. A pointer or index marker **183** (FIG. 3*a*) may be provided on the frame **174** to cooperate with a scale **184** on the platform **160**, to facilitate adjustment of the frame for different size cartons.

The feed plate **173** has a mounting portion **173***a* which is angulated with respect to the face of the feed plate and parallels the frame **174**. This angulated portion **173***a* has a follower **186** which is slidably supported on the guide rod **178**, and the angulated portion is adapted to move parallel to the bar **177** as the feed plate moves along the frame. A roller **199** is mounted on the feed plate **173** and engages the platform **160** to support the feed plate as it moves across the platform. The feed plate **173** is yieldably urged in a direction to advance the carton to the stripper. One suitable arrangement is best illustrated in FIGS. 3*a* and 12 and includes a spring **188** advantageously located at the underside of the platform **160** with one end attached to a pin **189** on the strap **181**. A pulley **190** mounted on a case **191** is attached to the other end of the spring **188** and the pulley is operatively connected through a cable **192** to the plate **173**. As shown, the cable **192** extends over an idler pulley **193** on the end bracket **176** of the frame and through a luff tackle arrangement including the double pulleys **194** and **195** and the single pulley **190**. The pulleys **194** and **195** are mounted by a bracket **196** on the strap **181** and the cable is entrained over these pulleys and is terminally attached to the pulley case **191**. This arrangement allows the long travel of the slide **173** necessary to accommodate a large stack of flattened cartons, while enabling the use of a relatively short spring **188**.

In order to avoid interruption of the feed of the cartons to the machine, when replenishing the stack of cartons in advance of the feed plate **173**, the end of the cable **192** is attached to an auxiliary feed hook **197**. This auxiliary feed hook has an angulated portion **197***a* adapted to engage the stack of cartons to advance the same. The portion **197***a* can also be hooked on the end of the portion **173***a* of the main feed plate **173** as shown in FIG. 2*a* after the stack of cartons have been placed in front of the feed plate, to thereby urge the main feed plate against the stack of cartons to advance the same. When replenishing the stack of cartons, the feed hook can be detached from the portion **173***a* and moved through an opening **198** in the main feed plate into direct engagement with the last carton in the stack to advance the stack toward the strippers **91***a* and **91***b*. The main feed plate can then be retracted away from the stack as shown in FIG. 1*a* to enable introduction of an additional batch of cartons in advance of the plate **173**. The plate **173** is then manually advanced until the new batch of cartons engages the stack and the hook is then moved back to the position shown in FIGS. 2*a* and 3*a* to urge the plate in a direction to advance the stack of cartons.

On certain cartons, particularly those having long end flaps, difficulties have been encountered due to the tendency of the lower end flaps to drag against the support platform as the stack is moved therealong. This shifts the lower end flaps out of the plane of the body of the carton and impairs proper feeding and stripping of the cartons off the end of the stack. In order to overcome these problems, a cable type support is advantageously provided on the platform **160** to engage the lower end flaps. This support is arranged so that the cable moves with the main feed plate **173** to advance the lower end flaps with the body of the carton. In addition, the cable support is arranged so as to be adjustable with the frame **177** to accommodate cartons of different size. The cable support

is best shown in FIGS. 1*a*, 2*a* and 12 and includes single pulley wheels **203** and **204** mounted at the forward corners of the stack support platform **160**, and pulleys **205** and **206** mounted by brackets **207** on the rear corners of the platform. Double pulleys **208** and **209** are mounted by a bracket **210** on the rear end of the strap **181** and a pulley **211** is mounted by a bracket **212** on the forward end of the frame **174**. A cable attaching bracket **214** is provided on the plate **173**. The cable **215** is terminally attached to the bracket and extends over the several pulleys. As shown in FIG. 2*a*, the cable extends from bracket **214** forwardly over pulley **208**, then to the right over pulley **205**, then rearwardly to pulley **203**, then to the left over pulley **204**, then forwardly over pulley **206**, then to the right to pulley **209** and rearwardly to pulley **211** and then forwardly to the bracket **214**. With this arrangement, the portion of the cable between bracket **214** and pulley **208** and the portion of the cable between pulleys **204** and **206** will both move in the same direction as the feed plate **173** and in unison therewith to aid in advancing the cartons. In addition, this arrangement is such that the total length of the cable will remain the same while the frame **173** is adjusted laterally relative to the plate **161** so that the cable will remain taut in all positions of the frame. Alternatively, if only one cable support is required, the cable can be entrained from the bracket **214** over rear pulley **208** then directly over front pulley **211** and back to the bracket **214**.

As previously described, the shoulder **103** on the stripper elements **91***a* and **91***b* engage the trailing edge of the flattened carton to move the end carton off the stack. In order to prevent feeding of more than one carton at a time, due to frictional contact between adjacent cartons, it is necessary to restrict the clearance at the leading edge of the stack so as to allow only a single carton to pass therethrough. This is conveniently achieved by adjusting at least a portion of the rear edge of the plate **161** relative to the carton guides **81***a* and **154** to provide a space therebetween sufficient to allow only single cartons to pass. As shown in FIGS. 11 and 14, the plate **161** is slit at **217** and **218** to provide an intermediate portion **219** that can be deflected out of the plane of the plate. A strap **220** is attached to the plate and an adjusting bolt **221** is threaded in the strap and engages the portion **219** to adjustably deflect the same and thereby adjust the spacing between the rear edge of the plate and the carton guides.

Carton erecting and folding apparatus

As the cartons are advanced along the machine, they are sequentially moved past the carton erecting apparatus **13**, then past a filling station *a* and past the sealing apparatus **37** to the carton compressor unit **39**. While different forms of carton erecting apparatus may be employed, the erecting apparatus **36** is advantageously of the type disclosed and claimed in my copending application filed August 1, 1962, Serial No. 214,082, entitled "Method and Apparatus for Erecting Flattened Cartons" now Patent No. 3,108,515. Reference is hereby made to the aforementioned application for a more complete description of the folding and erecting apparatus. In general, the apparatus includes upper and lower shoe assemblies **231** and **232** respectively which are so arranged as to open the carton and fold in the lead and trail flap on the lower end of the carton, as well as fold out the lead and trail flap on the upper end of the carton to facilitate loading of the carton at the filling or loading station. The lower shoe assembly **232** includes a guide plate **234** having a substantially straight upper edge disposed at the level of the lower edge of the rear side wall *a* of the carton and in close parallel relation to the side guide strip **154** on the main frame section **31**. The shoe **234** is inclined in a direction crosswise of the packaging machine and extends downwardly and rearwardly from its upper edge as is clearly shown in FIGS. 7 and 8, and has a generally upright attaching portion **235**. The nose portion **236** is shaped and angulated so as to engage the lower rear closure flap *f* on the carton and deflect the same to the rear side of the guide shoe **234**. A second guide shoe **237** is disposed below the guide shoe **234** and is also inclined downwardly and outwardly as shown in FIGS. 7 and 8. The shoe **237** also has an upright attaching portion **238** conveniently formed integrally with a horizontally disposed plate **239** which is supported on the lower leg of the channel **138**. The nose portion **241** on the shoe **237** extends into engagement with the lower lead flap *m* on the end carton in the stack of cartons carried by the platform **160**, and is so shaped as to guide the lead flap on the carton to the front side of the shoe **237** while guiding the trailing flap to the rear side of that shoe so that the trailing flap underlies the shoe **234** and overlies the shoe **237**. Since the lower lead and trail flaps *m* and *p* are disposed at the front side of the guide shoe **234** while the rear flap *f* is disposed at the rear side of the guide shoe, it will be seen that the rear side wall *a* of the carton is laterally guided and vertically supported on the upper edge of the shoe **234** for movement along a path paralleling the side guide **154**.

A forward erecting shoe **244** is disposed at the front side of the shoe **237**. The erecting shoe **244** has a portion **245** which diverges in the direction of movement of the cartons relative to the shoe **234**. The upper edge of this portion is shaped and arranged to guide the lower front flap *h* of the carton to the front side of the erecting shoe, so that the shoe **244** shifts the front wall *b* of the carton laterally away from the rear wall *a* to open the same. The upper edge of the erecting shoe **244** is generally disposed at the level of the lower edge of the front wall *b* of the carton so that the erecting shoe also vertically supports the front wall of the carton as it is advanced therealong. The erecting shoe **244** has a curved portion **247** at its trailing end which diverges away from the shoe **234** and produces a rapid final opening movement of the carton. The erecting shoe **244** is conveniently mounted on a flange **248** formed integrally with the mounting plate **239**, as is clearly shown in FIG. 11. Thus, as the carton is moved along the lower shoe assembly **232**, the lower rear flap *f* on the carton overlies the rear side of the shoe **234** and is guided thereby while the lower front flap *h* overlies the front side of the shoe **244** and is guided thereby. The shoes **234** and **244** diverge relative to each other so as to open the carton. The trailing flap *p* on the carton is guided between shoes **234** and **237** and is deflected at an angle to the trailing wall *d* of the carton. As the carton is opened, the trailing flap *p* is maintained at an angle to the trailing wall *d* of the carton so as to extend inwardly of the carton, as shown in FIG. 11. A cross shoe **249** extends crosswise at an angle between the shoes **234** and the shoe **247** adjacent the end thereof and engages the lower lead flap *m* on the carton to fold the same inwardly as the carton is moved therepast. Thus, as the carton leaves the erecting apparatus **36**, the carton is opened and erected and the lower lead and trail flaps *m* and *p* on the carton are folded inwardly, while the opposite side flaps *h* and *f* extend downward (as shown in FIG. 11).

In order to simplify the folding and sealing operations, the lower side flaps on the carton are not folded and sealed until after the container has moved past the loading station. The carton supports **33** underlie and support the carton and also form a temporary closure for the partially closed bottom of the carton, as the carton is moved past the loading station. Since the carton supports effectively close the bottom during loading, it will be seen that relatively short lower lead and trail flaps *m* and *p* can be used without danger of the articles dropping through the bottom as the carton is moved through the machine. The carton supports include first and second generally U-shaped channel members **252** and **253** which are respectively supported on the channel shaped

supports 142 and 138. The upper panels 252*a* and 253*a* of the supports are slightly vertically offset as shown in FIG. 9 to permit overlapping of the upper panels when the side frames are adjusted into closely spaced relation. As will be noted, from FIG. 11, the upper panels 252*a* and 253*a* form a closure for the partially closed bottom of the carton while the carton is at the loading station and the support 252 has laterally and downwardly inclined guide portions 256 and 257 respectively which engage and guide the lower front flap *h* of the carton inwardly and upwardly as the carton is moved therepast. The other channel 253 has a cut-out 258 to accommodate the downwardly inclined guide 257, when the side frames are adjusted into closely spaced relation. The supports 252 and 253 are also preferably cut-out as indicated at 259 and 260 to provide clearance for the adhesive applicators described hereinafter. A rear flap guide 261 is attached to the channel support 138 to guide the rear flap inwardly over the face of a panel 262. The upper edge 263 of the panel is curved adjacent the outlet end of the machine to form a smooth guide for guiding the lower rear carton flap *f* into its folded position, as the carton is moved laterally off the supports 33.

The upper carton erecting shoe 231 is arranged to assist in opening the upper end of the carton and to fold the side and end flaps on the upper end of the carton outwardly to facilitate loading of the carton. The upper shoe 231 includes an upwardly and rearwardly extending panel 271 which is mounted by a bracket 272 on the main frame panel 45 of the machine. A rear guide shoe 273 is attached to the underside of the panel 271 and has its lower edge paralleling the upper carton guide 81*a* on the shelf 81. A nose 274 is formed on the rear guide shoe 273 to guide the upper side flap *e* laterally to the rear or underside of the panel 271. An opening shoe 276 is attached to the front side of the panel and has the lower portion spaced from the shoe 273 as shown in FIG. 8 to form an upwardly and rearwardly diverging flap guide channel therebetween. The shoe 276 has a generally horizontally disposed portion 277 along its lower edge and this horizontally disposed portion has its edge arranged to diverge, as viewed in plan (see FIG. 1*a*), relative to the lower edge of the shoe 273, to open the upper end of the carton. A curved portion 278 is provided at the end of the shoe 276 and corresponds to the curved portion 247 on the lower shoe to open the upper end of the carton. Nose portions 280 and 281 are formed on the panel 271 and on the opening shoe 276 to guide the lead and trail flaps *k* and *o* on the upper end of the carton to the channel between the shoes 276 and 273. Since the lead flap on the upper end of the carton is deflected laterally toward the rear side of the machine, the lead flap will extend forwardly when the carton is opened. The trailing flap on the upper end of the carton will also initially project forwardly as the carton is erected. However, a cross flap folding guide 284 is provided at the end of the shoe 276 and is positioned and shaped to engage the upper trailing flap *o* to fold the trailing flap outwardly as it moves past the guide 284, to thereby open the top of the carton to facilitate loading at the filling station. The side flaps *g* and *e* on the upper end of the carton are guided below retainer shoes 286 and 287 located at the filling station above the shelves 81 and 82 to thereby hold the side flaps outwardly during filling of the carton. The flap retainer shoe 286 is preferably extended as indicated at 288 along the shelf 82 to a point adjacent the outlet end of the machine, to hold the upper side flap *g* in an outwardly extending position in which it does not interfere with the closing of the lead and trail flaps *k* and *o*.

As the cartons are advanced from the filling station to the compressor unit 39, the upper lead flap *k* is folded inwardly by a shoe 289 and the side flap *g* is folded by a plate 290, the edge 290*a* of which is inclined in a direction crosswise of the conveyors toward the outlet. The other upper side flap *e* is guided upwardly by a guide plate 292 to the front side of a generally upright plate 293 and to the rear of a guide shoe 297. As shown in FIG. 10, the lower edge of the plate 293 is curved inwardly at 296 above the outlet opening to guidably fold the upper rear flap *e* downwardly as the carton is moved crosswise of the conveyor to the outlet opening.

The flaps on the cartons are advantageously sealed by an adhesive, it being understood that the cartons could alternately be of the type having self locking flaps or flaps precoated with a pressure or heat sensitive adhesive. In the embodiment illustrated, upper and lower adhesive applying heads 294 and 295 are provided adjacent plates 293 and 262 respectively. The heads are conveniently mounted for vertical adjustment on rods 298 and 299, to enable adjustment of the heads for different size carton flaps. As will be seen from FIGS. 1*b*, 3*b* and 15, the heads are positioned at the front sides of the plates 293 and 262 and are spaced slightly therefrom to allow the carton flaps *e* and *f* to pass between the heads and the respective plates so that the adhesive is applied to the inner faces of the carton flaps. The heads operate as the cartons move past to apply adhesive in a strip or band to the inner faces of the flaps *e* and *f*. For cartons of the type shown in FIG. 22, the heads are preferably adjusted on the rods 298 and 299 so as to position the strip or band of adhesive adjacent the upper and lower edges of the flaps *e* and *f* respectively. Any suitable apparatus (not shown) may be provided for feeding adhesive to the heads.

An apparatus best shown in FIGS. 20 and 21, is provided for folding the upper trailing flap forwardly as the carton is advanced along the machine. This apparatus is mounted on the slide plate 84 for movement therewith and includes a flap engaging finger 301 having a shaft portion 302 mounted in a bracket 303 on the slide 84, for turning movement about an axis transverse to the slide. As shown, the finger is mounted adjacent the nose portion on the upper carton engaging finger 97*a* so as to engage and fold the trailing flap on the carton being advanced by the finger 97*a*.

The finger is normally retracted as shown in FIGS. 20 and 21 and is swung upwardly and forwardly to fold the upper trailing flap *o* as the slide 83 is extended. For this purpose, a pinion 304 is fixed to the shaft 302 and, for reasons set forth hereinafter, has a groove 305 formed in the periphery thereof. A gear 306 is mounted by a pin 307 on the slide 84 and meshes with the pinion 304. A cam follower 309 is attached to the gear 306 at a point eccentrically thereof and extends through an opening 310 in the slide 84. A spring 311 has one end connected to the gear, through a flexible connector such as a chain 313, and the other end attached to the slide as by a pin 314 (FIG. 4*a*), to yieldably urge the flap folding finger 301 forwardly in a direction to fold the trailing flap on the carton. The cam follower 309 projects into engagement with a cam track 315 attached to the side panel 58, and which cam controls rotation of the gear 306 and flap folding finger 301. As best shown in FIGS. 4*a* and 5, the cam track has dwell portions 316 and 317 adjacent opposite ends and a well 318 intermediate the ends thereof. When the slide is retracted, as shown in FIG. 4*a*, the follower 309 engages the dwell portion 316 to swing the finger to its normal position shown in FIG. 4*a*. As the slide moves forwardly, the follower 309 rides into the well 318 to allow the finger to swing forwardly and, before the slide reaches the end of its stroke as shown in FIG. 5, the follower engages the rise between well 318 and the dwell 317 to again swing the flap folding finger rearwardly and out of engagement with the carton flap.

In order to clear the succeeding carton, during retraction of the slide 84, the flap folding finger 301 is advantageously arranged as to automatically shift lateral-

ly out of the path of movement of the cartons before the slide is retracted. This is conveniently achieved by means of a lever **321** which is pivotally mounted at **322** on the bracket **119***a*. The lever engages the groove **305** in the pinion **304**, and has vertically offset fingers **324** and **325** attached thereto. The fingers **324** and **325** are arranged to engage dogs **326** and **327** mounted on the side panel **58** alongside the track **315**. The dog **326** is positioned in the path of movement of the finger **324** and, when the slide **383** is retracted the finger **324** engages the dog **326** to move the lever **321** and hence the flap folding finger **301** outwardly away from the slide **83**. The dog **327** is positioned at a level below the dog **326** and in the path of movement of the finger **325** and, as the slide reaches its extended position, the finger **325** engages the dog **327** and shifts the flap folding finger **301** inwardly toward the slide. Thus, the flap folding finger is moved outwardly into the path of movement of the cartons when the slide is retracted, and the finger pivots forwardly as the slide is extended to fold the trailing flap on the top of the carton. As the slide approaches its forward position, the finger **301** is swung rearwardly away from the carton and is simultaneously moved laterally toward the slide **84** and out of the path of movement of the carton so as to clear the succeeding carton during retraction of the slide.

Outlet transfer apparatus

When the cartons reach the end of the carton supports **33**, the lead and trail flap as well as one of the side flaps on both the top and bottom of the cartons have been folded inwardly. The outlet transfer apparatus **39** is provided for moving the cartons crosswise of the support means **33** and past the curved plates **296** and **263** to fold the other side flaps downwardly. This transfer apparatus is best shown in FIG. 15 and while it may be of any suitable construction, it is conveniently formed by a cross slide **330** which is slidably supported at its lower end in a grooved bar **332** and at its upper end by a bracket **334** which engages a rod **335**. A cross slide operator is provided for reciprocating the slide **330** and include a bell crank **336** pivotally mounted by a bracket **337** on the side panel **58** of the adjustable frame section **32**. The crank has a bifurcated end which engages a pin **339** on the cross slide. With this arrangement, it will be noted that lateral adjustment of the side frame **32**, for different size cartons, will simultaneously adjust the position of the bell crank **336** and hence the position of the cross slide **330**. The cross slide is reciprocated in timed relation with the main transfer mechanism and, as best shown in FIGS. 4*a* and 5 is connected through a link **340** to a bell crank **341** pivotally mounted on a shaft **342** for movement about an axis transverse to the side panel **53** of the end housing. The shaft is supported on the front and rear walls **53** and **51** of the end housing and the crank **341** is slidable on the shaft to shift therealong as the frame section **32** is laterally adjusted. The other leg of the crank **341** is connected through a link **344** to a lever **345**. The lever **345** is pivotally mounted at **346** to the adjustable frame panel **58** and has a follower **348** at the end remote from the link **344**. The follower engages a cam track **349** attached to the slide **84**, and which cam track is shaped to oscillate the lever **345** and move the cross slide **330** in timed relation with the main transfer mechanism. The slide plate **84** is shown in its retracted position in FIG. 4*a* and the follower **348** is disposed in the portion **349***a* of the track **349**. As the slide is extended to the position shown in FIG. 5, the follower moves into the portion **349***b* and swings the lever **345** in a clockwise direction as viewed in FIG. 4*a* to the position shown in FIG. 5. The lever operates through link **344**, crank **341**, link **340** and crank **336** to retract the cross slide **330** as the slide plate **84** is extended. Conversely, as the slide plate is retracted, the cross slide **330** is extended to move the carton off the support **33** and into the compressor unit **339**.

The cross slide **330** has an upper carton engaging arm **351** which is fixed to the cross slide, and a lower carton engaging arm **352**. The lower carton engaging arm is advantageously arranged for vertical adjustment relative to the upper arm, to accommodate containers of different height, and, as shown in FIG. 15, is vertically adjustably mounted on the cross slide **330** by a block **353** and spaced followers **354** which extend through a slot **355**. The followers have rollers **356** on the inner ends thereof arranged to engage a rail **357** attached to the vertically adjustable channel **142** on the frame section **32** so as to raise and lower the arm **352** as the carton support is elevated and lowered. In this manner, the lower carton engaging arm **352** is maintained adjacent the level of the carton supports **33** as the latter are raised and lowered to accommodate cartons of different height.

Carton compressor unit

As previously noted, adhesive is applied to the top and bottom side flaps and the side flaps are folded downwardly as the carton is moved by the outlet transfer apparatus **39**. The compressor unit **40** is arranged to hold the top and bottom flaps on the carton closed for a time interval sufficient to allow the adhesive to set and seal the cartons. The carton compressor unit is made vertically adjustable to accommodate cartons of different height and, in accordance with the present invention, is arranged as to be adjustable with the packaging machine. The compressor unit **40** advantageously includes upper and lower endless type conveyors **371** and **372** which are driven in unison with each other to positively advance the cartons while compacting the ends of the cartons. The upper endless conveyor includes a roller **374** mounted by a shaft **375** on the bracket **376** attached to the end housing. An elongated beam, herein shown in the form of an inverted U-shaped member **378** is pivotally mounted at one end of the shaft **375** and has a drive roller **379** rotatably supported on a shaft **380** adjacent its other end. The endless belt **371** is entrained over the rollers **374** and **379** and an adjustable belt tensioning roller **381** is conveniently mounted on the beam **378** to enable adjustment of the belt tension. A plurality of weight elements **383** are provided to apply pressure to the lower run of the belt **371**. As shown, in FIGS. 15 and 17, the weight elements are pivotally mounted at spaced points along the beam **378**, as by pins **384** and the weight elements span the space between the adjacent pins and have a hook portion **386** overlying the adjacent weight element to limit downward movement of the weight elements. As the cartons are advanced by the conveyor **371**, the weight elements apply a yieldable pressure to the flexible belt and hence to the top of the cartons to yieldably close the same.

The lower conveyor **372** includes a drum **391** which is mounted on a shaft **392**. The shaft **392** is supported by brackets **393** carried by the vertically adjustable channel **138** on the main frame section **31**. The inlet end of the lower conveyor **372** is thus vertically adjustable with the carton supports **33** on the main conveyor so as to automatically accommodate cartons of different height. A generally U-shaped beam **394** is pivotally mounted on the shaft **392** and has a housing **395** at its other end which supports the conveyor drive roll **397** and the drive mechanism **42** for the compressor unit. The drive roll **397** is supported by a shaft **399** on the housing **395** and an idler roll **398** is also preferably provided to enable adjustment of the tension of the belt **372**.

The compressor unit is driven from a motor **401** which motor is connected through a belt **402** to a speed reducer **403** having an output shaft **404**. The output shaft is connected by a chain **405** to a sprocket **406** attached to the shaft **399** for the drum **397**. The upper conveyor is driven

in timed relation with the lower conveyor through an adjustable drive so arranged as to accommodate changes in spacing between the upper and lower conveyors, as required for cartons of different height. This drive includes a bar **409** which is swingably mounted at one end on the shaft **380** and which has an idler wheel or sprocket **410** rotatably mounted on a shaft **411** at its other end. A sprocket **412** is attached to the shaft **380** and a power take-off sprocket **413** is attached to the shaft **399** to be driven from the aforedescribed compressor unit drive. A chain **417** extends over the sprockets **410** and **412** and has one run looped over the power take off sprocket **413** and under idler sprockets **418** and **419** carried by the drive housing **395**. With this arrangement, the upper conveyor **371** will be driven in unison with the lower conveyor by the common drive, and the upper and lower conveyors can be adjusted toward and away from each other.

As previously noted, the inlet end of the lower conveyor **372** is vertically adjustable with the carton support apparatus of the packaging machine. In accordance with the present invention, the outlet end of the conveyor **372** is made independently adjustable to discharge the cartons at a level suitable for subsequent handling operations, such as a further conveyor, a casing machine or the like. For this purpose, there is provided an upright generally U-shaped frame having spaced side members **421** and **422** and a cross member **423** at the upper end. The outlet conveyor is guidably received between the upright members **421** and **422** and is supported by spaced rollers **424** on a shaft **425**. The shaft is adapted to be locked in any selected vertically adjusted position as by fasteners **426** which extend through slots **427** in the upright members **421** and **422** and engage locking blocks **428**. The outlet end of the upper conveyor is also guidably received between the uprights **421** and **422** and is suspended by cables **429** which are wound around a shaft **430**, and which shaft is rotatably supported at the upper ends of the uprights **421** and **422**. A crank wheel **431** is attached to the shaft to enable raising and lowering of the outlet end of the upper conveyor, to maintain the upper conveyor **371** in substantial parallelism with the lower conveyor **372** and the shaft is adapted to be locked as by a locking screw **432**. As shown in FIG. 19, a scale **434** and indicator **435** are advantageously mounted on the upper and lower conveyors, to facilitate relative vertical adjustment thereof.

From the foregoing, it is thought that the operation and construction of the device will be readily understood. The frame section **32** is laterally adjustable toward and away from the frame section **31** by turning of the crank wheel **79**, to accommodate cartons of different cross-section. The carton supports **33** are arranged to overlap during lateral adjustment to enable the machine to handle narrow as well as very wide cartons. In addition, it will be noted that lateral adjustment of the frame **32** also adjusts the forward position of the cross slide **330**. The machine is adjusted for cartons of different height by turning the crank **151**, which crank elevates and lowers the carton supports **33**. The several lower carton engaging fingers are operatively connected to the carton support so as to be elevated and lowered therewith, while permitting free reciprocation of the carton engaging fingers during reciprocation of the slide. In addition, the lower carton engaging arm **352** on the cross slide and the inlet end of the lower conveyor **372** of the presser unit are also adjustable with the carton supports.

The stack supporting apparatus is made independently adjustable since the position of the stack supporting apparatus is controlled not only by the height of the cartons, but also by the size of the carton flaps. This adjustment is effected by turning of the crank **170** which elevates and lowers the platform **160** and by adjusting the frame **174** relative to the plate **161**.

The main transfer mechanism including the slides **83** and **84** are reciprocated in unison to intermittently move the carton through the packaging machine. The stripper fingers **91***a* and **91***b* move the end carton off the stack and into the erecting apparatus; the fingers **92***a* and **92***b* move the next preceding carton from the erecting apparatus to the loading station; the fingers **93***a* and **93***b* move the carton from the loading station to the glue applying station; and the fingers **94***a* and **94***b* move the carton from the glue applying station to the outlet ends of the main conveyor. The cross conveyor is operated in timed relation with the main conveyor and is retracted during extension of the main conveyor and extended during retraction of the main conveyor to push the carton onto the compressor unit **40**.

I claim:

1. In a packaging machine, the combination of a frame, container support means mounted on said frame for limited vertical adjustment relative thereto, an elongated slide, means mounting said slide on said frame for reciprocation along a path generally paralleling said support means to advance containers therealong, a plurality of container engaging fingers, means mounting said fingers on said slide at spaced points therealong for reciprocation with the slide and for limited vertical adjustment relative to the slide, means for vertically adjusting said container support means to accommodate containers of different height and means responsive to vertical adjustment of said support means for vertically adjusting said fingers relative to said slide.

2. In a packaging machine, the combination of a frame, container support means mounted on said frame for limited vertical adjustment relative thereto, an elongated slide, means mounting said slide on said frame for reciprocation along a path generally paralleling said support means to advance containers therealong, a plurality of container engaging fingers, means mounting said fingers on said slide at spaced points therealong for reciprocation with the slide and for limited vertical adjustment relative to the slide, and means operable while said slide is reciprocating for vertically adjusting said support means relative to said frame and for vertically adjusting said container engaging fingers relative to said slide to accommodate containers of different height.

3. In a packaging machine, the combination of a frame, container support means mounted on said frame for limited vertical adjustment relative thereto, an elongated slide, means mounting said slide on said frame for reciprocation along a path generally paralleling said support means to advance containers therealong, a plurality of container engaging fingers, means mounting said fingers on said slide at spaced points therealong for reciprocation with the slide and for limited vertical adjustment relative to the slide, and means for vertically adjusting said support means and said fingers to accommodate containers of different height, said means including an elongated trackway paralleling the path of movement of the slide and a follower engaging said trackway for effecting vertical adjustment of the support means and the fingers while permitting longitudinal reciprocation of the slide and fingers relative to the support means.

4. In a packaging machine, the combination of a main frame, container support means mounted on said main frame for limited vertical adjustment relative thereto, an elongated slide, means mounting said slide on said frame for reciprocation along a path generally paralleling said support means to advance containers therealong, a set of upper container engaging fingers mounted on said slide at spaced points therealong, a set of lower container engaging fingers, means mounting said set of lower fingers on said slide at spaced points therealong for reciprocation with said slide and for limited vertical adjustment relative to the slide, and means operable while the slide is reciprocating for vertically adjusting said support means relative to said frame and for vertically adjusting said set of lower container engaging fingers rela-

tive to said slide to accommodate containers of different height.

5. In a packaging machine, the combination of first and second laterally spaced frame sections; means for selectively adjusting the lateral spacing of said frame sections, container support means mounted on at least one of said frame sections for limited vertical adjustment relative thereto, first and second elongated slides, means mounting said first and second slides on said first and second frame sections for reciprocation along a path generally paralleling said support means to advance containers therealong, a plurality of container engaging fingers, means mounting said fingers on said first and second slides at spaced points therealong for movement with the slides and for limited vertical adjustment relative thereto, and means operable while said slides are reciprocating for vertically adjusting said support means relative to said frame sections and for vertically adjusting said container engaging fingers relative to said slide to accommodate containers of different height.

6. In a packaging machine, the combination of a main frame, container support means mounted on said main frame for limited vertical adjustment relative thereto, an elongated slide, means mounting said slide on said frame for reciprocation along a path generally paralleling said support means to advance containers therealong, a set of upper container engaging fingers mounted on said slide at spaced points therealong, a set of lower container engaging fingers, means mounting said set of lower fingers on said slide at spaced points therealong for reciprocation with said slide and for limited vertical adjustment relative to the slide, a cross slide mounted for reciprocatory movement crosswise of said container support means for moving containers off the support means, said cross slide having an upper carton engaging arm, a lower carton engaging arm mounted on the cross slide for movement therewith and for limited vertical adjustment relative thereto, and means for operating said elongated slide and said cross slide in timed relation with each other, and means operable while said slides are reciprocating for vertically adjusting said support means relative to said frame and for simultaneously vertically adjusting said set of lower container engaging fingers relative to said elongated slide and said lower container engaging arm relative to said cross slide to accommodate containers of different height.

7. In a packaging machine, the combination of a main frame, container support means mounted on said main frame for limited vertical adjustment relative thereto, an elongated slide, means mounting said slide on said frame for reciprocation along a path generally paralleling said support means to advance containers therealong, a set of upper container engaging fingers mounted on said slide at spaced points therealong, a set of lower container engaging fingers, means mounting said set of lower fingers on said slide at spaced points therealong for reciprocation with said slide and for limited vertical adjustment relative to the slide, a cross slide mounted for reciprocatory movement crosswise of said container support means for moving containers off the support means, said cross slide having an upper carton engaging arm, a lower carton engaging arm mounted on the cross slide for movement therewith and for limited vertical adjustment relative thereto, and means for operating said elongated slide and said cross slide in timed relation with each other, means for vertically adjusting said support means relative to said elongated slide and said cross slide to accommodate containers of different height, and means operatively connecting said support means to said lower set of fingers on said elongated slide and to said lower arm on said cross slide for vertically adjusting said lower set of fingers and said lower arm with said support means while permitting free reciprocatory movement of said slides relative to said support means.

8. In a packaging machine, the combination of a main frame, container support means mounted on said main frame for limited vertical adjustment relative thereto, an elongated slide, means mounting said slide on said frame for reciprocation along a path generally paralleling said support means to advance containers therealong, a set of upper container engaging fingers mounted on said slide at spaced points therealong, a set of lower container engaging fingers, means mounting said set of lower fingers on said slide at spaced points therealong for reciprocation with said slide and for limited vertical adjustment relative to the slide, means for vertically adjusting said support means relative to said elongated slide to accommodate containers of different height, means operatively connecting said support means and said set of lower container engaging fingers for vertically adjusting said lower set of fingers with said support means while permitting free reciprocation of said slide relative to said support means, an elongated container receiving conveyor, and means attaching one end of said receiving conveyor on said support means for vertical adjustment therewith.

9. In a packaging machine, the combination of a main frame, container support means mounted on said main frame for limited vertical adjustment relative thereto, an elongated slide, means mounting said slide on said frame for reciprocation along a path generally paralleling said support means to advance containers therealong, a set of upper container engaging fingers mounted on said slide at spaced points therealong, a set of lower container engaging fingers, means mounting said set of lower fingers on said slide at spaced points therealong for reciprocation with said slide and for limited vertical adjustment relative to the slide, means for vertically adjusting said support means relative to said elongated slide to accommodate containers of different height, means operatively connecting said support means and said set of lower container engaging fingers for vertically adjusting said lower set of fingers with said support means while permitting free reciprocation of said slide relative to said support means, an elongated container receiving conveyor, and means attaching one end of said receiving conveyor on said support means for vertical adjustment therewith, a container compressor apparatus including an upper endless type conveyor having one end attached to said frame at a level to engage the tops of the containers, a lower endless type conveyor having one end attached to said support means for vertical adjustment therewith, means for driving said upper and lower conveyors in unison, and means for selectively adjusting the relative spacing between the other ends of said upper and lower conveyors to maintain the adjacent faces of the upper end lower conveyors substantially parallel.

10. In a packaging machine for handling cartons of the type having four body walls and closure flaps on the ends of the body walls, the combination of a main frame, elongated carton support means mounted on said frame for limited vertical adjustment relative thereto, a first carton transfer means extending alongside said support means for advancing cartons therealong, means adjacent one end of said support means for supporting a stack of flattened cartons, means on said first transfer means engageable with a carton on the stack for moving the same off the stack and for advancing the carton along said support means, means for adjusting said stack support means to receive cartons of different size and height, means for vertically adjusting said carton support means relative to said frame to accommodate containers of different height, means disposed alongside the path of movement of the cartons on said support means for erecting cartons and folding the carton flaps, a carton compressor comprising an elongated upper flap presser having one end attached to said frame and extending transverse to the path of movement of the cartons on said carton support means, an elongated lower flap presser extending below said upper presser and having one end attached to said carton sup-

port means for vertical adjustment therewith, means for adjusting the relative spacing of the other ends of said upper and lower flap pressers to accommodate cartons of different height, and a second transfer means operated in timed relation with said transfer means for moving cartons crosswise of said carton support means and for advancing the cartons to said upper and lower flap pressers.

11. The combination of claim **10** wherein said first transfer means includes a set of upper container engaging fingers and a set of lower container engaging fingers mounted for vertical adjustment toward and away from the upper fingers, and means including a track and follower operatively connecting said lower container engaging fingers and said adjusting means for said carton support means to adjust the lower container engaging fingers with said carton support means while permitting free movement of said lower set of fingers in a direction lengthwise of the carton support means.

12. The combination of claim **11** wherein said second transfer means includes an upper arm and a lower arm mounted for limited vertical movement relative to the upper arm, and a second track and follower means operatively connecting said lower arm and said carton support means to vertically adjust the lower arm with the carton support means.

13. In a packaging machine, the combination of a main frame section and an adjustable frame section laterally spaced from said main frame section, means for selectively adjusting said adjustable frame section toward and away from said main frame section, container support means mounted on at least one of said frame sections, a main slide mounted on said adjustable frame section for reciprocation along a path generally paralleling said support means, a plurality of container engaging fingers on said main slide at spaced points therealong for advancing containers along said support, said main frame section having outlet means adjacent one end of said support means, a cross slide mounted for reciprocation in a direction crosswise of said support means between a retracted position adjacent one side of said support means to an extended position and back to move containers off the support means to said outlet means, means for reciprocating said main slide, means for reciprocating said cross slide in timed relation with said main slide, said last mentioned means including means for laterally adjusting said retracted position of said cross slide in accordance with the position of said adjustable frame section.

14. In a packaging machine, the combination of a main frame section and an adjustable frame section laterally spaced from said main frame section, means for selectively adjusting said adjustable frame section toward and away from said main frame section, container support means mounted on at least one of said frame sections, a main slide mounted on said adjustable frame section for reciprocation along a path generally paralleling said support means, a plurality of container engaging fingers on said main slide at spaced points therealong for advancing containers along said support, said main frame section having outlet means adjacent one end of said support means, a cross slide mounted for reciprocation in a direction crosswise of said support means between a retracted position adjacent one side of said support means to an extended position and back to move containers off the support means to said outlet means, means for reciprocating said main slide, means including a cross slide operator mounted on said adjustable frame section for reciprocating said cross slide in timed relation with said main slide, said cross slide operator being movable laterally of said main frame section with said adjustable frame section to laterally adjust said retracted position of said cross slide in accordance with the position of said adjustable frame section.

15. In a packaging machine, the combination of first and second laterally adjustable frame sections having lateral carton guide means on the registering faces thereof for laterally guiding a carton, means for selectively adjusting said frame sections toward and away from each other to accommodate cartons of different width, transfer means for advancing cartons between said guide means, and carton support means for supporting the cartons as they are moved along said lateral carton guide means, said support means including first and second platforms respectively mounted on said first and second frame sections and positioned to underlie and support a carton, said platforms being arranged to substantially span the space between said lateral guide means and to overlap when the frame sections are adjusted toward each other.

16. In a packaging machine, the combination of first and second laterally adjustable frame sections having lateral carton guide means on the registering faces thereof for laterally guiding a carton, means for selectively adjusting said frame sections toward and away from each other to accommodate cartons of different width, transfer means for advancing cartons between said guide means, and carton support means for supporting the cartons as they are moved along said lateral carton guide means, said support means including first and second platforms respectively mounted on said first and second frame sections and positions to underlie and support a carton, said first and second platform each having one side edge paralleling the lateral guide means on the respective frame section and disposed substantially vertically therebelow to allow the lower side flaps on the carton to pass alongside the platforms, said platforms being arranged to substantially span the space between said lateral guide means on said first and second frame sections and to overlap when the frame sections are adjusted toward each other.

17. The combination of claim **16** wherein said first of said support platforms has flap folding means thereon for folding the side flap inwardly and upwardly into overlying relation to the first platform.

18. A packaging machine for handling cartons of the type having four body walls and first and second side flaps and lead and trailing flaps on each the top and bottom ends of the carton, said machine comprising laterally spaced guide means engageable with the body walls of the carton for guiding the same along a rectilinear path, means adjacent one end of said guide means for supporting a stack of flattened cartons, carton transfer means for moving a carton off the stack and along a path between said guide means, means for opening the flattened carton as it is moved from the stack into said guide means, means for folding the lead and trailing flaps on the lower end of the carton inwardly to partially close the bottom of the carton, a support platform between said guide means underlying the opened carton as it is moved therealong to support the carton and the lead and trailing flaps on the lower end of the carton and to prevent passage of articles through the bottom of the carton, said support platform having a width no greater than the spacing between said guide means to provide a passage at each side of the platform for said first and second side flaps on the bottom of the carton, means intermediate the ends of said guide means defining a carton loading station, means disposed intermediate the ends of said guide means for folding said first side flaps on each the top and bottom of the carton inwardly, means disposed intermediate the ends of said guide means for applying adhesive to said second flaps on each the top and bottom of the carton, a second carton transfer means adjacent one end of said support platform for moving the carton crosswise of said support platform, and means engageable with said second flaps on each the top and bottom of the carton as the carton is moved crosswise of the support platform for simultaneously folding said second flaps inwardly into engagement with the other side flap on the respective end of the carton.

19. A packaging machine for handling cartons of the type having four body walls, first and second side flaps and lead and trailing flaps on the lower end of the carton,

said machine comprising a main frame section and an adjustable frame section, said frame sections having lateral carton guide means on the registering faces thereof, means for adjusting said frame sections toward and away from each other to accommodate cartons of different width, carton transfer means including slides mounted on each of said frame sections for reciprocation along a path paralleling said lateral carton guide means, container engaging fingers on said slides engagable with a carton disposed between said lateral guide means for advancing the cartons, a carton support for supporting cartons as they are advanced by said transfer means, said support including first and second platforms each having one side edge paralleling the lateral guide means on the respective frame section and disposed substantially vertically therebelow to allow the lower side flaps on the cartons to pass alongside the platform, said platform being arranged to substantially span the space between the lateral guide means on said main and adjustable frame sections when the frame sections are separated and to overlap when the frame sections are adjusted toward each other, means adjacent one end of the support means for opening a flattened carton and for folding the lead and trail flaps on the lower end of the carton inwardly, means intermediate the ends of said carton support means for folding one of the side flaps inwardly into engagement with the lead and trail flaps, and means adjacent the other end of the support means for moving the carton crosswise of the support means and for folding the other side flap on the lower end of the carton inwardly into engagement with the lead and trail flaps.

20. In a packaging machine for handling cartons with four body walls and flaps on at least the lower ends of the body walls, the combination of first and second frame sections having first and second laterally spaced upper carton guides on the registering faces thereof, first and second lower carton guides respectively mounted on said first and second frame sections for vertical adjustment toward and away from the respective upper carton guide, transfer means for advancing cartons along a path between said carton guides, means for simultaneously vertically adjusting said first and second lower carton guides relative to said upper carton guides to accommodate cartons of different height, a carton support including first and second overlapping support platforms attached said first and second lower carton guides for vertical adjustment therewith, said platforms having their outer edges parelleling said lateral carton guides on the respective frame section and disposed substantially vertically therebelow to allow flaps on each side of the carton to pass alongside the platform, and means for laterally adjusting said frame sections relative to each other to accommodate cartons of different width.

21. The combination of claim **20** wherein said transfer means includes a slide mounted on each frame section for reciprocation along a path substantially paralleling said guides, a set of upper and a set of lower carton engaging fingers on each slide, means mounting the lower fingers on the respective slides for vertical adjustment relative thereto, and means responsive to vertical adjustment of said lower carton guides for vertically adjusting said lower fingers relative to said slides while permitting free reciprocation of said slides relative to said guides.

22. In a packaging machine for handling cartons of the type having first and second side walls, front and rear walls, and at a closure flap on at least the rear wall thereof, the combination of a support frame, a carton transfer mechanism including a slide mounted for reciprocation on the frame and having at least one carton engaging finger mounted on the slide for movement therewith, means for folding the flap on the rear wall of the carton as it is advanced by said transfer mechanism, said last mentioned means including a crank arm mounted on the slide for movement therewith and for swinging movement about an axis transverse to the slide, a flap engaging finger on said arm engageable with the flap on the rear wall of the carton as it is advanced by said carton engaging finger, and means operative when the slide moved forwardly to advance a carton for swinging said arm about its axis to thereby fold the flap on the rear wall forwardly.

23. The combination of claim **22** wherein said means for swinging said arm relative to said slide includes a cam track on said frame alongside said slide and a follower engageable with said cam track and operatively connected to said crank arm.

24. The combination of claim **23** wherein said means for swinging said arm pinion gear on said crank arm, a sector gear on said slide meshing with said pinion gear and having an eccentric follower, and a cam track on said frame alongside said slide and engaging said follower to turn said sector gear and swing said crank arm as the slide reciprocates.

25. In a packaging machine for handling cartons of the type having first and second side walls, front and rear walls and a rear closure flap on said rear wall, the combination of a support frame, a carton transfer mechanism including a slide mounted for reciprocation on the frame and having at least one carton engaging finger mounted on the slide for movement therewith, means for folding said rear flap as the carton is advanced by said transfer mechanism, said last mentioned means including a crank arm, means mounting said arm on said slide for swinging movement about an axis transverse to the slide and for limited shifting movement in a direction laterally of said slide, a flap engaging finger on said arm engageable with the rear wall of a carton as it is advanced by said carton engaging finger, means operative when the slide is moved forwardly to advance a carton for swinging said arm about its axis to thereby fold the rear carton flap forwardly, and means operative in timed relation with the movement of said slide for shifting said arm laterally of said slide to shift the flap engaging finger out of its flap engaging position during retraction of the slide.

26. The combination of claim **25** wherein said means for swinging said arm relative to said slide includes a cam track on said frame engageable with said track and operatively connected to said crank arm.

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UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 3,216,175 November 9, 1965

Roger H. Stohlquist

It is hereby certified that error appears in the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 18, line 51, for "end" read -- and --; column 20, line 24, for "positions" read -- positioned --.

Signed and sealed this 26th day of July 1966.

(SEAL)
Attest:

ERNEST W. SWIDER
Attesting Officer

EDWARD J. BRENNER
Commissioner of Patents