April 16, 1963 I. L. KAUFFMAN ETAL 3,085,480

METHOD AND APPARATUS FOR SIDE SEAMING CARTON BLANKS

Filed Nov. 16, 1960

11 Sheets-Sheet 1

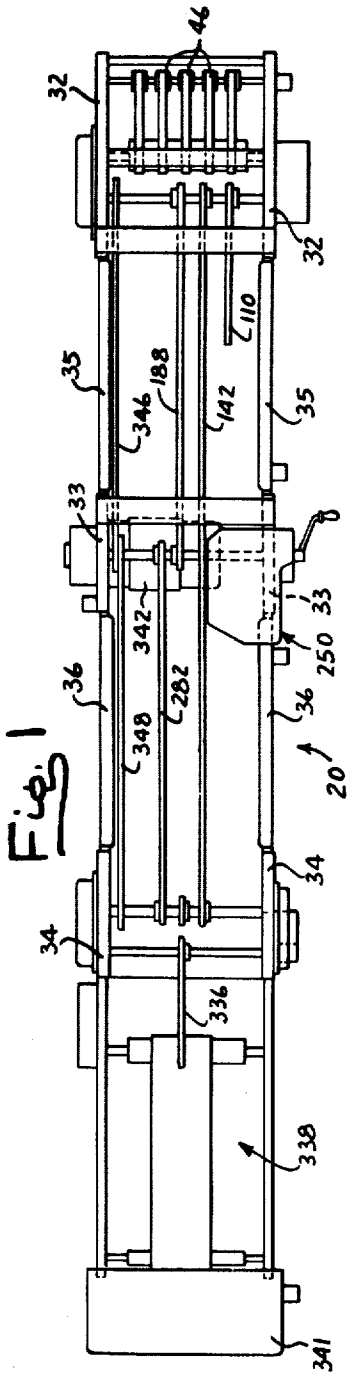


Fig. 1

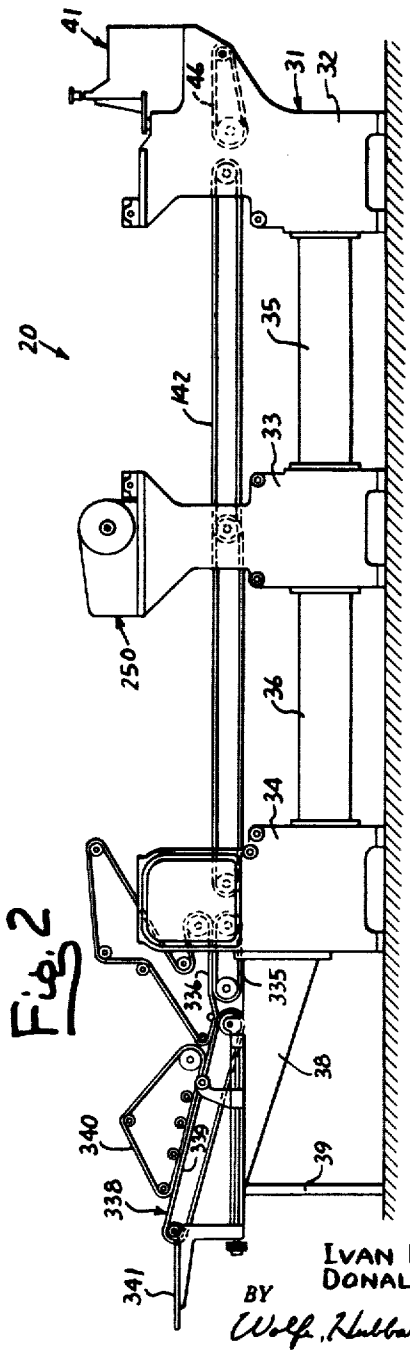


Fig. 2

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METHOD AND APPARATUS FOR SIDE SEAMING CARTON BLANKS

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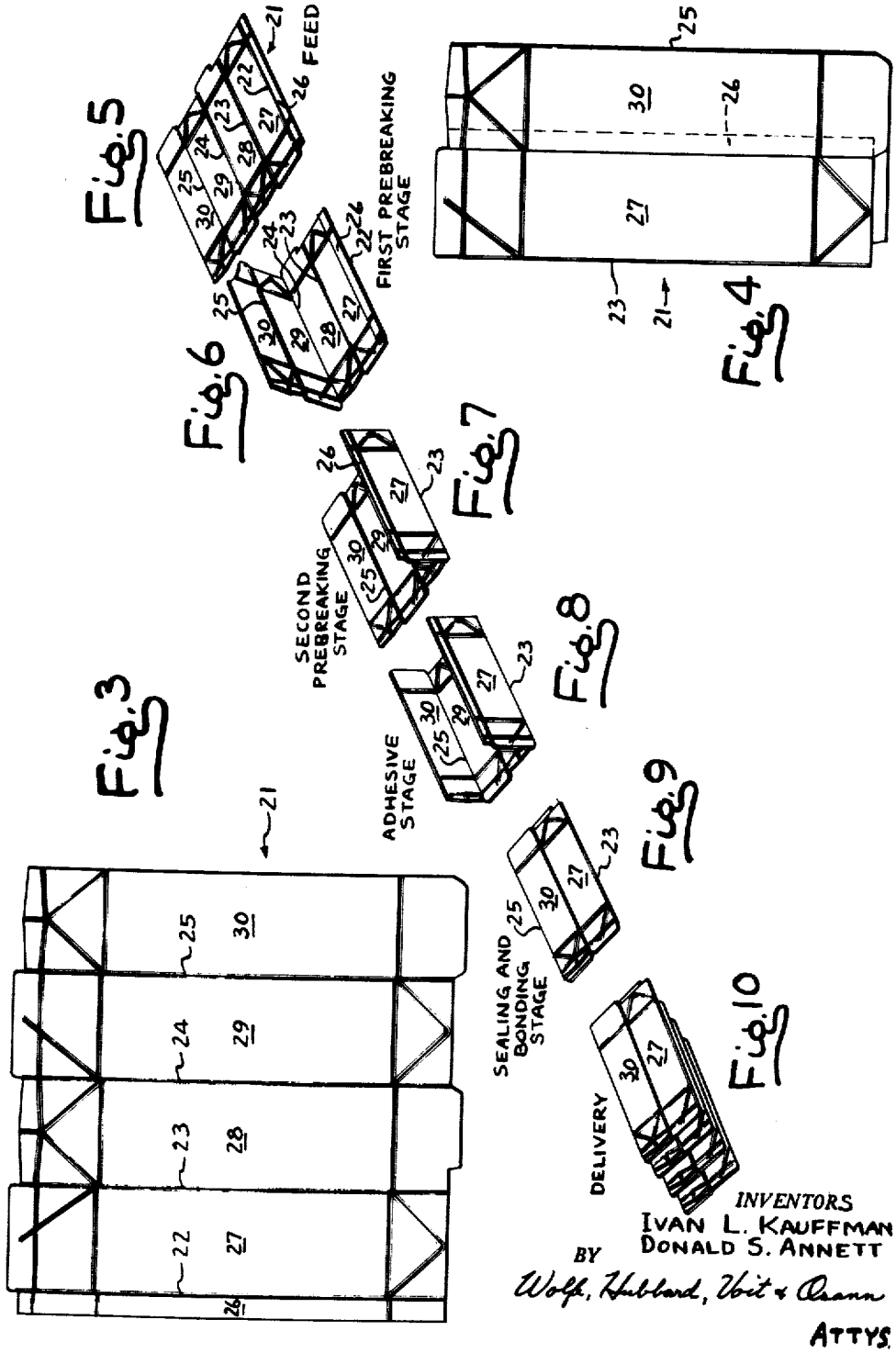


Fig. 5

Fig. 6

Fig. 4

Fig. 7

Fig. 8

Fig. 3

Fig. 9

Fig. 10

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METHOD AND APPARATUS FOR SIDE SEAMING CARTON BLANKS

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Fig. 11

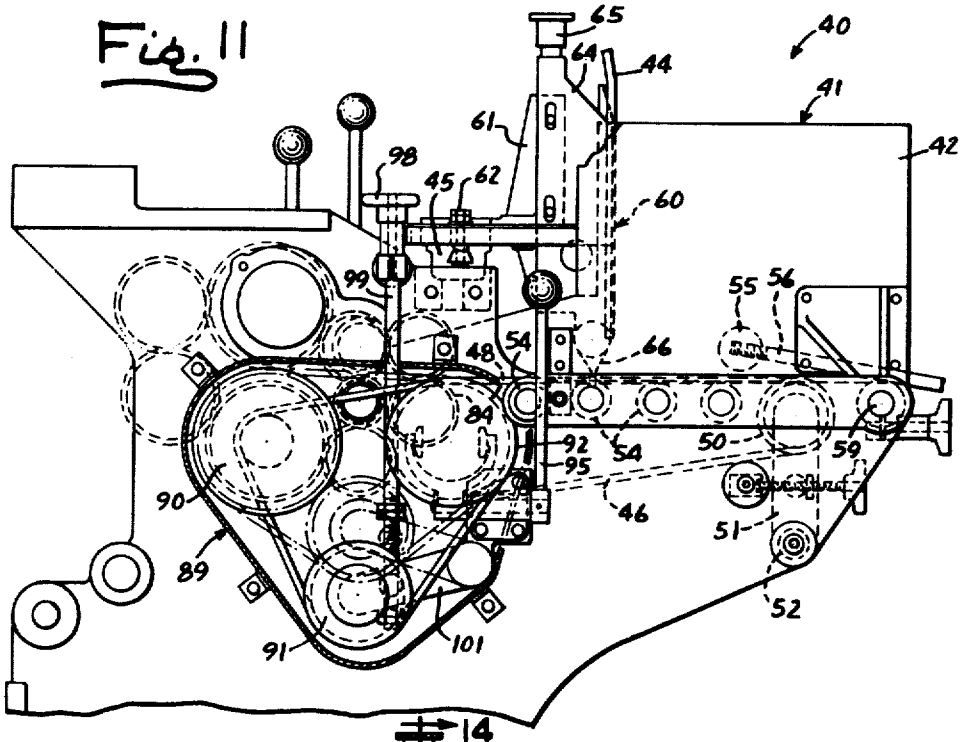
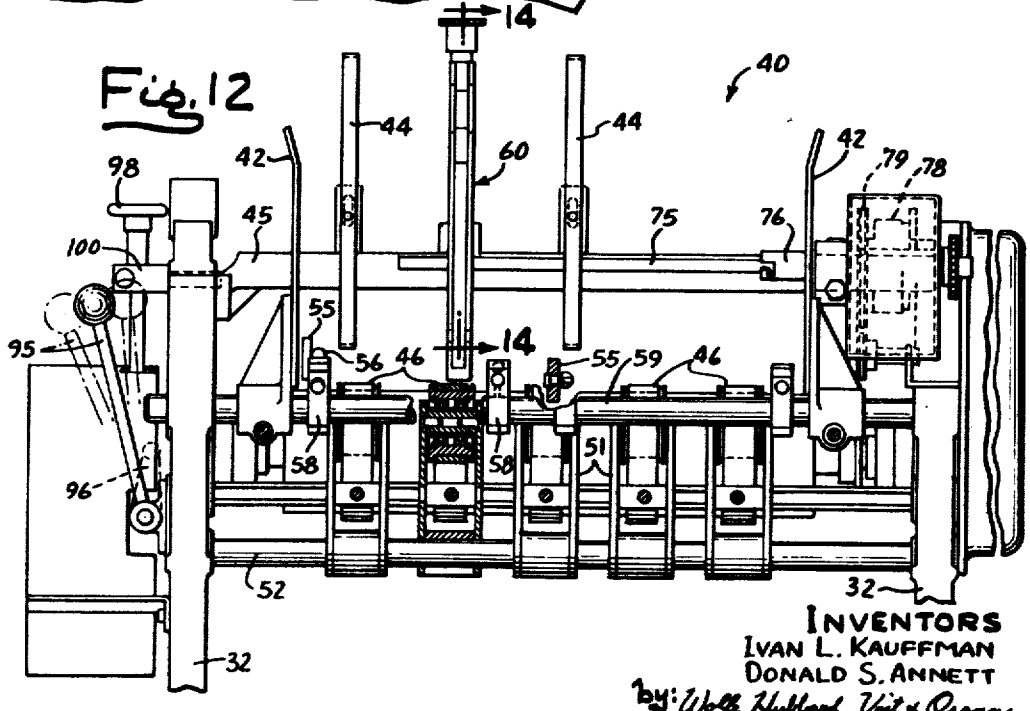


Fig. 12



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METHOD AND APPARATUS FOR SIDE SEAMING CARTON BLANKS

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Fig. 13

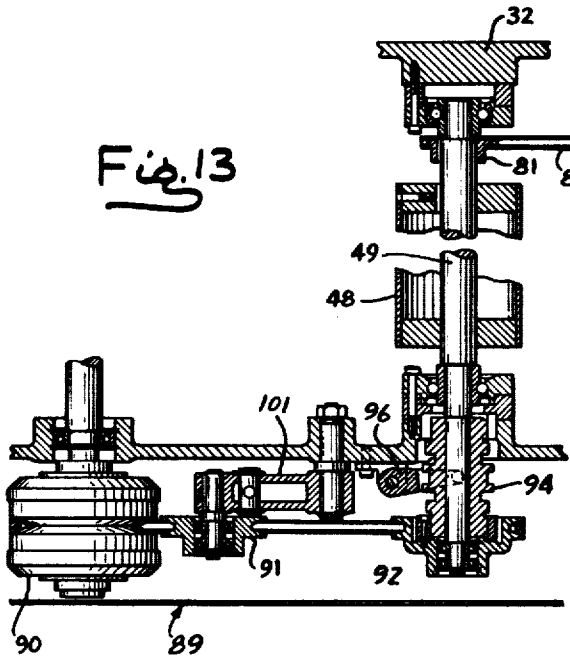


Fig. 14

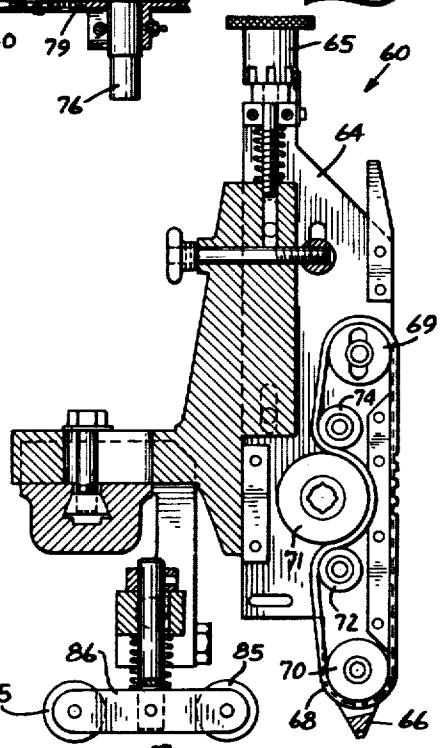
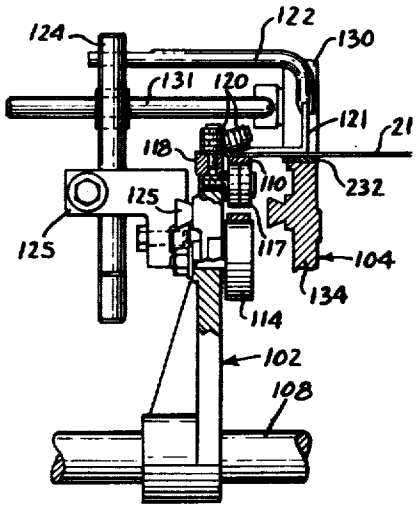


Fig. 17



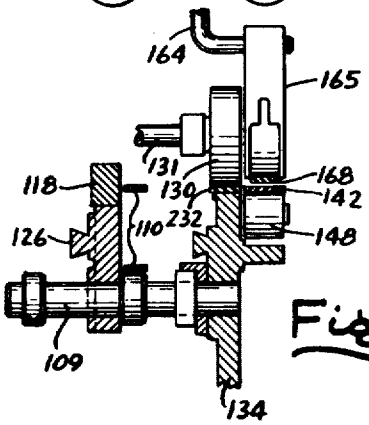


Fig. 18

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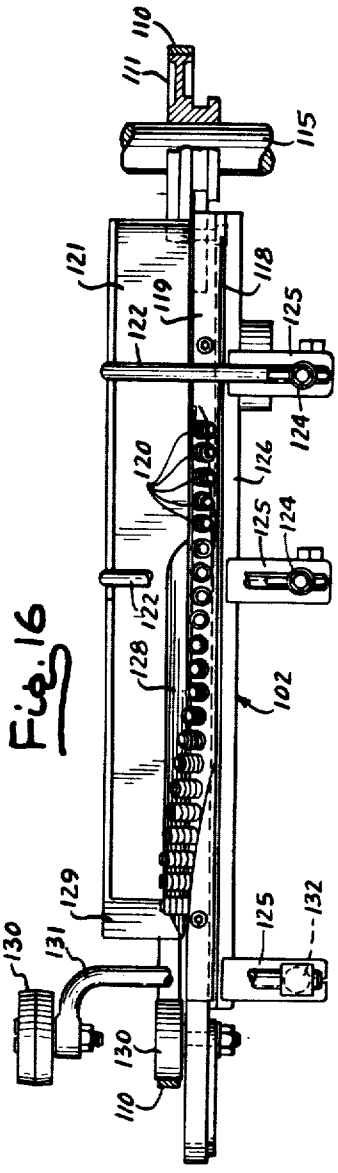


Fig. 16

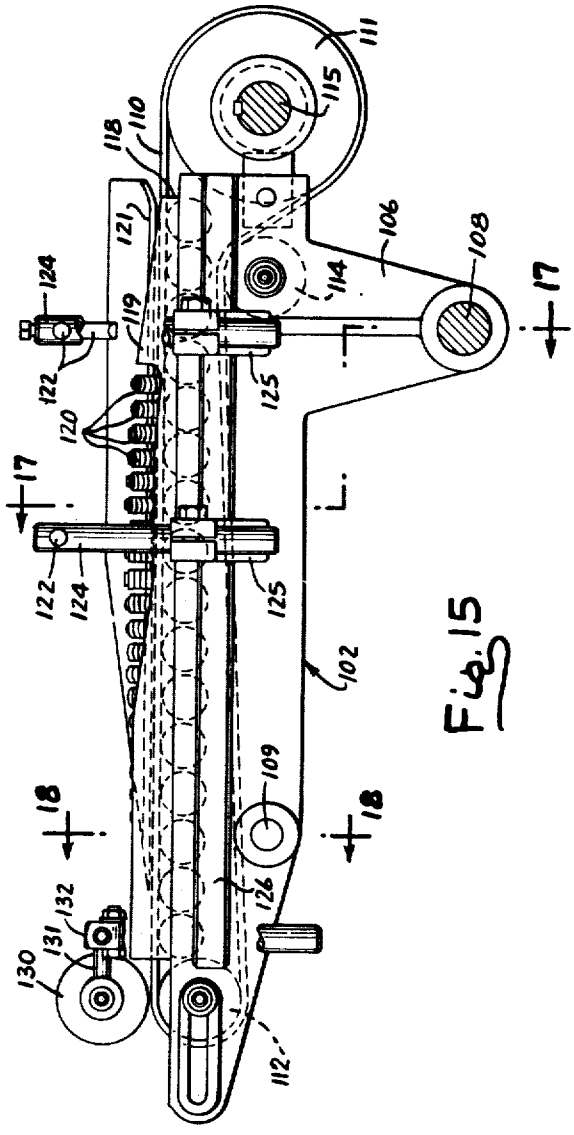


Fig. 15

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METHOD AND APPARATUS FOR SIDE SEAMING CARTON BLANKS

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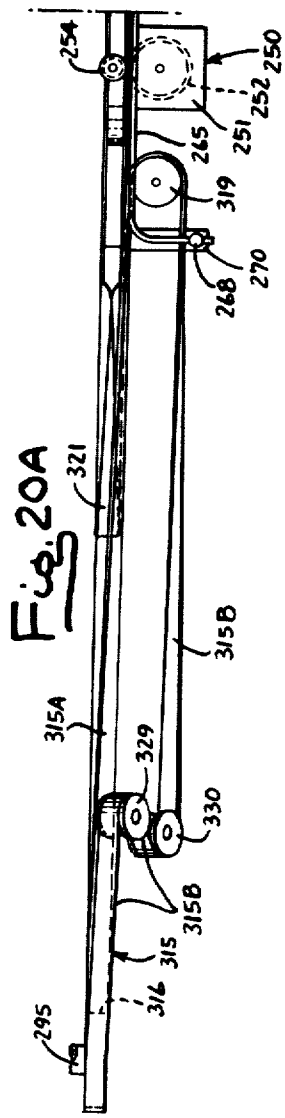


Fig. 20A

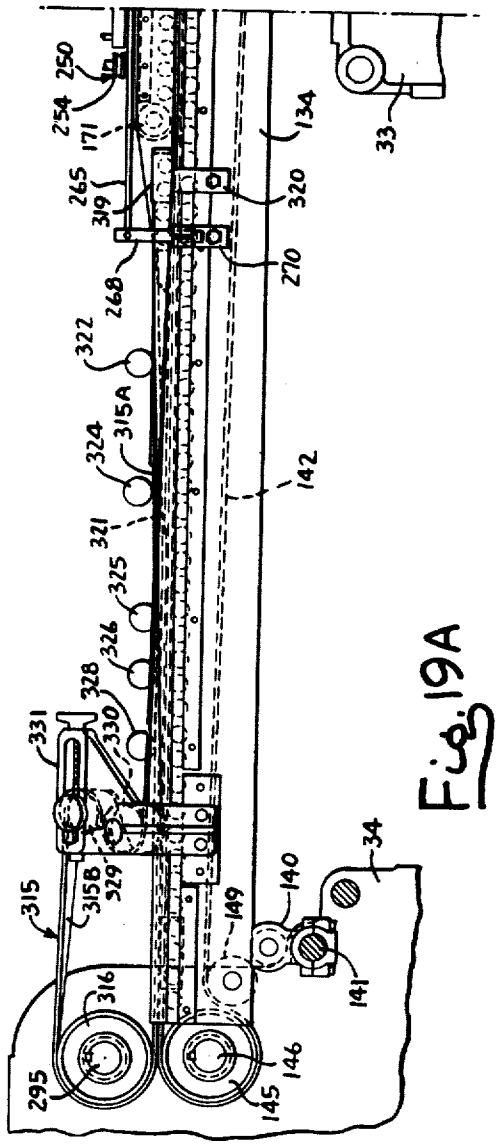


Fig. 19A

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METHOD AND APPARATUS FOR SIDE SEAMING CARTON BLANKS

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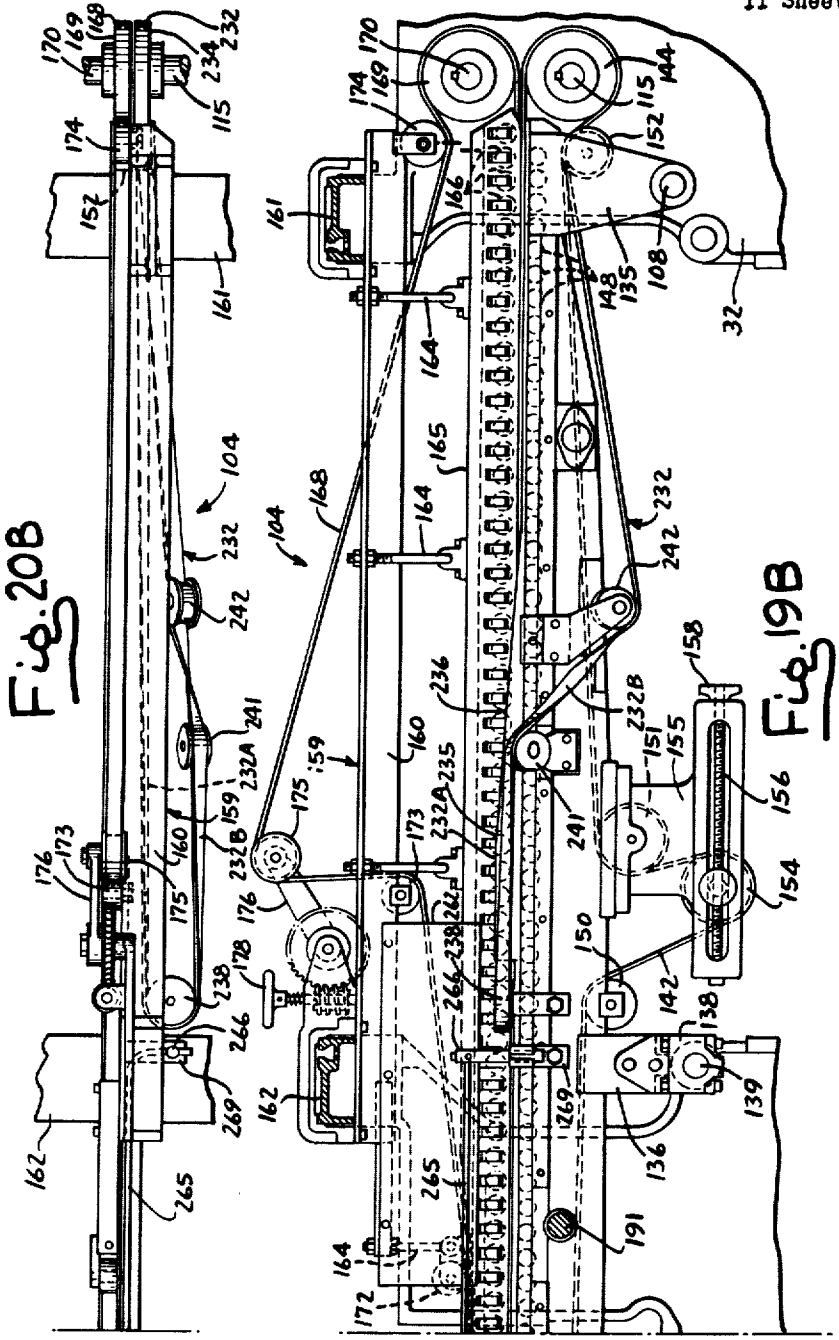


Fig. 20B

Fig. 19B

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METHOD AND APPARATUS FOR SIDE SEAMING CARTON BLANKS

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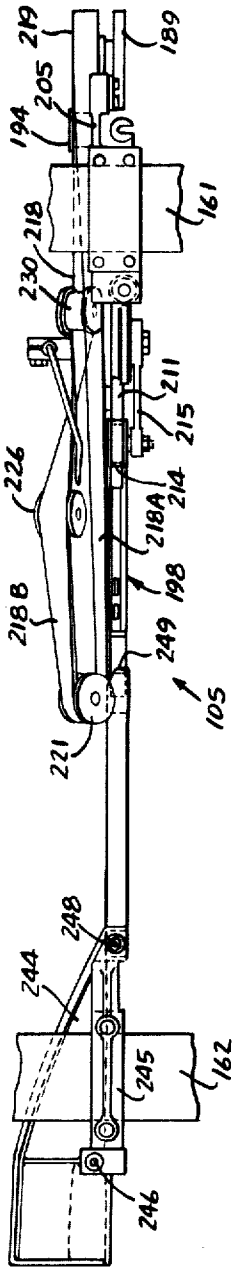


Fig. 22

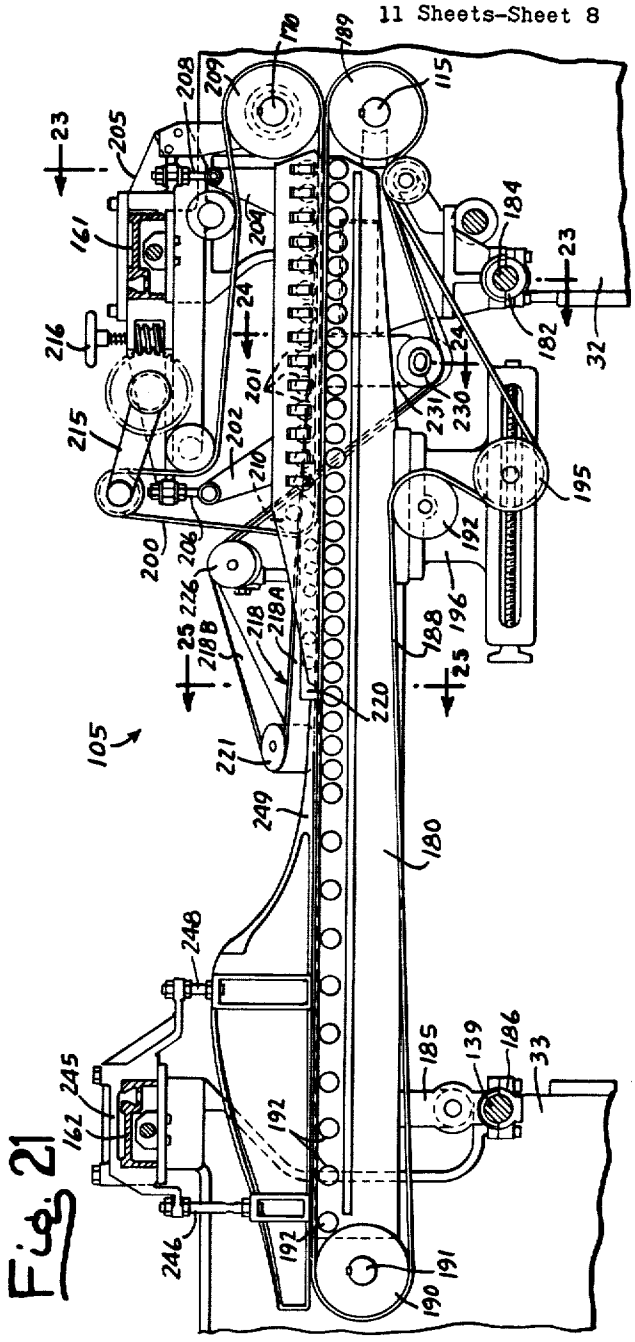


Fig. 21

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METHOD AND APPARATUS FOR SIDE SEAMING CARTON BLANKS

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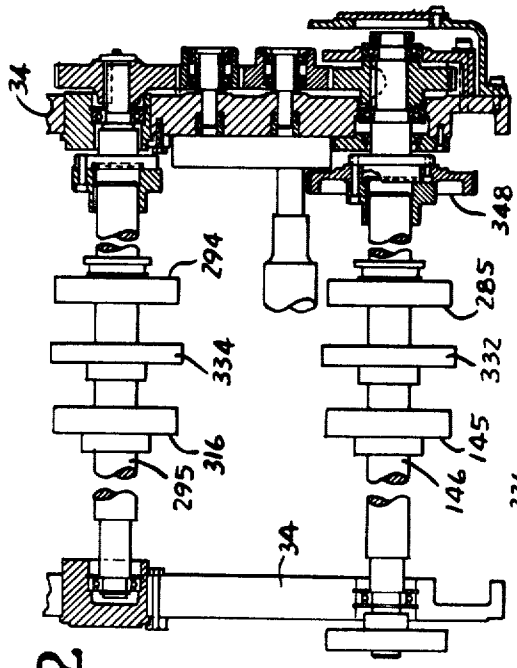


Fig. 32

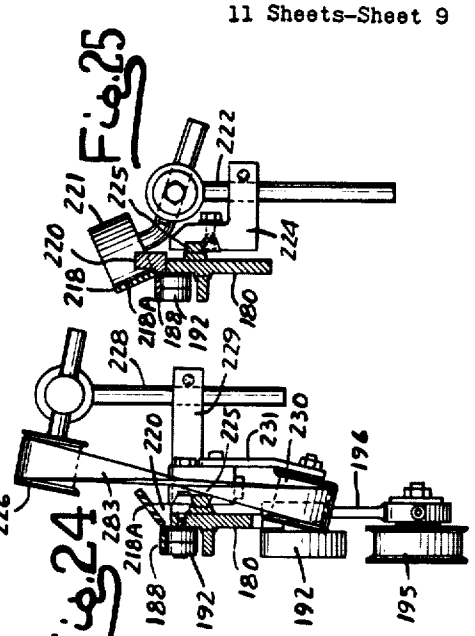


Fig. 24

Fig. 25

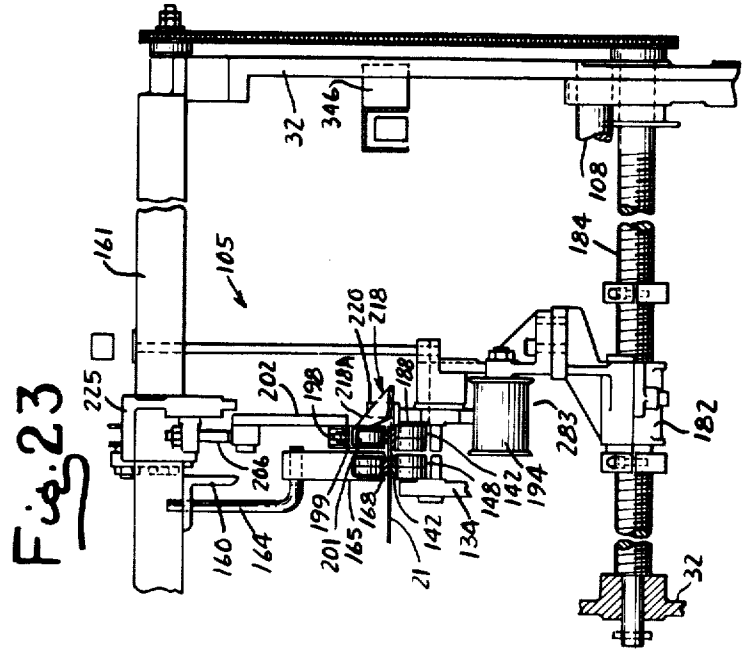


Fig. 23

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Fig. 26

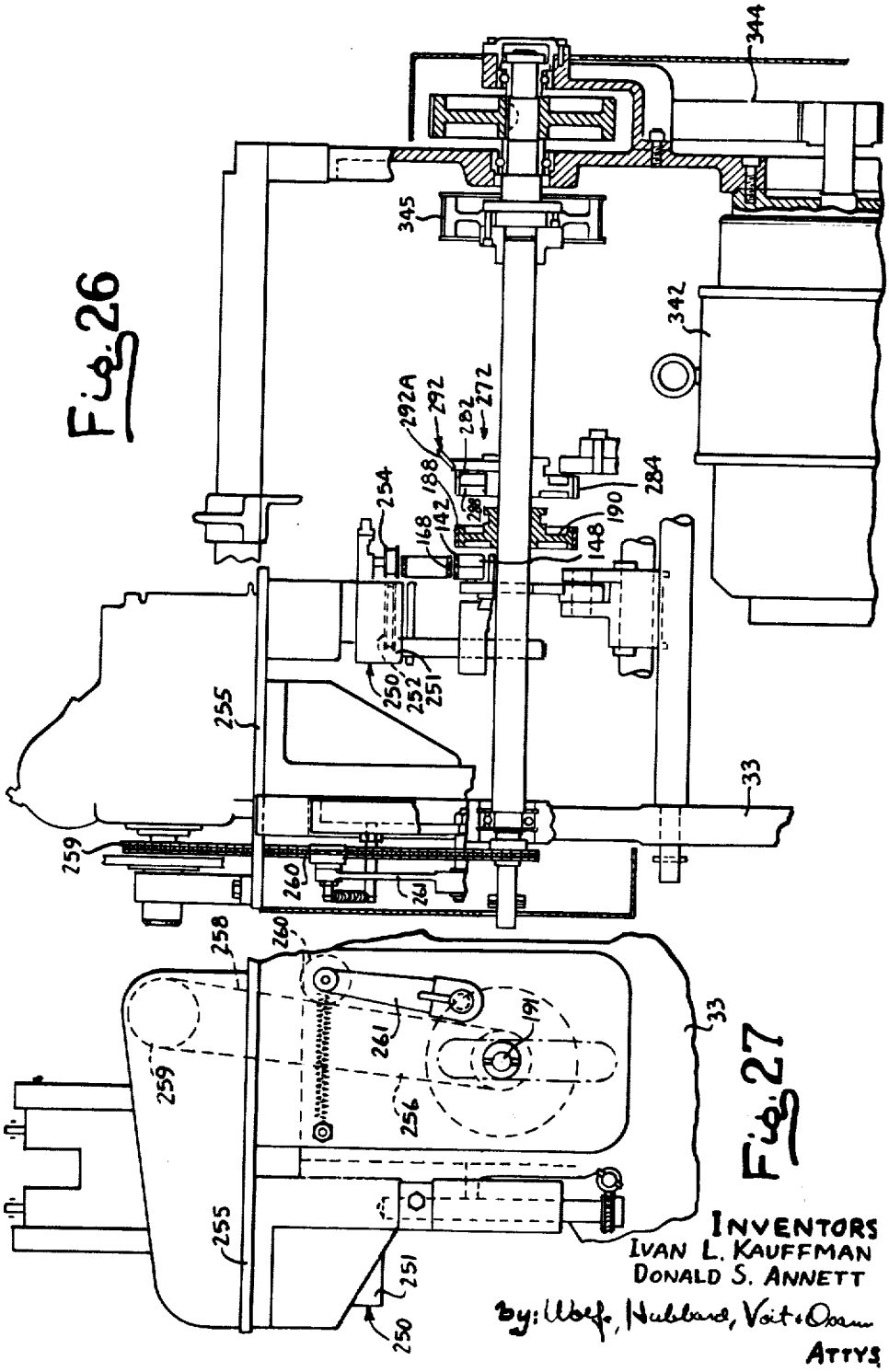


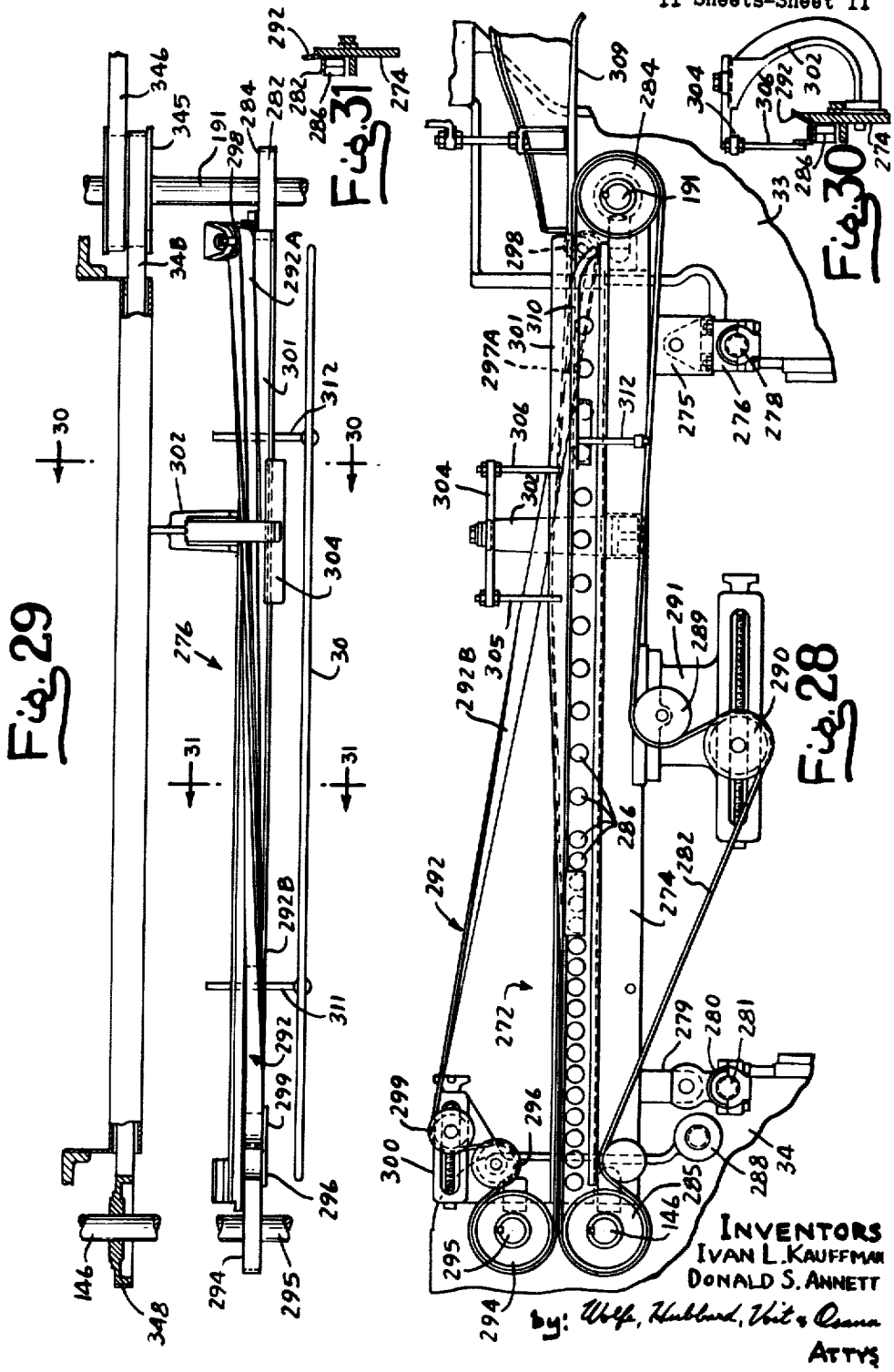
Fig. 27

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METHOD AND APPARATUS FOR SIDE SEAMING CARTON BLANKS

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United States Patent Office 3,085,480 Patented Apr. 16, 1963

3,085,480

METHOD AND APPARATUS FOR SIDE SEAMING CARTON BLANKS

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Filed Nov. 16, 1960, Ser. No. 69,593
12 Claims. (Cl. 93—52)

The present invention relates to the field of carton making and, more specifically to a novel method and apparatus for gluing a carton blank of paperboard or the like. The invention finds particular, but by no means exclusive, utility in forming the adhesive juncture of the side seam of plastic coated paperboard carton blanks of the type disclosed in the applications of Harry B. Egleston and Charles Z. Monroe, Serial No. 707,259, filed in the United States Patent Office on January 6, 1958, now abandoned, and Serial No. 122,571, filed therein July 7, 1961.

In the manufacture of certain types of cartons, such, for example, as paperboard cartons for milk and other dairy products, it is important that the glue applied to the carton blank be located with precision. This may be due to a variety of reasons including sanitation, appearance, or some requirement dictated by the structure or manner of assembling the carton. These considerations are particularly significant with respect to forming the adhesive juncture of the side seam on a carton blank preparatory to manipulating the blank into flat-folded tubular form for shipment to the place where it will be erected, filled and sealed.

Heretofore, a number of expedients have been utilized for positioning a carton blank for side seaming but all have undesirable limitations. One such method involves locating the blank by means of its cut lateral edge remote from the glue flap. Another involves locating by means of the lateral edge of the glue flap itself. Both of these arrangements are disadvantageous in that the lateral edges used for reference are not always clean cut. Still another mode is to utilize a pair of laterally spaced parallel belts or guide bars straddling a partially folded panel in the blank. This is also subject to error in that it may permit the blank to become skewed by an angle proportional to the distance between the belts.

In addition to precision of location of adhesive in making a carton seam, the introduction of plastic coated carton stock and fast-setting thermally activated adhesives makes the time factor from application to bonding a critical element. Where conventional practice is followed, the parts of the blank to be glued are bent through an angle of 180° from application of the adhesive to joining of the glued surfaces together. This results in an undesirable time delay prior to bonding.

Having the foregoing in mind, one object of the present invention is to provide a novel method and apparatus for precisely positioning a carton blank during the side seaming operation by taking advantage of the structure of the carton in a simple but highly effective manner.

Another object of the invention is to provide a novel method and apparatus for gluing a carton blank and which will be adapted to minimize substantially the time elapsing between application and bonding of the adhesive, thereby facilitating the use of fast-acting adhesives.

A further object of the invention is to provide a method and apparatus of the character set forth which will be particularly well adapted for gluing the side seam of a plastic coated carton blank of paperboard or the like by the use of a thermally activated, fast-setting adhesive but which will also be readily applicable for use with other types of adhesives.

Other objects and advantages will become apparent

from the following detailed description, taken together with the accompanying drawings, wherein:

FIGURE 1 is a plan view of an illustrative apparatus embodying the present invention and by means of which the method of the invention may be carried out.

FIG. 2 is a side elevation of the apparatus of FIG. 1.

FIG. 3 is a plan view showing the inside face of an illustrative carton blank adapted to be glued by the use of the method and apparatus of the present invention.

FIG. 4 is a plan view of the blank of FIG. 3 after the same has been glued and folded into a flat collapsed tubular shape adapted for presentation to a forming, filling, closing and sealing machine.

FIGS. 5 to 10, inclusive, are stop-motion sequential views illustrating the successive stages through which the blank of FIG. 3 is put in practice of the method and operation of the apparatus of the present invention.

FIG. 11 is an enlarged fragmentary side elevation of the feed mechanism of the illustrative apparatus described herein.

FIG. 12 is an enlarged fragmentary and elevation of the feed mechanism of FIG. 11.

FIG. 13 is a broken transverse sectional view through a portion of the feed mechanism and taken in the plane of the line 13—13 in FIG. 11.

FIG. 14 is a fragmentary vertical sectional view taken in the plane of the line 14—14 in FIG. 12.

FIG. 15 is a side elevation of the glue flap folder frame of the illustrative apparatus described herein.

FIG. 16 is a plan view of the glue flap folder frame of FIG. 15.

FIGS. 17 and 18 are, respectively, end elevations of the glue flap folder frame with certain of the parts being illustrated in vertical section to bring out detail.

FIGS. 19A and 19B are companion side elevational views of the left-hand folder frame of the apparatus.

FIGS. 20A and 20B are corresponding companion plan views of the left-hand folder frame of FIGS. 19A and 19B.

FIGS. 21 and 22 are, respectively, side elevation and plan views of the first right-hand folder frame of the illustrative apparatus.

FIGS. 23, 24 and 25 are vertical sectional views taken through the first right-hand folder frame in the planes of the lines 23—23, 24—24 and 25—25, respectively, of FIG. 21.

FIG. 26 is a vertical sectional view through the central portion of the illustrative apparatus and showing the relation of certain of the blank carrier means to the adhesive applicator.

FIG. 27 is a fragmentary side elevational view of the apparatus as shown in FIG. 26.

FIGS. 28 and 29 are, respectively, elevation and plan views of the second right-hand folder frame of the apparatus.

FIGS. 30 and 31 are enlarged fragmentary vertical sectional views taken through the second right-hand folder frame in the planes of the lines 30—30 and 31—31, respectively of FIG. 29.

FIG. 32 is an enlarged developed sectional view taken axially of the main drive shafts and drive pulleys at the discharge end of the folder frames.

While the invention is susceptible of various modifications and alternative constructions, certain illustrative embodiments have been shown in the drawings and will be described below in considerable detail. It should be understood, however, that there is no intention to limit the invention to the specific form or mode disclosed, but, on the contrary, the intention is to cover all modifications, alternatives and equivalents falling within the spirit and scope of the invention as expressed in the appended claims.

Turning now to FIGS. 1 to 10, inclusive, the invention is there emexplified in a novel method and in an illustrative apparatus **20** through which the method may be carried out. In the present instance, the objective is to perform a side seaming operation on a flat carton blank such, for example, as the one disclosed in Egleston and Monroe application Serial No. 707,259 referred to earlier herein. To this end, a cut and scored blank **21** is manipuated through a number of stages while undergoing continuous, straight line motion and ultimately emerges as a flat folded, open-ended tube, as shown in FIG. 4, adapted for presentation to forming, filling, closing, and sealing equipment.

Referring more specifically to FIG. 3, the inside face of the carton blank **21** is there shown with a plurality of spaced apart, substantially parallel longitudinal score lines **22, 23, 24** and **25** dividing the face of the blank into a relatively narrow glue flap **26** adjacent one marginal edge thereof and a plurality of side panel areas **27, 28, 29** and **30** which in this case are of approximately equal width. The blank also includes a series of transverse and angular score lines which facilitate formation of the top and bottom closures of the carton when erected but for present purposes these latter lines need not be further considered.

Starting with the blank **21** in the flat, unfolded condition illustrated in FIG. 5, the first step in the practice of the method of the invention is to move the blank along a support in a straight line running longitudinally of the longitudinal score lines **22, 23, 24** and **25** therein. As an incident to such motion, the blank is subjected to a first prebreaking stage, illustrated in FIG. 6. While passing through this stage, the glue flap **26** is folded out of the plane of the blank through an angle of approximately 180° about the score line **22**, the inner face of the glue flap thereupon abutting the inner face of the side panel area **27**. At the same time, the side panel areas **29** and **30** are folded upwardly as a unit out of the plane of the blank about the score line **24** and through an angle of approximately 110°.

Still under continuous straight line motion along the support, the blank **21** is then subjected to a second prebreaking stage, illustrated in FIG. 7. In this stage, the glue flap **26** is folded backwardly about the score line **22** through an angle of approximately 90° and, at the same time, the side panel area **27** is folded about the score line **23** upwardly out of the plane of the blank through an angle of approximately 90° until the glue flap and the side panel area **27** are substantially coplanar and perpendicular to the original plane of the blank. By the same token, the panel areas **29** and **30** are folded backwardly about the score line **24** until they have returned approximately to the original plane of the blank.

The blank then continues its straight line motion along the support and enters into the adhesive stage, illustrated in FIG. 8, where it is subjected to contact with an adhesive applicator. The latter is adapted to apply a fast-setting thermally activated adhesive to the outside face of the glue flap, as in the present instance, but may also be adapted to activate thermoplastic adhesive material already present on the glue flap. The glue flap **26** is precisely positioned for adhesive application by reason of the perpendicular relationship between the side panel area **27** and the side panel area **28** which remains in the original plane of the blank. Thus, it will be perceived that the corner score line **23**, and the precise lateral dimension of the side panel area **27**, accurately position the glue flap for reception of the adhesive from the adhesive applicator. As an incident to passing through the adhesive stage, the side panel area **30** on the opposite edge of the blank is broken upwardly about the score line **25** through an angle of approximately 90° from the original plane of the blank.

The adhesively activated blank, still moving in a straight line, then enters the selaing and bonding stage, illustrated in FIG. 9. At this point, the side panel area and glue flap **26** are downfolded against the inside face of the blank at an angle of approximately 90°, followed in quick succession by downfolding of the side panel area **30** into abutting relation with the glue flap. The application of ironing pressure to these abutting elements serves to complete the bonding and sealing of the side seam and the blank thereupon emerges as a flat folded collapsed tube. Completed blanks are collected at the discharge station, illustrated in FIG. 10, for subsequent presentation to forming, filling, closing and sealing equipment.

With the foregoing in mind, attention may now be given to the illustrative apparatus **20** in greater detail. Referring more specifically to FIGS. 1 and 2 which are primarily diagrammatic views, it will be noted that the apparatus **20** is organized upon a relatively long main frame **31**. In the present instance, the frame **31** comprises three pairs of laterally spaced side frame members **32, 33** and **34** formed of relatively heavy plate material and maintained in longitudinally spaced relation by means of intermediately situated pairs of side rails **35, 36**. In addition, the side frames **34** include cantilever brackets **38** which may be supported adjacent their outboard ends by means of column **39**.

Feed Mechanism

The apparatus **20** includes a high-speed feed mechanism **40** (FIGS. 11 to 14) which is adapted to hold a supply of cut and scored flat blanks **21** and to present them one at a time in precisely oriented form to the carrying mechanism which moves them through the subsequent stages of the machine.

As shown in FIGS. 11 and 12, the feed mechanism **40** comprises a magazine **41** defined by a pair of laterally spaced plates **42** adapted to hold a stack of flat blanks **21**. In this instance, the magazine is adapted to receive the blanks with their inside faces up, their longitudinal score lines aligned with the plates **42**, their longitudinal edges abutting the plates **42**, and with their top edge leading in so far as their subsequent movement is concerned. The stacked blanks, when so positioned in the magazine, are adapted to bear against a pair of laterally spaced, adjustable stop bars **44** mounted at the inner end of the magazine on a heavy transverse bar **45**.

Underlying the magazine **41** are a plurality of power driven feed belts **46** disposed in laterally spaced relation and extending around a common drive roller **48** fixed to a shaft **49** (FIGS. 11, 12 and 13). The belts **46** extend from the roller **48** to a plurality of idler pulleys **50** journaled on individually adjustable tensioning arms **51**, the latter being rockably mounted on a transverse support shaft **52**. The upper flights of the feed belts **46** are disposed horizontally and supported by a plurality of aligned support rollers **54** (FIG. 11) situated between the drive roll **48** and idlers **50**.

The stack of blanks **21** is supported in the magazine with its inner or leading end downwardly inclined against the feed belts **46** and its outer or rearward end raised and resting upon a plurality of laterally spaced adjustable support rollers **55**. The latter are mounted on adjustable arms **56** which extend into the magazine. The roller support arms **56** are, in turn, adjustably secured to mounting brackets **58** carried by a fixed transverse support shaft **59** spanning the side frames **32**.

For the purpose of effecting positive feeding of blanks one at a time in rapid succession from the bottom of the stack, the magazine **41** is equipped with a power feed gate **60** (FIGS. 11, 12 and 14). The latter comprises an upstanding mounting bracket **61** which may be adjustably mounted on the transverse bar **45** as by means of one or more clamping bolts **62**. The bracket **61** carries gate member **64** which is mounted thereon for limited vertical sliding movement as determined by adjustment handwheel **65**. Projecting from the lower end of the gate member **64** and forming a rigid extension thereof

is a fixed finger **66**. The gate member is so adjusted as to have a clearance with the nearest underlying feed belt **46** approximately equal to but slightly greater than the thickness of one of the blanks **21**. Operatively associated with the finger **66** and also carried by the gate member **64** is a power driven, endless flexible member which in this case happens to be an externally toothed belt **68** (FIG. 14). The latter extends in a loop between upper and lower idler rollers **69**, **70**, journaled on the gate member, and is driven by pulley **71** which is held in driving engagement therewith by associated idlers **72**, **74**. The drive pulley **71**, in turn, is splined or otherwise slidably keyed to shaft **75**. The latter is connected by drive sleeve **76**, protective slip clutch **78**, sprocket **79**, chain **80** and sprocket **81** to said roll drive shaft **49** (FIGS. 12 and 13).

By reason of this arrangement, it will be appreciated that the lower portion of the stack of blanks **21** is urged downwardly and forwardly so that the lower portion of the stack of blanks in the magazine, that is the portion below lower ends of the stop bars **44**, is wedged down against the inclined abutting surface of the finger **66**. Due to the weight of the stack, and the positive downward pressure exerted by the belt **68**, the leading marginal edge portion of the lowermost blank in the stack is frictionally engaged by the belts **46** and slipped under the projecting end of the finger **66**, resulting in rapid withdrawal of the blank from the magazine and presentation to the next portion of the apparatus for subsequent processing. As soon as one blank has left the magazine in this manner, the next blank above it in the stack drops down against the feed belts **46**, past the end of the finger **66**, repeating the same withdrawal action. This arrangement permits the feeding of blanks in rapid succession and with no overlapping as they progress through the principal processing stages of the apparatus **20**.

Blanks discharged from the magazine **41** are presented to a pair of guide rolls **82**, **84** (FIG. 11) which, in turn, present them to movable support means taking them further through the machine. In order to insure proper transfer from the magazine to the rolls **82**, **84**, and avoid the possibility of jams in between, the power gate **60** may have associated therewith one or more pairs of hold-down rollers **85**. The latter may conveniently be carried on downwardly biased frames **86**, the latter being mounted on depending brackets **88** fastened to transverse strip **45**.

The feed mechanism **40** may be driven at a great variety of speeds, depending upon the operating speed of the apparatus **20**. This is accomplished in the present instance by means of a small power transmission **89** (FIGS. 11 and 13), including a split drive pulley **90**, an idler **91** and a driven pulley **92**. The driven pulley **92** is in this case coupled to the feed belt drive shaft **49** by means of an appropriate clutch **94**. The clutch **94** is actuated by means of manual control lever **95** and shifter yoke **96** which is rigidly secured thereto. The speed of the driven pulley **92** and feed belt shaft **49** may be precisely adjusted by means of handwheel **98** situated at the upper end of a vertically disposed control rod **99**, carried in a bracket **100** on the machine side frame **32**. The lower end of the control rod **99** threadedly engages a pivoted crank arm **101** which carries the idler **91**. This arrangement affords a wide range of feeder speeds and contributes to the versatility of the apparatus.

First Prebreaking Stage

As the blank **21** enters the first prebreaking stage (FIG. **6**) provision is made for breaking the glue flap **26** about the score line **22** through an angle of substantially 180° and folding it back on the inside face of the blank. At the same time, the blank is broken about the score line **24** with the panels **29**, **30** being raised upwardly as a single coplanar unit into a position perpendicular to or a little beyond the original plane of the blank. This is accomplished through the coaction of a glue flap folder frame **102**, a left-hand folder frame **104**, and a first right-hand folder frame **105**, including their respective carrier, pressure, and folder belts.

The glue flap folder frame **102** (FIGS. 15 to 18) is rigidly mounted longitudinally of the machine between the side frame members **32** and side rails **35**. In the present instance, the glue flap folder frame has at one end a relatively heavy depending bracket **106** fixed upon a transverse strut **108** spanning the side frames **32**. The opposite end of the glue flap folder frame **102** is mounted on a fixed transverse stub shaft **109** which projects laterally from adjacent left-hand folder frame **104**.

Operatively associated with the glue flap folder frame **102** is a traveling support comprising a carrier belt **110** which is trained over a drive pulley **111** and a pair of idler pulleys **112**, **114** (FIG. 15). The drive pulley is fixed to a transverse shaft **115** driven from an appropriate power source in the apparatus. The idler **112** remote from the drive pulley **111** is adjustable with respect to the frame **102** for controlling tension of the belt **110**. The upper flight of the carrier belt **110** is supported longitudinally between the pulleys **111**, **112** by means of a plurality of underlying support rollers **117** journaled in longitudinally spaced relation along the upper portion of the folder frame **102**. The belt **110** is adapted to support the blank along the marginal edge portion of the side panel **27** immediately adjacent the score line **22** which separates it from the glue flap (FIG. 17).

For engaging the glue flap **26** and making the initial bend of it about the score line **22**, the glue flap folder frame **102** is provided with a prebreaker bar **118**. The latter has adjacent its leading end an inclined ramp **119** which terminates in a plurality of manipulating rollers **120** on progressively inclined axes. The rollers **120** are disposed in longitudinally spaced relation along the folder frame **102** and their axes are disposed first at an obtuse angle and then increasingly inclined toward the folder frame **104** until they approach the horizontal at the far end or innermost end of the folder frame **102**.

Upon reference to FIG. 17, it will be appreciated that as the blank **21** and its glue flap **26** move past the ramp **119** and progressively inclined manipulating rollers **120**, these elements act to fold the glue flap about the score line **22** and toward the inside or upper face of the blank. By the time the blank has reached the end of the glue flap folder frame **102**, the glue flap **26** has been folded through an angle of substantially 180°.

In order to hold down the blank **21** and maintain it in precise lateral position for accurate breaking along the score line **22**, the folder frame **102** is provided with a hold-down shoe **121** overlying the inside face of the blank. The shoe **121** may be adjustably mounted on the folder frame **102** as by means of hanger brackets **122**, support columns **124**, and adjustable clamping brackets **125** slidably positionable on a cleat **126** of dovetailed cross section running longitudinally of the frame **102**.

In order to accommodate the glue flap **26** as it is folded progressively toward the inside face of the blank, the adjacent longitudinal edge portion of the hold-down shoe **121**, as well as its trailing end portion, may be relieved or chamfered as at **128**, **129**. This facilitates the making of a decisive break and a relatively sharp fold on the score line **22**.

As the blank passes out of engagement with the trailing end of the hold-down shoe **121**, a portion of its inside face previously covered by the shoe is engaged by a hold-down roller **130** (FIGS. 15, 16, 17). The latter in this case is journaled on a hanger **131** supported by an upstanding column **132**. The column **132**, in turn, is adjustably secured to the folder frame **102** by means of a clamping bracket **125** similar to those described earlier herein and also adapted to engage the cleat **126**.

The left-hand folder frame **104** (FIGS. 19A, 19B,

20A, 20B) constitutes one of the main supporting and guiding means for the blank 21 in its passage through the entire machine. In so far as the first prebreaking stage is concerned, the folder frame 104 serves primarily as a moving support and locating means maintaining the blank in position as it is acted upon by the associated folder frames 102 and 105.

For present purposes, it will suffice to note that the left-hand folder frame 104 comprises a keel-like support beam 134 running longitudinally of the machine (FIGS. 19A and 19B). At its end adjacent the feeder (on the right as viewed in FIG. 19B) the beam 134 has a depending bracket 135 which engages transverse support strut 108 between the side frame members 32. In its intermediate portion, the beam 134 has a second depending bracket 136 with a nut 138 at its lower end engaging a transverse positioning screw 139 spanning the side frame members 33. Adjacent its trailing end (on the left as viewed in FIG. 19A) the beam 134 has a third depending support bracket 140 which engages a transverse strut 141 spanning the side frame members 34.

Operatively associated with the support beam 134 and extending along its entire length is a carrier belt 142. The belt 142 is trained over a main drive pulley 144, keyed or otherwise fixed to the drive shaft 115, and a second main drive pulley 145, keyed or otherwise fixed to a drive shaft 146 adjacent the delivery end of the machine. The upper flight of the belt 142 is supported at closely spaced longitudinal intervals by means of support rollers 148 mounted on the beam 134 in any suitable manner (FIGS. 19A, 19B). The lower flight of the belt 142 is trained over fixed idlers 149, 150, 151, 152, and adjustable idler 154. The latter is carried by a depending bracket 155 which includes adjusting screw 156 and knob 158 for regulating belt tension.

With the arrangement just described, the belt 142 is adapted to engage the underside or outside face of the blank 21 along the marginal edge portion of its side panel 28 adjacent the score line 23, and to maintain that engagement throughout all the processing stages of the apparatus. In order to facilitate holding the blank in precise position laterally of the belt 142 as the blank moves through the machine, the folder frame 104 is provided with a top carrier assembly 159 (FIGS. 19A, 19B, 20A, 20B). The latter comprises a structural member 160, which in this case happens to be a structural angle member, extending longitudinally of the machine and adjustably supported by transverse slide bars 161, 162. The bar 161 spans the tops of the side frames 32, while the bar 162 similarly spans the tops of the side frames 33. Suspended in depending relation from the structural member 160, as by means of hangers 164, is a pressure shoe 165 which is disposed in overlying relation with the belt 142 and its support rollers 148. In the present instance, the pressure shoe 165 is fashioned as an inverted channel member having a plurality of longitudinally spaced rollers 166. The latter are resiliently loaded or biased so as to bear downwardly against the lower flight of a pressure belt 168 disposed in overlying registered relation with the carrier belt 142 for a little over half the length of the latter. Under the action of pressure rollers 166, the belt 168 is adapted to coact with the carrier belt 142 for effectively gripping the blank therebetween. The pressure belt 168 is trained over a main drive pulley 169, keyed or otherwise fixed to shaft 170, adjacent the feeder, and a plurality of fixed idlers 171, 172, 173, 174, and an adjustable idler 175. The idler 175 is journaled on the free end of a rockable arm 176 positionable as by means of handwheel 178 and a worm and gear mechanism to regulate belt tension.

Turning now to the first right-hand folder frame 105 (FIGS. 21–25), it will be noted that the same comprises a keel-like support beam 180 mounted longitudinally of the machine and spaced laterally to the right of the folder frame 104 as viewed from the feeder end of the machine. One end of the beam 180 is carried by means of a depending bracket 181 fixed to a nut member 182 on a transverse positioning screw 184 which spans the side frames 32. The opposite end of the beam 180 is carried by a depending bracket 185 connected to a nut member 186 on transverse positioning screw 139 which spans the side frames 33.

The support beam 180 has operatively associated therewith a carrier belt 188 adapted to engage the underside of the blank side panel 28 adjacent the score line 24. The latter is trained over a main drive pulley 189 keyed or otherwise fixed to the shaft 115, and a second main drive pulley 190, keyed or otherwise fixed to the shaft 191. The upper flight of the belt 188 is supported at closely spaced longitudinal intervals by means of support rollers 192 journaled on the beam 180 (FIGS. 21, 23–25). The lower flight of the belt 188 is trained over fixed idlers 192, 194, and adjustable idler 195. The latter, like the idler 154 described earlier herein, is mounted on a depending bracket 196 and is adjustable thereon for regulation of belt tension.

Mounted in overlying relation with the belt 188 is a top carrier assembly 198 comprising a longitudinally disposed pressure shoe 199 and a cooperating pressure belt 200 pressed against the belt 188 by the shoe 199. The shoe 199 in this case is fashioned as an inverted channel member and includes a plurality of resiliently loaded or biased rollers 201 adapted to bear against the lower flight of the pressure belt 200. The shoe 199 is held in position by means of a pair of upstanding brackets 202, 204, suspended from horizontal yoke member 205, as by means of hangers 206, 208. The yoke member 205, in turn, is adjustably secured to the transverse slide bar 161. The belt 200 is trained around a main drive pulley 209 keyed or otherwise fixed to the shaft 170, and around fixed idlers 210, 211, 212, and an adjustable idler 214. The latter is mounted at the free end of a rockable adjusting arm 215 positionable as by means of handwheel 216 and a worm and gear arrangement to control belt tension.

Provision is made in the folder frame assembly 105 for engaging blank side panels 29, 30 as a unit and breaking them upwardly about the score line 24 through an angle of approximately 110° with respect to the original plane of the blank. This is accomplished by the use of a relatively wide folder belt 218 traveling at the same speed as the blank and adapted to effect broad engagement with the outside surface of the side panel 29 as the blank moves along under the action of the carrier and pressure belts 142, 168 and 188, 200. In this instance, such breaking action takes place during the time the glue flap is being broken and may continue for a short interval thereafter.

The belt 218 is spaced adjacent to, and on the right-hand side of, the carrier and pressure belts 188, 200, as viewed in FIG. 23. It is trained around a drive pulley (FIG. 22) fixed to the shaft 115 in close, laterally spaced relation with the drive pulley 189 of carrier belt 188. The belt 218 includes a folding flight 218A running along the support beam 180 and having an upwardly inclined twist which becomes progressively steeper in the direction of motion of the blank through the machine. The flight 218A is supported and guided by a backing bar 220 (FIGS. 23, 24, 25) secured to the top of the beam 180 and having an upper face which changes in inclination from horizontal to approximately vertical in the direction of motion of the blank.

At the end of the flight 218A remote from the drive pulley 219, the belt 218 is trained around an inclined idler 221 partially overlying the carrier belt 188. The idler 221 is disposed so that its outer periphery, and hence the plane of the belt 218 in that area, will make an acute angle of approximately 80° with the plane of the belt 188. The idler 221 is adjustably mounted on a

column 222 carried by clamp bracket 224 which engages a cleat 225 running longitudinally of the beam 180.

The return flight 218B of the belt 218 runs from the idler 221 over a second inclined idler 226 (FIGS. 21, 22 and 24) mounted somewhat higher than the idler 221 and disposed a little further to the right as viewed in FIG. 24. The idler 226 is adjustably mounted by means including a column 228 and a clamp bracket 229 which also engages the cleat 225. The return flight 218B extends from the idler 226 in a downwardly inclined direction, with a twist, and passes over inclined idler 230 carried by depending bracket 231 adjustably clamped to the cleat 225. From the idler 230, the flight 218B passes over common fixed idler 194, which also carries the belt 188, and thence to the drive pulley 219.

By reason of the arrangement just described, as the blank 21 is carried along the folder frames by the belts 142, 168, 188, 200, the folding flight 218A of the belts 218 engages a wide area of the underside of the side panel 29. Due to the progressive inclination of the flight 218A and the backing bar 220, the side panel 29 and its associated side panel 30 are cammed upwardly as a unit so as to break about the score line 24. This continues until the upward folding or breaking movement of the side panels 29, 30 has caused them to move through an angle of approximately 110° with respect to their original position in the plane of the blank. At this point, the first prebreaking stage is completed.

Second Prebreaking Stage

In the second prebreaking stage, exemplified in FIG. 7, provision is made for breaking the side panels 27, 28 relative to one another about the score line 23 and at the same time for down-folding the side panels 29, 30 to a position approaching the original plane of the blank in preparation for breaking them relative to each other about the score line 25. Also, as an incident to the second prebreaking stage, the glue flap 26 is urged back toward a coplanar relationship with the side panel 27 as the latter is folded upwardly into a substantially perpendicular position about the score line 23.

In furtherance of the foregoing, the left-hand folder frame 104 is provided with a folder belt 232 (FIG. 19B) adapted to engage the underside of the side panel 27 adjacent the score line 23 and to cam the panel 27 upwardly shortly after it passes the pressure roller 130 (FIG. 17). The folder belt 232 is trained over a drive pulley 234 fixed to the shaft 115 in close, laterally spaced relation to the drive pulley 144 of belt 142 and on the left of the latter as viewed from the feeder end of the machine. The belt 232 has a folding flight 232A extending along a backing bar 235 fixed to the beam 134 of the left-hand folder frame. The backing bar 235 has an inclined ramp 236 defined in its upper surface and having a lateral inclination which increases progressively in the direction of blank movement until it reaches a substantially vertical attitude. The folding flight of the belt 232 terminates at a fixed idler 238 spaced adjacent the end of the backing bar 235 (FIG. 19B) and which is adapted to rotate in a horizontal plane. The idler 238 is disposed in partially overlying relation with the beam 134 and its outer periphery is spaced from the pressure shoe 165 by a distance slightly greater than the thickness of the folder belt 232. The idler 238 is journaled on a clamp bracket 239 which is adjustably secured to a cleat 240 running longitudinally of the beam 134. The folder belt 232 also has a return flight 232B extending from the idler 238, thence to fixed idler 241, thence downwardly and with a twist to fixed idler 242, thence to common fixed idler 152 which also supports the belt 142, and thence to drive pulley 234. Tension in the belt 232 may readily be regulated by adjusting the position of one or more of the fixed idlers 238, 241 or 242.

It will be appreciated that, by reason of the construction just described, as the side panel 27 moves out of engagement with the pressure roller 130, the underside of the side panel 27 will be pressed upwardly by the belt 232 toward the pressure shoe 165 and with a progressively increasing thrust. At the same time, the glue flap 26 tends to spring back partially toward its original position coplanar with the side panel 27. Accordingly, as the side panel 27 approaches the fixed idler 238, the belt 232 folds the panel 27 to substantially a perpendicular position with respect to the original plane of the blank. As an incident to such action, the glue flap is brought against the vertical side surface of the pressure shoe 165 tending to make it approach a coplanar relation with the panel 27.

In order to provide for down-folding of the side panels 29, 30 in preparation for breaking them relative to each other about the score line 25, the first right-hand folder frame is provided with a fixed folder shoe 244 having a contour somewhat similar to that of a moldboard plow. The shoe 244 is disposed in longitudinally aligned, overlying relation with the beam 180 of the folder frame, being supported by means of a yoke 245 adjustably fixed to transverse slide bar 162 and a pair of hangers 246, 248 (FIGS. 21 and 22). The shoe 244 has a sword-like extension 249 extending past the idler 221 and almost to the end of the backing bar 220. The extension 249 is adapted to engage the inside face of side panel 29 adjacent the score line 24 and to begin camming the same outwardly and downwardly. Such action is increased by the downwardly inclined underside of the shoe 244 which ultimately forces the side panel 29 down to an almost horizontal position, carrying with it the side panel 30.

Adhesive Stage

From the first prebreaking stage, the blank 21 continues to travel in a straight line along the moving support defined by the carrier belts 142, 188, and enters the adhesive stage (FIGS. 8, 19A, 19B, 20A, 20B, 26, and 27). During the course of the adhesive stage, the glue flap 26 is precisely positioned by the consistent lateral dimension of its associated upfolded side panel 27 and then adhesively treated either by application of thermally activated adhesive or by activation of thermoplastic adhesive material already present on the glue flap. At approximately the same time, the side panel 30 is folded upwardly relative to the side panel 29 so as to break about the score line 25 therebetween.

In keeping with the foregoing, the apparatus includes an adhesive applicator 250 (FIGS. 19A, 20A, 26 and 27) which, in the present instance, is adapted to apply to the outside face of the glue flap 26 one or more beads of fast-setting, thermally activated adhesive. The applicator 250 may take a wide variety of forms and supply many different adhesives, but the present invention is not concerned with those particular details. For present purposes, it will suffice to note that the applicator 250 comprises a reservoir housing 251 containing an appropriate adhesive melt and an adhesive roller 252 having a portion of its periphery projecting slightly beyond one side of the housing 251. The housing is mounted alongside the path of the glue flap in closely spaced relation therewith so that the adhesive roller makes rolling contact with the outer face of the glue flap to deposit the adhesive thereon. By the same token, the applicator also includes a back-up roller 254 of somewhat smaller diameter than the adhesive roller and positioned to make rolling contact with the inside face of the glue flap while the adhesive roller is acting on the opposite side.

The adhesive applicator 250 may conveniently be mounted on an adjustable support platform 255 carried by one of the intermediate side frames 33 (FIGS. 26 and 27). The applicator may be power driven to effect positive rotation of the rollers 252, 254 and also to maintain a steady supply of thermoplastic adhesive in the reservoir housing 251. In the present instance, driving power is supplied to the applicator 250 from main drive shaft 191 which runs transversely of the side frames 33. The shaft 191 may include at its outer end of a sprocket wheel 256 con-

nected by chain **258** to a corresponding sprocket **259** on the applicator. Chain tension may be controlled by means of an idler **260** meshing with the chain and mounted on the end of a resiliently biased arm **261**.

Provision is made for precisely locating the glue flap **26** by utilizing the lateral dimension of its adjacent side panel **27** and for maintaining the glue flap and its adjacent side panel in such precise position relative to the plane of the blank during the adhesive operation. In furtherance of such objective, the left-hand folder frame **104** includes a backing sheet **262** (FIGS. 19A, 19B) fixed between the structural support **160** and the left-hand face of the pressure shoe **165** adjacent their trailing ends. Substantially coplanar with the backing sheet is a relatively short guide bar **264** interposed between the trailing end of the sheet and the closest side of the adhesive reservoir housing **251**. Mounted in close, laterally spaced relation with the backing sheet and guide bar **262, 264** is a fixed guide rail **265**. The latter is adapted to bear against the marginal edge portion of the outside face of the side panel **27** adjacent the glue flap so as to maintain the perpendicular relation of the side panel to the original plane of the blank and its moving support. In this case, the guide rail **265** is supported on a pair of adjustable columns **266, 268** attached to the folder frame beam **134** as by means of clamping brackets **269, 270** (FIGS. 19A, 19B, 20A, 20B). The adjustment of the columns **266, 268**, and the guide rail **265** is such that the latter runs substantially parallel with the path of the blank and slightly below the reservoir housing **251**.

As noted earlier herein, the side panel **30** is broken relative to the side panel **29** by being folded upwardly about the score line **25** as an incident to the adhesive operation. To accomplish this, and also to effect subsequent manipulation of the side panel **30**, the apparatus includes a second right-hand folder frame **272** extending between the side frames **33, 34** and situated to the right of the first right-hand folder frame **105** as viewed from the feeder end of the apparatus (FIGS. 28, 29).

The second right-hand folder frame **272** comprises a longitudinal beam **274** (FIG. 28) supported at one end by a depending bracket **275** fixed to a nut **276** on transverse adjusting screw **278**, the latter running transversely of the side frames **33**. The opposite end of the folder frame beam **274** is supported by a depending bracket **279** fixed to a nut **280** on transverse adjusting screw **281** which runs transversely of the side frames **34**. The folder frame **272** includes a carrier belt **282** somewhat similar to carrier belts **142, 188** described earlier herein. The carrier belt **282** extends between a drive pulley **284**, keyed or otherwise fixed to shaft **191**, and a drive pulley **285**, keyed or otherwise fixed to the shaft **146**. The upper flight of the carrier belt **282** is supported longitudinally by a plurality of aligned, longitudinally spaced, support rollers **286** journaled on the beam **274** in any suitable manner. The lower flight of the carrier belt **282** is trained around fixed idlers **288, 289** and adjustable idler **290**. The latter is adjustably mounted on a depending bracket **291** carried by the beam **274** and may be shifted in the manner described earlier herein for regulation of belt tension.

The folder frame **272** is also provided with a folder belt **292** trained around a drive pulley **294**, keyed or rigidly fixed to main shaft **295**, thence around fixed idlers **296, 298**, and adjustable idler **299** which is shiftably mounted on bracket **300** for regulating belt tension (FIG. 28). The folder belt **292** has a lower or folding flight **292A** which extends from the fixed, inclined idler **298** and along a laterally inclined guide surface on top of the folder frame beam **274**, ultimately assuming a longitudinal twist and then flattening out as it approaches the main drive pulley **294** (FIGS. 28, 29 and 26). The belt **292** also has a return flight **292B** which extends from the drive pulley **294** and idlers **296, 299** directly to the inclined idler **298**, making a single longitudinal twist therebetween.

Operatively associated with the folder belt **292** and adapted to hold down the blank side panel **29** as the side panel **30** is broken upwardly about the score line **25** by the belt **292**, is a hold-down shoe **301**. The latter, in this instance, happens to be a structural angle member disposed with one of its flanges closely overlying the carrier belt **282** and having a free edge adjacent the folding flight of the belt **292** (FIG. 30). The hold-down shoe extends longitudinally for the greater part of the length of the folder frame **272** and is held in position by means of a large offset bracket **302**. The bracket **302** is rigidly fixed to the beam **274** and has a horizontal yoke **304** at its top, the latter being connected to the hold-down shoe **301** as by means of a pair of hangers **305, 306**. To facilitate breaking of the blank at the score line **25**, the adjacent free edge of the hold-down shoe **301** may be chamfered or tapered as at **308** (FIG. 30).

In order to preclude downward and lateral bowing of the intermediate side panels **28, 29** of the blank on the prefolded score line **24** as a result of manipulation of the side panels **27, 30** during and subsequent to the adhesive operation, a fixed central support means is interposed between the right- and left-hand folder frames **272, 104**. This comprises a support bar **309** (FIG. 28) anchored in any suitable manner adjacent the feeder end of the folder frame **272**, and a support rail **310** running substantially the length of the folder frame **272** and carried by brackets **311, 312** fixed in any suitable manner to its beam **274**.

Sealing and Bonding Stage

From the adhesive stage, the blank **21**, still moving in a straight line on the carrier belts **142, 188, 282**, enters the sealing and bonding stage (FIGS. 9, 19A, 20A, 28, 29). During this stage, the side panel **27** and adhesively activated glue flap **26** are rapidly downfolded through approximately 90° against the inside face of the blank, followed a short interval later by similarly rapid downfolding of the side panel **30** through approximately 90°, until the free marginal edge portion of the latter abuts against the glue flap **26** to form an adhesive juncture therewith. Such action is thereupon followed by the application of pressure on the side seam area to complete the transformation of the blank into the flat folded collapsed tube illustrated in FIG. 4. The foregoing is accomplished in part by the action of a folder belt **315** mounted on the left-hand folder frame **104**, and in part by the folder belt **292**, mounted on the second right-hand folder frame **272**.

The folder belt **315** (FIG. 19A) is trained between a main drive pulley **316**, keyed or otherwise fixed to the shaft **295**, and a fixed idler **319** mounted on the folder frame beam **134** and adapted to rotate in a horizontal plane. The idler **319** may conveniently be journaled on an adjustable clamp **320** engaging the cleat **240** on the side of the beam **134**.

The belt **315** has a folding flight **315A** extending between the idler **319** and the drive pulley **316**. The folding flight **315A**, which is substantially vertical at the idler **319**, has a longitudinal twist causing it to incline progressively toward the pressure shoe **165** as it moves away from the idler **319**. In the course of such action, the folder flight **315A** tends to overlie a progressively increasing area of swordlike extension **321** of pressure shoe **165**, carrying with it the side panel **27** and glue flap **26** and camming them downwardly about the score line **23**. Such downfolding action is further accentuated by the use of a plurality of longitudinally spaced rollers **322, 324, 325, 326**, and **328** adjustably mounted in brackets on the beam **134** and each oriented to force the folding flight **315A** a little flatter. The return flight **315B** of the folder belt **315** runs from drive pulley **316** over inclined adjustable idler **329** and fixed idler **330**, both carried by the bracket **331**, thence rearwardly along the beam **134** to the horizontally disposed fixed idler **319**.

Shortly after the downfolding of the side panel **27** and glue flap **26** is initiated, the folder belt **292** of the second right-hand folder frame initiates similar downfolding of the side panel **30** about the score line **25** and

toward the inside face of the blank (FIGS. 28, 29, 30, 31). Such folding action is brought about by the lateral inclination of the twisted folding flight **292A** of the folder belt **292** and is facilitated by the tapered or chamfered edge portion **308** of the folder shoe **301**. Accordingly, as the blank approaches the ends of the folder frames **104, 272**, the marginal edge portion of the side panel **30** is brought into abutting relation with the adhesively activated glue flap **26**, forming an adhesive juncture therewith and converting the blank **21** into a flat collapsed tube such as illustrated in FIG. 4.

The blank is thereupon moved by the carrier belts **142, 188, 282** into engagement with a pair of pressure rolls **332, 334** (FIG. 32) fixed respectively to the drive shafts **146, 295** between the drive pulleys **145, 285** and **294, 316**. Thus disposed, the pressure rolls **332, 334** are adapted to apply substantial sealing pressure to the newly formed adhesive juncture, or in other words, to the side seam, of the blank. This results in completion of the formation of the side seam and transformation of the blank into the flat collapsed tube shown in FIG. 4.

From the pressure rolls, the completed, flat folded blank is presented to an appropriate delivery means such as transfer belts **335, 336** (FIG. 2) and delivery conveyor **338**. The latter preferably includes belts **339, 340** which are arranged to run at a somewhat slower linear speed than the carrier, folder, and transfer belts described earlier herein. Consequently, as successive blanks are discharged from the apparatus and presented to the delivery conveyor, they tend to overlap in a well-known manner and to accumulate on delivery table **341**, thus facilitating subsequent handling and packaging.

Main Drive

While it will be appreciated by those skilled in the art that the various carrier, pressure, and folder belts of the apparatus **20** are driven in timed relation to each other at a common linear speed, it might be helpful to indicate briefly the arrangement of the main driving means. Referring more specifically to FIG. 26, it will be noted that a main drive motor **342** is mounted in the lower portion of the apparatus between the side frames **33**. The motor **342** is drivingly connected, as by means of a heavy duty belt **344**, to drive shaft **191** journaled transversely of the side frames **33**. The shaft **191** has keyed or otherwise fixed thereon a main drive pulley **345** (FIGS. 26 and 29) drivingly connected by means of belt **346** to the main drive shaft **115** at the feeder end of the machine. The shaft **115** is journaled transversely of the frame members **32** and geared to its companion drive shaft **170**. By the same token, the main drive pulley **345** is drivingly connected as by means of belt **347** and pulley **348** to shaft **146** journaled transversely of the frame members **34**, the latter being geared to its companion drive shaft **295** (FIGS. 29 and 32). By reason of such positive driving arrangement of the main pulleys of the carrier, pressure, and folder belts, severe unbalances in belt tension are virtually eliminated and high-speed operation of the machine at rates of 1200 blanks per minute, for example, is greatly facilitated.

We claim as our invention:

1. A method for side seaming a flat carton blank having a plurality of parallel longitudinal score lines dividing the same into side panel areas and a glue flap adjacent one of said areas, said method comprising the steps of moving the carton blank longitudinally of the score lines therein and along a support, prebreaking the blank about each score line by folding one or more said panel areas and said glue flap out of the plane of said blank, adhesively activating said glue flap while the same and its adjacent side panel area are folded out of the plane of said blank, folding said glue flap and its adjacent side panel in the same direction against the face of said blank, folding another side panel area against the folded glue flap, and applying pressure thereto to complete the adhesive bond.

2. A method of forming the side seam of a flat carton blank of foldable paperboard or the like having four parallel longitudinal score lines dividing the blank into four side panel areas and a glue flap, the latter being situated at one marginal edge of said blank, said method comprising the steps of moving the carton blank longitudinally of the score lines therein and along a support, subjecting said blank to a prebreaking stage wherein the glue flap is bent against the face of said blank through an angle of approximately 180° and the two side panel areas remote from said glue flap are bent as a unit through an angle of at least 90° about the second score line, subjecting said blank to a second prebreaking stage wherein said glue flap is bent back through approximately 90° toward its original position and the side panel area adjacent said glue flap is bent at substantially the same time out of the plane of the blank through an angle of approximately 90° into substantially coplanar relation with said glue flap and said two side panel areas previously bent up are folded back so as to approach the plane of the blank, subjecting said blank to an adhesive applicator for the activation of adhesive on said glue flap while the latter and its associated side panel are approximately perpendicular to the plane of the blank, the side panel area remote from said glue flap being concurrently bent through an angle of approximately 90°, folding said side panel and glue flap against the face of said blank through an angle of approximately 90° and then folding said remote side panel area toward the face of said blank and into sealing contact with said glue flap, subjecting said blank to pressure to facilitate sealing and bonding of the adhesive, and delivering said flat folded blank in the form of a collapsed tube for subsequent presentation to forming, filling, closing and sealing equipment.

3. A method for side seaming a flat carton blank having a plurality of parallel longitudinal score lines dividing the same into side panels and a glue flap adjacent one of said side panels, said method comprising the steps of moving the carton blank longitudinally of the score lines therein and along a support, prebreaking the blank about each score line by folding one or more said side panels and said glue flap out of the plane of said blank, positioning said glue flap for activation of adhesive by utilizing the lateral dimension of said adjacent side panel while the same and said glue flap are folded out of the plane of said blank, adhesively activating said glue flap while the same and its said adjacent side panel are folded out of the plane of said blank, folding said glue flap and said adjacent side panel in the same direction against the face of said blank, folding another side panel against the folded glue flap, and applying pressure thereto to complete the adhesive bond.

4. Apparatus for forming the side seam of a flat carton blank of foldable paperboard or the like having four parallel longitudinal score lines dividing the blank into four side panel areas and a glue flap, the latter being situated at one marginal edge of said blank, said apparatus comprising, in combination, means defining a movable support, means for moving the carton blank longitudinally the score lines therein and along said support, means for subjecting said blank to a prebreaking stage wherein the glue flap is bent against the face of said blank through an angle of approximately 180° and the two side panel areas remote from said glue flap are bent as a unit through an angle of at least 90° about the second score line, means for subjecting said blank to a second prebreaking stage wherein said glue flap is bent back through approximately 90° toward its original position and the side panel area adjacent said glue flap is at substantially the same time bent out of the plane of the blank through an angle of approximately 90° into substantially coplanar relation with said glue flap and

said two side panel areas previously bent up are folded back so as to approach the plane of the blank, an adhesive applicator situated for the activation of adhesive on said glue flap while the latter and its associated side panel are approximately perpendicular to the plane of the blank, the side panel area remote from said glue flap being concurrently bent through an angle of approximately 90°, means for folding said side panel and glue flap against the face of said blank through an angle of approximately 90° and then folding said remote side panel area toward the face of said blank and into sealing contact with said glue flap, means for subjecting said blank to pressure to facilitate sealing and bonding of the adhesive, and means for delivering said flat folded blank in the form of a collapsed tube for subsequent presentation to forming, filling, closing and sealing equipment.

5. Apparatus for side seaming a flat carton blank having a plurality of parallel longitudinal score lines dividing the same into side panels and a glue flap adjacent one of said side panels, said apparatus comprising, in combination, a movable support, means for moving the carton blank longitudinally of said support, means associated with said support for prebreaking the blank about each score line by folding one or more of said side panels and said glue flap out of the plane of the blank, means for positioning said glue flap relative to said support for application of adhesive by utilizing the lateral dimension of said adjacent side panel while the same and said glue flap are folded out of the plane of said blank, an adhesive applicator adapted for activation of adhesive on said glue flap while the same and its said adjacent side panel are folded out of the plane of said blank, means for folding said glue flap and said adjacent side panel in the same direction against the face of said blank following activation of adhesive on said glue flap, means for folding another side panel against said folded glue flap, and means for applying pressure to said other side panel and folded glue flap to complete an adhesive bond therebetween.

6. Apparatus for forming a seam in a carton blank having a plurality of longitudinal score lines each defining a corner when the blank is formed into a carton, said apparatus comprising the combination of a support, means for moving the blank longitudinally of said score lines and in continuous straight line motion along said support, means for folding portions of said blank sequentially about each said score line, means for activating adhesive on one said portion of said blank when in folded position, and means for folding the adhesive carrying portion of said blank into contact with another portion of said blank under pressure to complete a seam in the carton.

7. Apparatus for forming a side seam in a carton blank having longitudinal score lines dividing the blank into a plurality of side panels and a glue flap, said apparatus comprising, in combination, means for prebreaking the blank about each score line by folding one or more of said side panels and said glue flap out of the plane of the blank, an adhesive applicator adapted for activation of adhesive on said glue flap, means for positioning said glue flap for activation of said adhesive by utilizing the lateral dimension of said adjacent side panel while the same and said glue flap are folded out of the plane of the blank, means for sealing and bonding said glue flap and another of said side panels to form an adhesive juncture therebetween, and a movable support disposed in continuous engagement with one side panel of said blank during said prebreaking, adhesive activation, and sealing and bonding.

8. Apparatus for forming a side seam in a carton blank having longitudinal score lines dividing the blank into a plurality of side panels and a glue flap, said apparatus comprising the combination of means for prebreaking the blank about each score line by folding one or more of said side panels and said glue flap out of the plane of the blank, adhesive applicator means adapted for activation of adhesive on said glue flap, means for positioning said glue flap for adhesive activation by utilizing the lateral dimension of said adjacent side panel while the same and said glue flap are folded out of the plane of the blank, means for sealing and bonding said glue flap and another of said side panels together to form a side seam, and a movable support disposed in constant engagement with said blank and adapted to move the same with continuous straight line motion during said prebreaking, adhesive activation, and sealing and bonding.

9. Apparatus for forming a side seam in a carton blank having longitudinal score lines dividing the blank into a plurality of side panels and a glue flap, said apparatus comprising the combination of means including a plurality of folder frames for prebreaking the blank about each score line by folding one or more of said side panels and said glue flap out of the plane of the blank, an adhesive applicator adapted for activation of adhesive on said glue flap, means for positioning said glue flap for activation of said adhesive by utilizing the lateral dimension of said adjacent side panel while the same and said glue flap are folded out of the plane of the blank, means for sealing and bonding said glue flap and another of said side panels to form a side seam, and a single carrier belt on one of said folder frames disposed in constant engagement with said blank and adapted to move the same with continuous straight line motion during said prebreaking, adhesive activation, and sealing and bonding.

10. Apparatus for forming a side seam in a carton blank having a plurality of side panels defined by longitudinal score lines, said apparatus comprising the combination of means for prebreaking the blank about each score line by folding one or more of said side panels out of the plane of the blank, adhesive applicator means adapted for activation of adhesive along the marginal edge of one of said side panels, means for positioning said one side panel for adhesive activation by utilizing the lateral dimension thereof while the same is folded out of the plane of the blank, means for bringing said one side panel and another of said side panels together to form a side seam, and a movable support disposed in constant engagement with said blank and adapted to move the same with continuous straight line motion during said prebreaking, adhesive activation, and side seam formation.

11. Apparatus for forming a side seam in a carton blank having a plurality of side panels and a glue flap defined by longitudinal score lines, said apparatus comprising, in combination, means including a plurality of folder frames for prebreaking the blank about each score line by folding one or more of said side panels and said glue flap out of the plane of the blank, an adhesive applicator adapted for activation of adhesive on the marginal edge portion of one of said side panels, means for positioning said one side panel for activation of said adhesive by utilizing the lateral dimension thereof while folded out of the plane of the blank, means for bringing said marginal edge of said one side panel and said glue flap together under pressure to form a side seam, and a single carrier belt on one of said folder frames disposed in constant engagement with said blank and adapted to move the same with continuous straight line motion during said prebreaking, adhesive activation, and side seam formation.

12. An apparatus for forming a side seam in a carton blank under continuous motion therethrough, said blank being cut and scored to define therein a plurality of side panels and a glue flap, said apparatus comprising, in combination, a first folder frame adapted to prebreak the glue flap, a second folder frame extending substantially the length of said apparatus, a third folder frame disposed adjacent said second folder frame and extending for approximately the first half of the length of the lat-

ter, a fourth folder frame spaced laterally from the other folder frames and extending for approximately the remaining half of the length of the same, and an adhesive applicator disposed between the midpoint of said second folder frame and the far end thereof for applying adhesive to the glue flap as an incident to continuous motion of the blank through said apparatus.

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