United States Patent [19]

Scully

[11] **3,740,031**

[45] **June 19, 1973**

[54] **APPARATUS FOR PRODUCING CARTONS**

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[73] Assignee: **Pneumatic Scale Corporation,** Quincy, Mass.

[22] Filed: **July 12, 1971**

[21] Appl. No.: **161,612**

Related U.S. Application Data

[62] Division of Ser. No. 813,172, April 3, 1969.

[52] **U.S. Cl.** ..... **271/35,** 271/29, 271/44 SS, 271/41

[51] **Int. Cl.** **B65h 3/04**

[58] **Field of Search** ..... 271/29, 35, 41, 44 SS, 271/44 R

[56] **References Cited**

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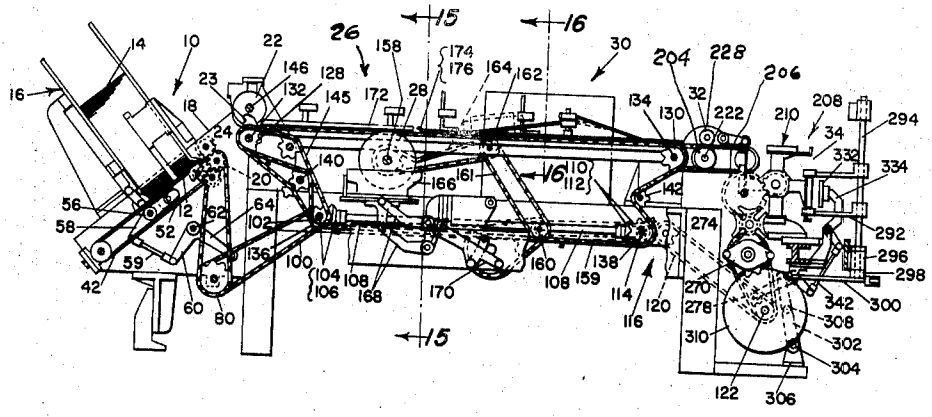
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Attorney—Robert T. Gammons

[57] **ABSTRACT**

Apparatus comprising a side seaming device adapted to fold a prescored carton blank along two score lines and to provide an adhesively secured side seam to form a flat tube. The apparatus also includes a carton blank feeding device preceding the side seaming device for feeding blanks to the latter and a device following the side seaming device for reverse folding the flat tube along the remaining two score lines.

9 Claims, 24 Drawing Figures



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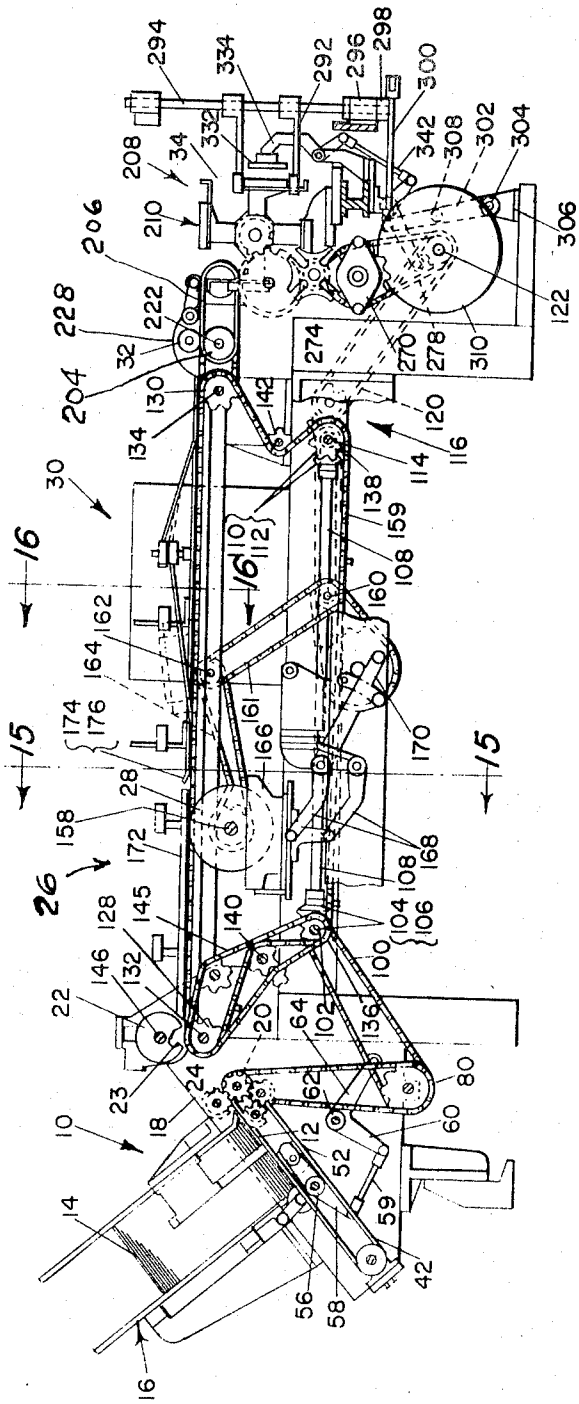


Fig. 1

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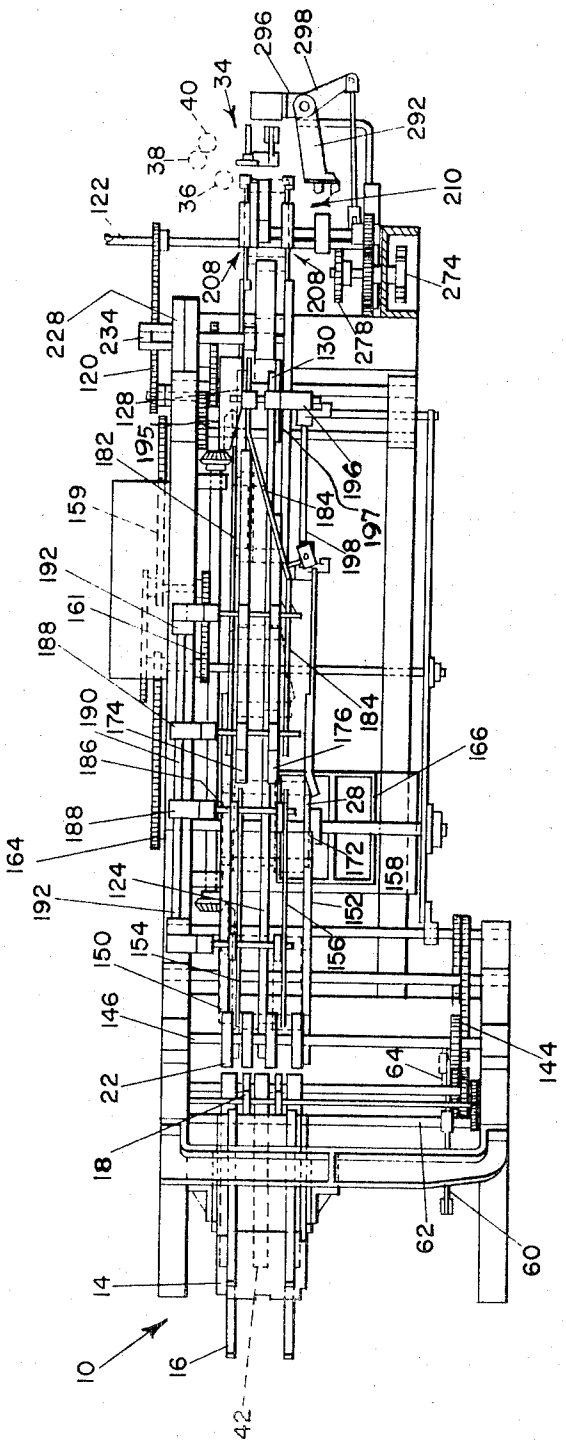


Fig. 2

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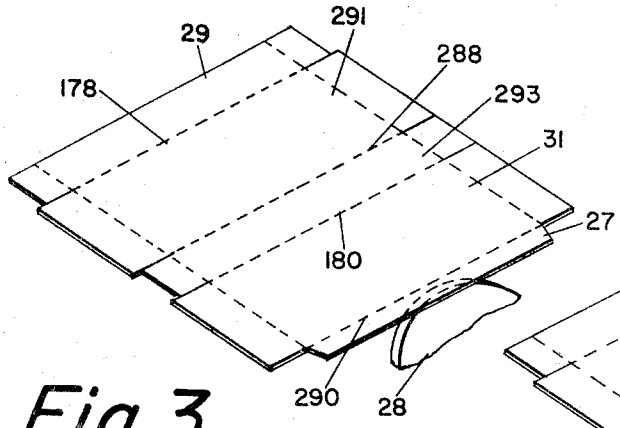


Fig. 3

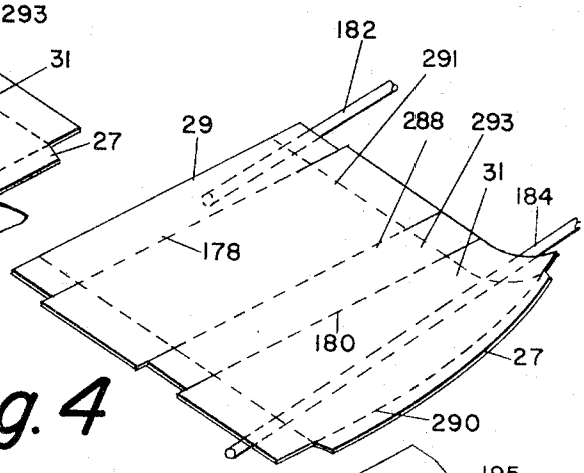


Fig. 4

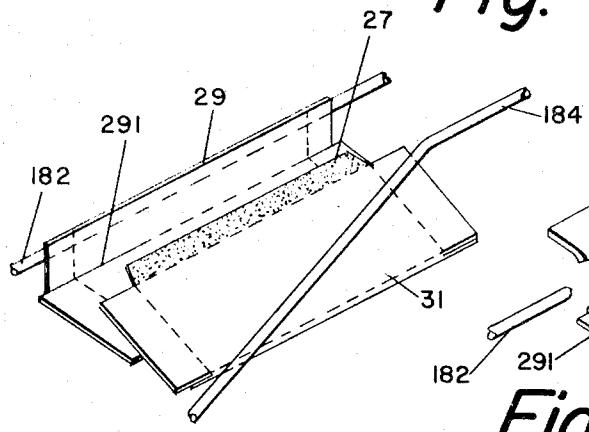


Fig. 5

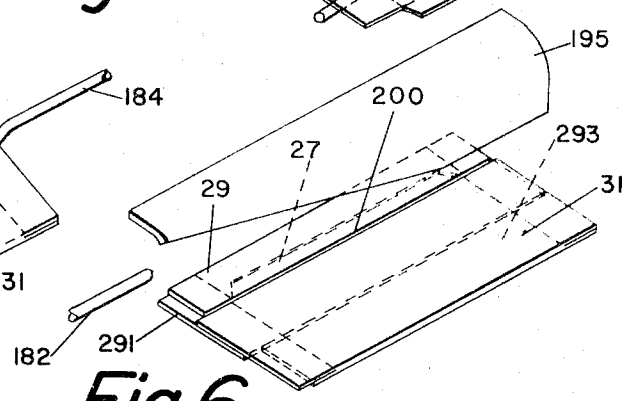


Fig. 6

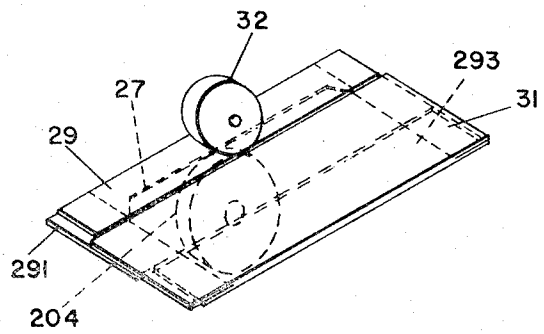


Fig. 7

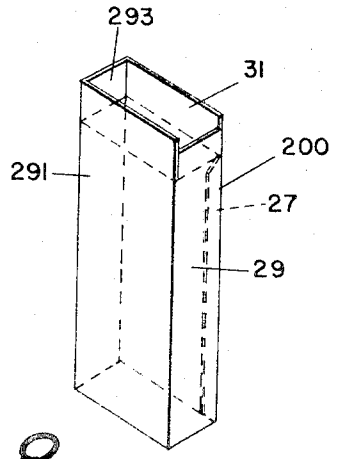


Fig. 8

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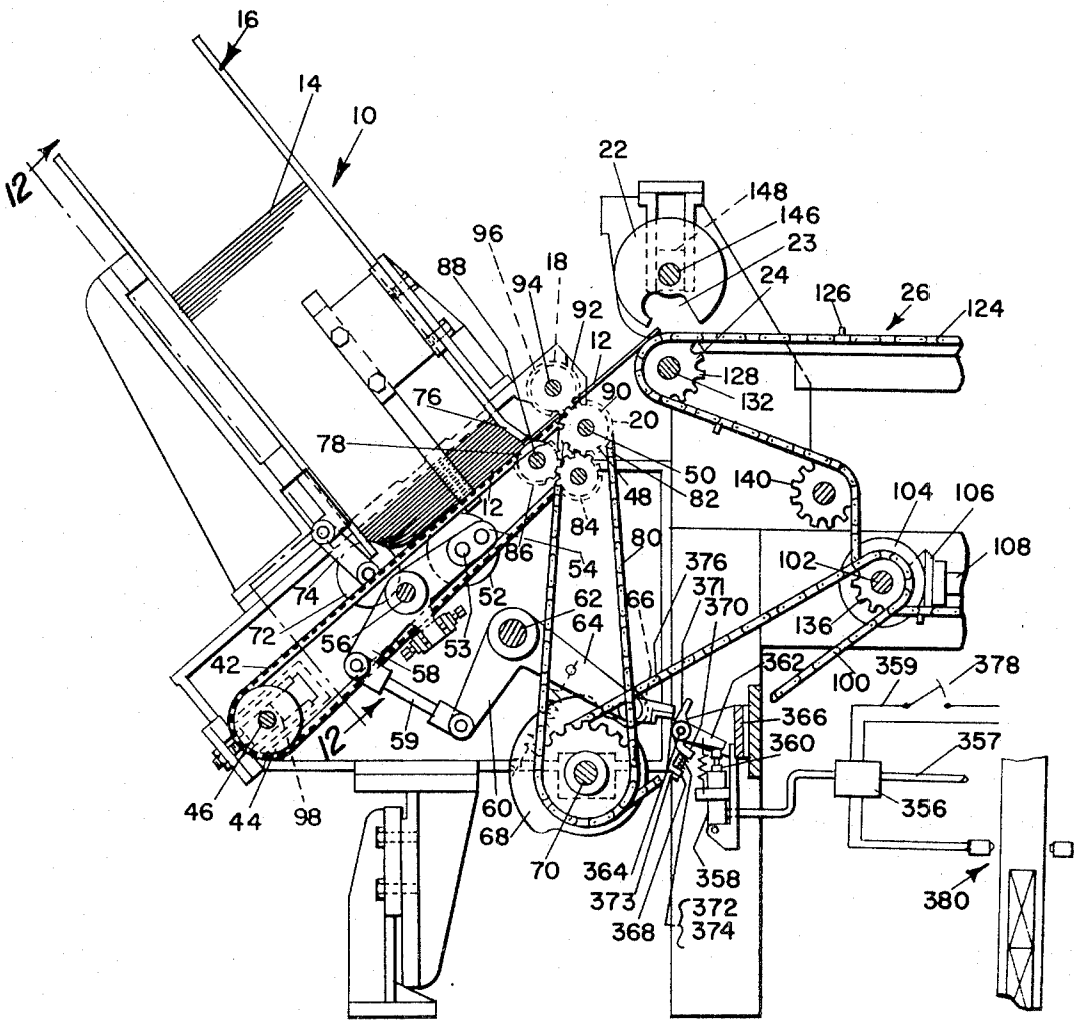


Fig. 9

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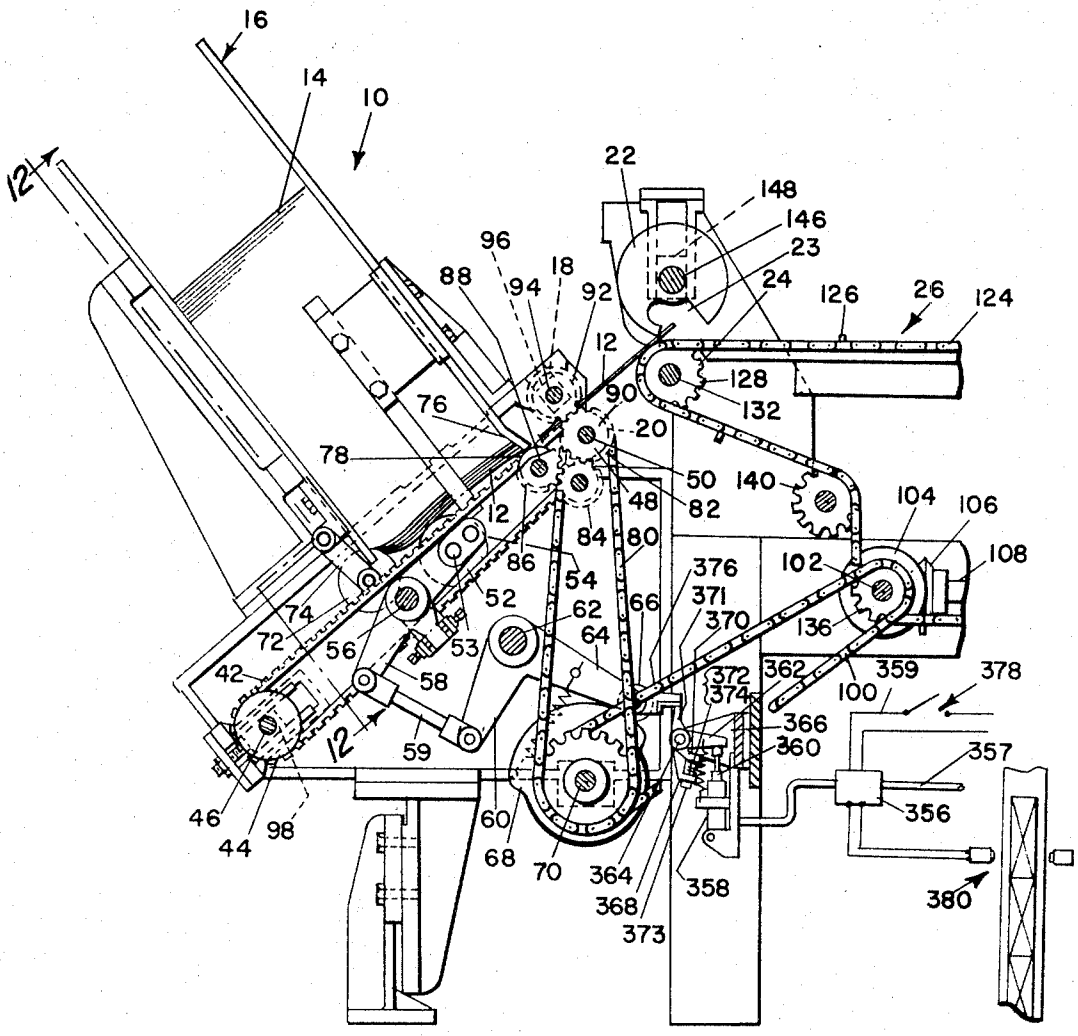
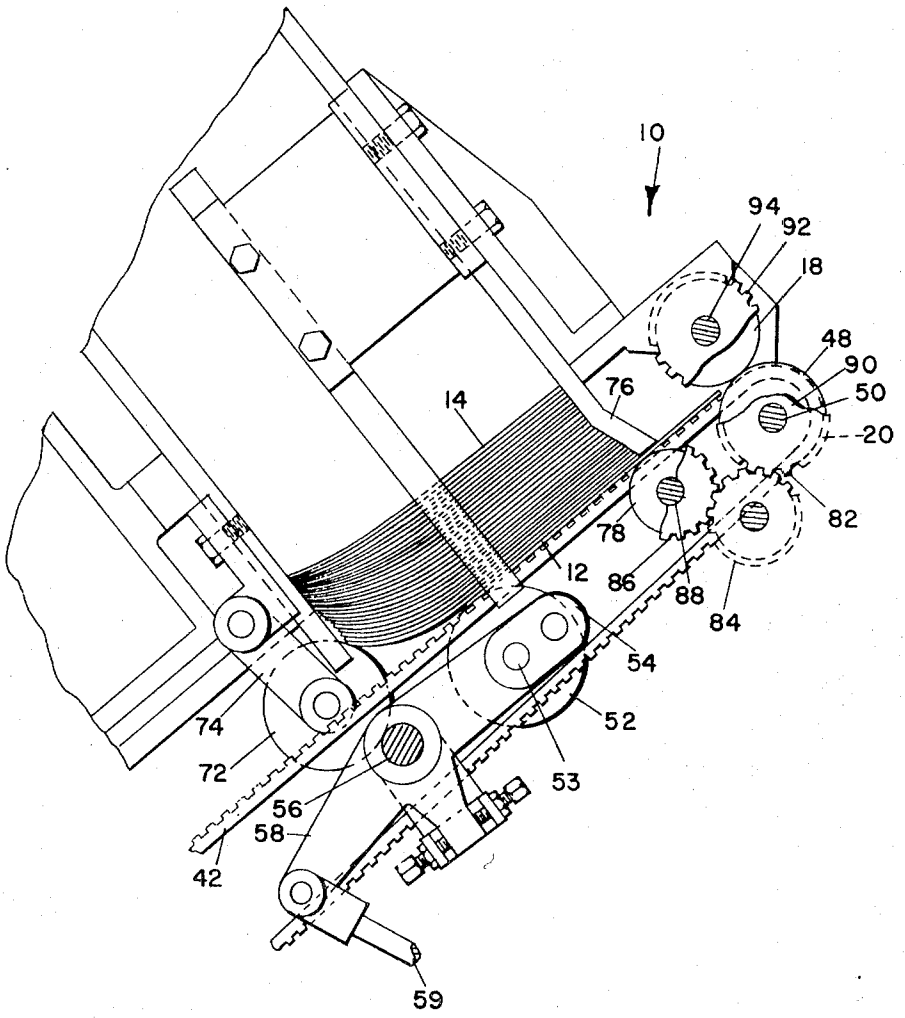


Fig. 10

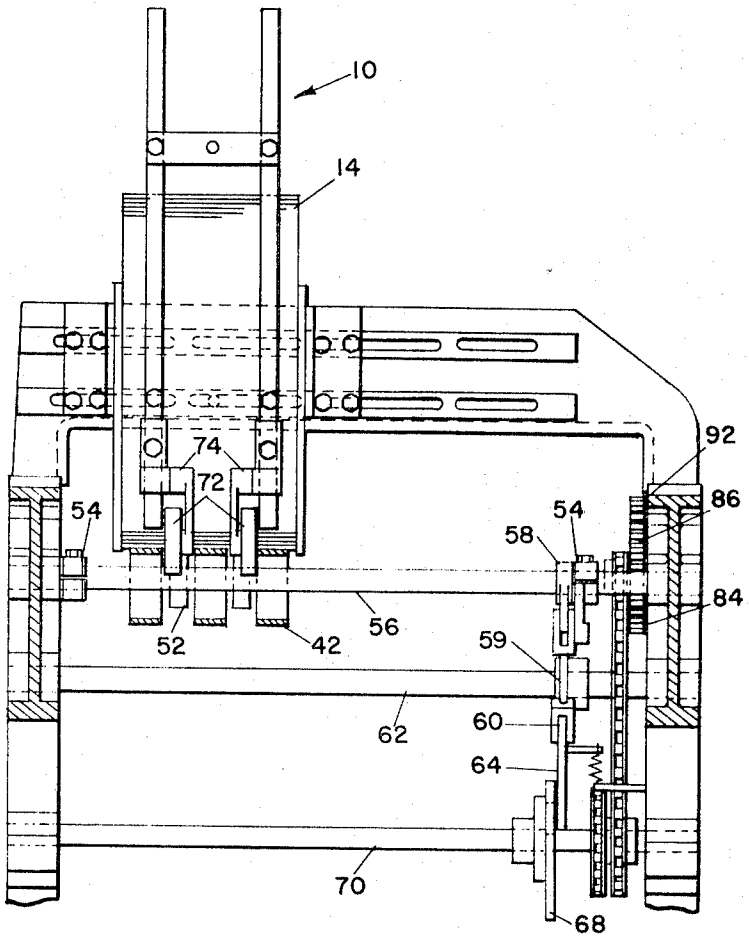
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Fig. 11



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Fig. 12



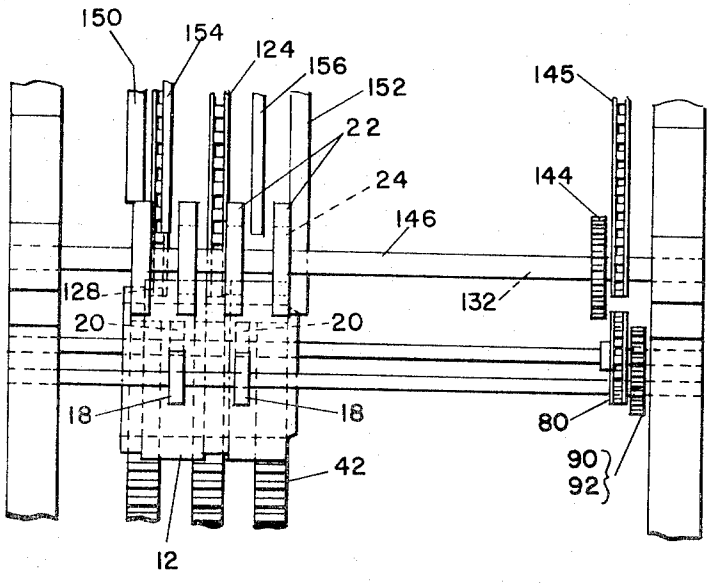


Fig. 13

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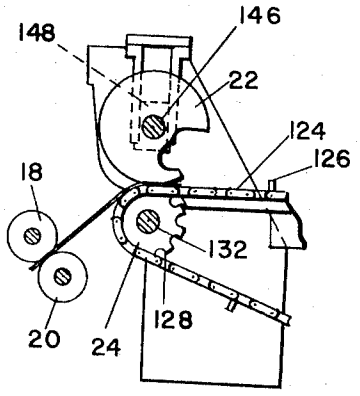


Fig. 14

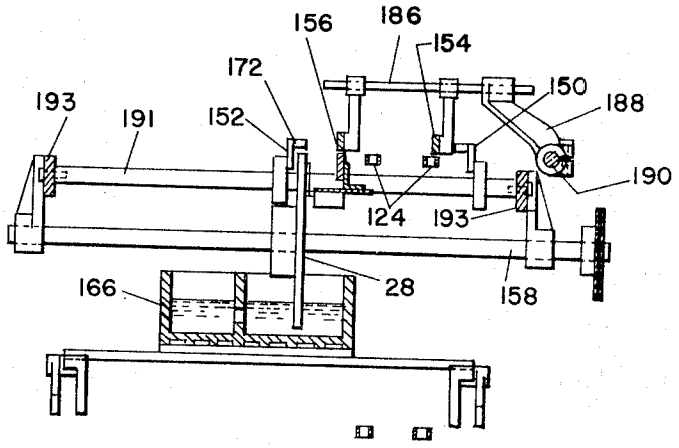


Fig. 15

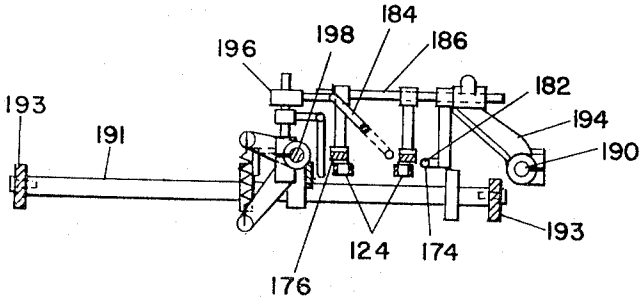


Fig. 16

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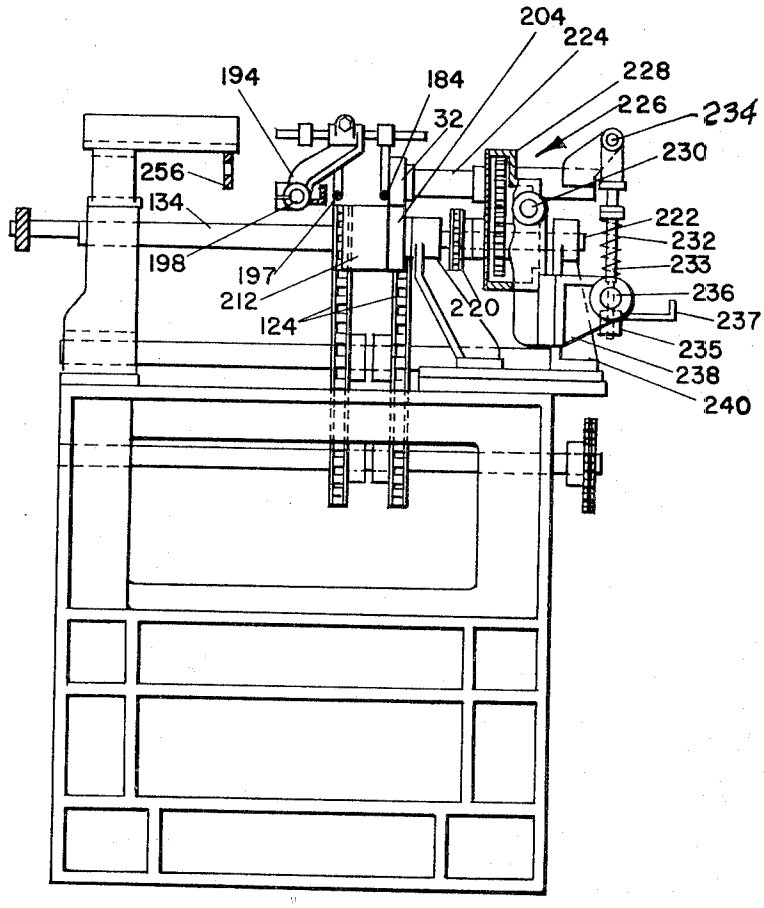


Fig. 17

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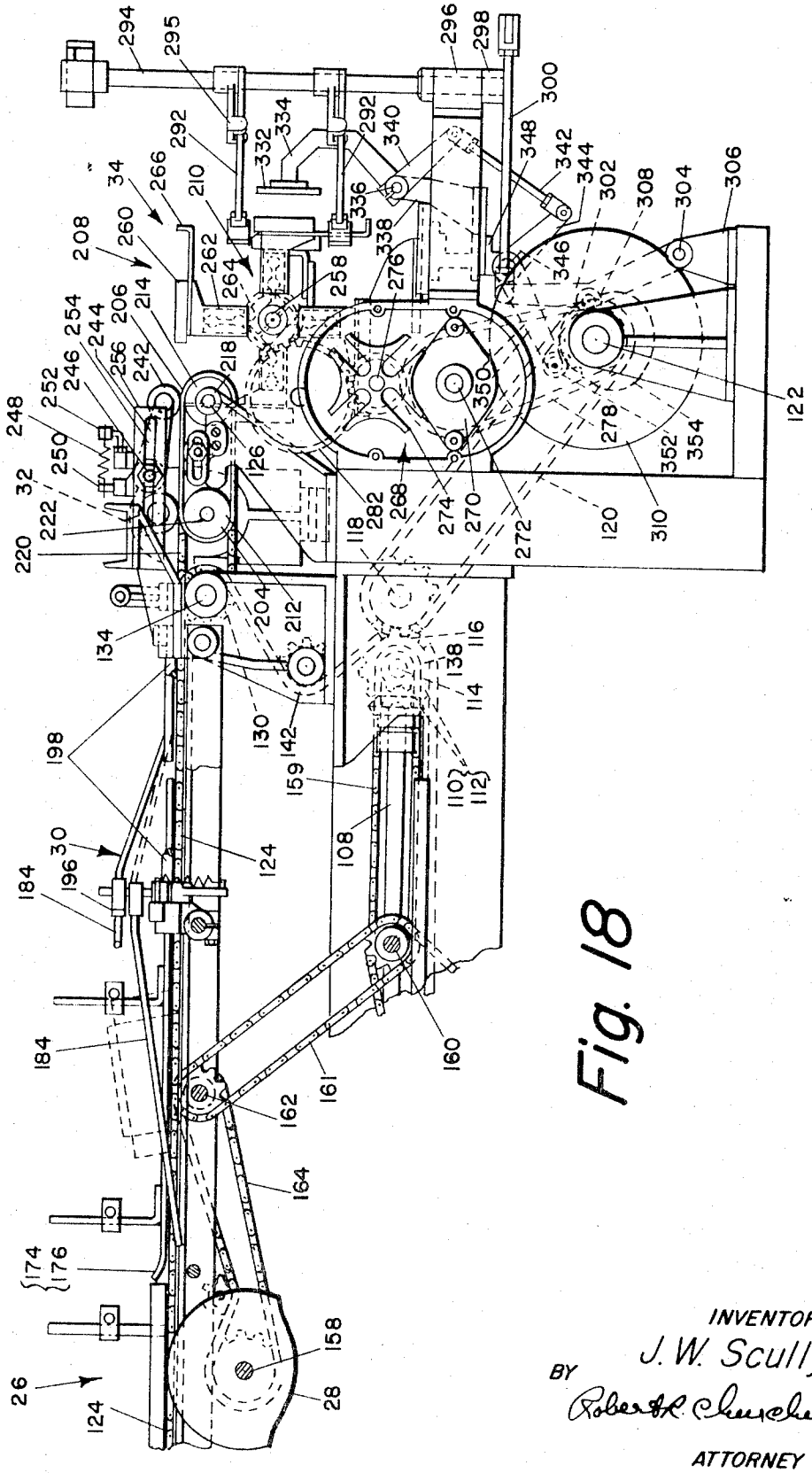


Fig. 18

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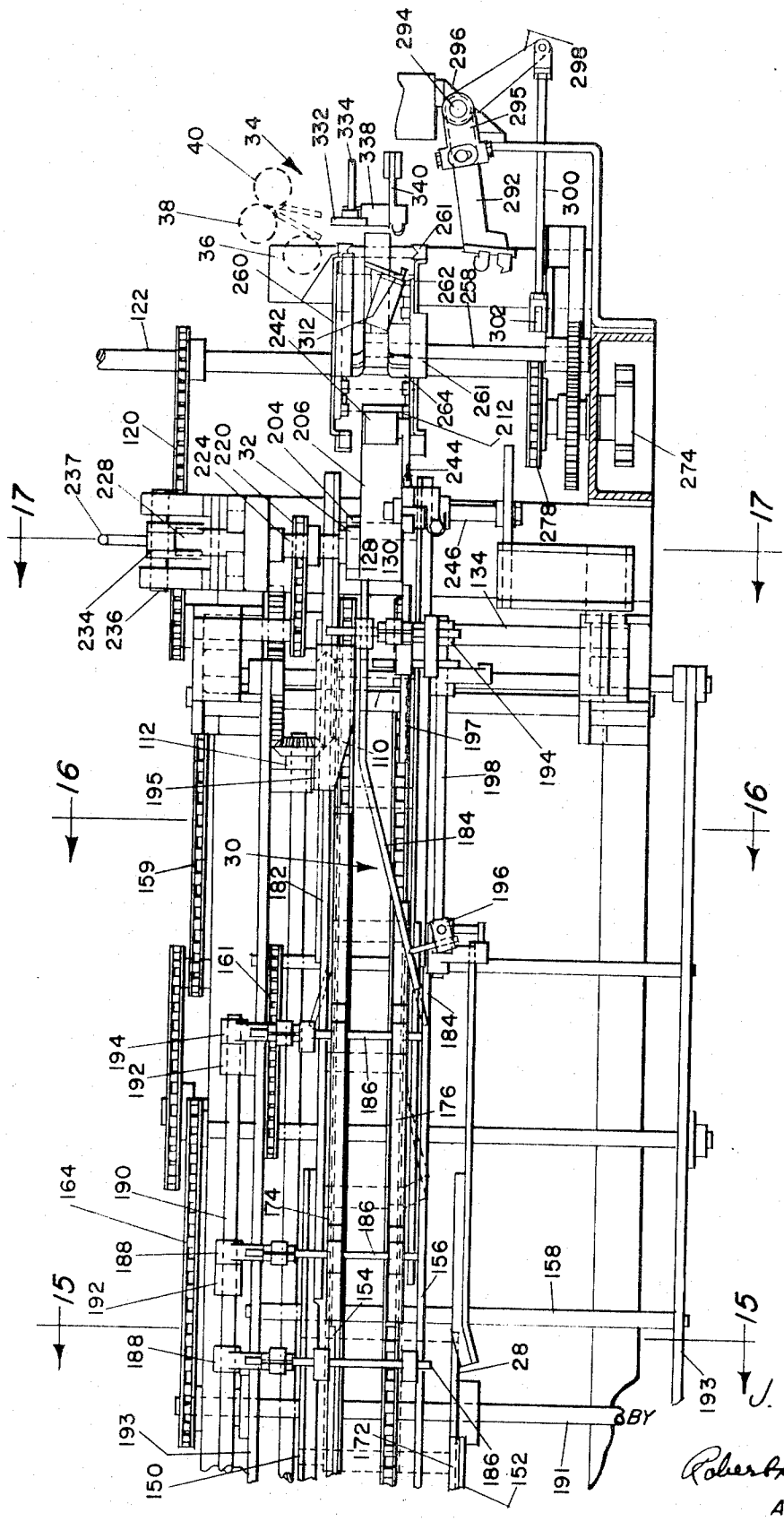


Fig. 19

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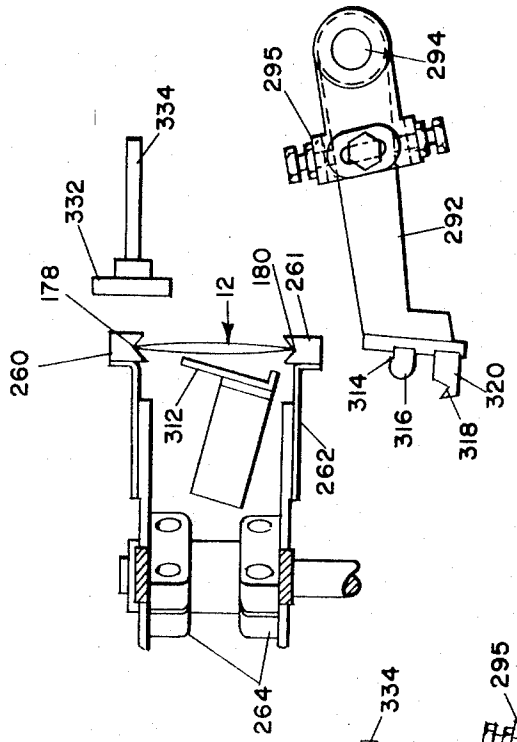


Fig. 20

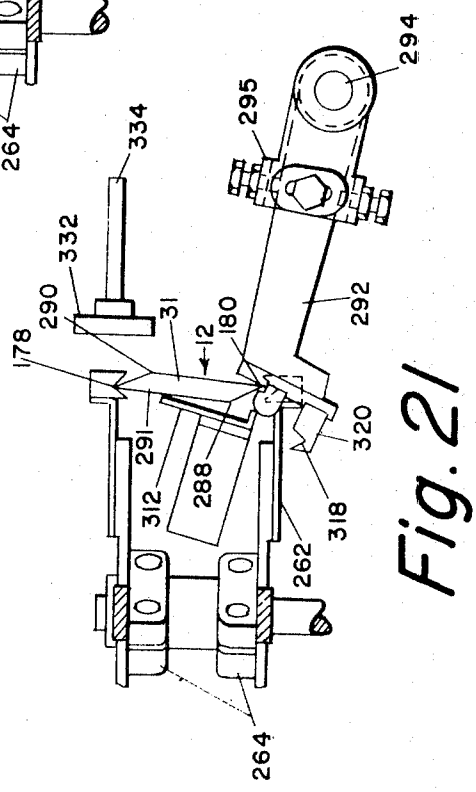


Fig. 21

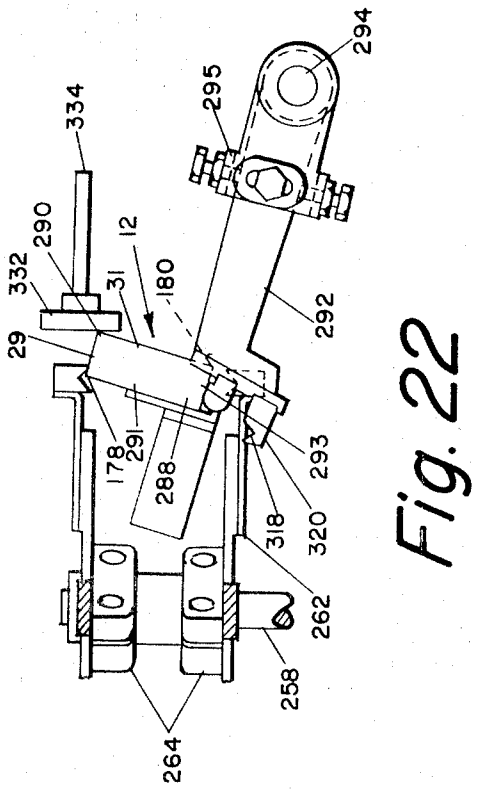


Fig. 22

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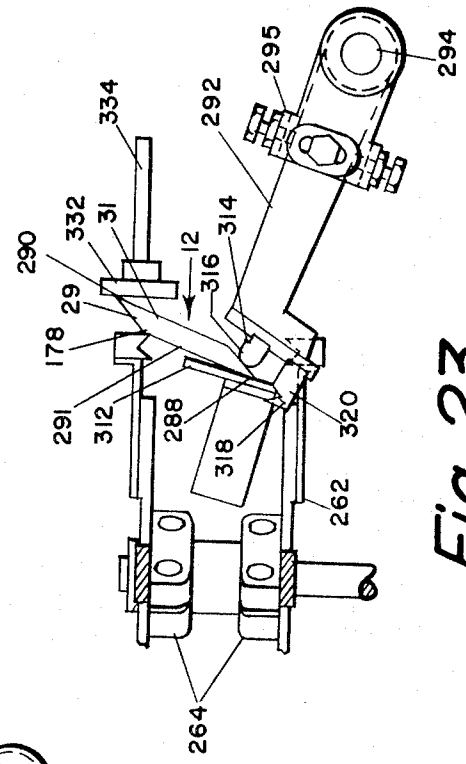


Fig. 23

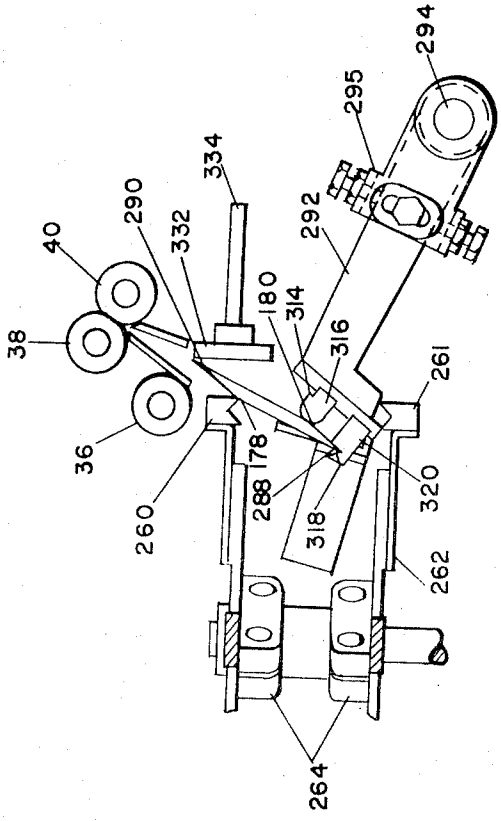


Fig. 24

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APPARATUS FOR PRODUCING CARTONS

This is a division of my copending application, Ser. No. 813,172, filed Apr. 3, 1969, for apparatus for producing cartons.

SUMMARY OF THE INVENTION

This invention relates to the packaging art and contemplates novel apparatus for feeding, folding, side seaming and reverse bending flat tubular cartons, known in the art as "knockdown" cartons, prepared from prescored carton blanks. The feeding mechanism is arranged to withdraw successive lowermost carton blanks from a stack thereof and to present successive blanks to a continuously moving conveyer where the blanks are first provided with a strip of adhesive along a seam forming portion. The prescored panels on either side of the blank are then folded inwardly to foin the marginal edges and to form a tube provided with a side seam. The side seam is then pressed to firmly set the adhesive.

In the illustrated embodiment of the invention provision is made for transferring successive flat tubular cartons from the tube forming conveyer to a reverse folding or bending device arranged to open the flat folded cartons and to refold the same 180° in the opposite direction along the score lines which were previously unfolded. In operation, the cartons thus reverse folded are transferred directly to a bottom sealing machine, not shown, where each carton is squared up and applied to a mandrel or forming block whereupon the bottom flaps are closed and adhesively secured to provide a bottom closure. Alternatively, the flat tubular cartons may be stacked and stored for future use.

Prior to the present invention it has been the practice for those in the packaging trade to purchase the flat tubular cartons from a carton manufacturer, and in practice such cartons are transferred from a magazine into the pocket of a bottom sealing machine where the carton is squared up and applied to a forming block to be bottom sealed. One transfer mechanism widely used in the packaging industry comprises a reciprocating bladelike device which is inserted within a flat knockdown carton in a magazine and then moved to open the carton and to present the same between rollers which deliver the carton to the squaring pocket of the bottom sealing machine. The prior art apparatus for feeding the side seamed cartons to a bottom sealing machine is exemplified generally in the patent issued to S. R. Howard, U.S. Pat. No. 1,916,425, July 4, 1933. While such prior devices have operated successfully over a long period of time, it was found that in practice if the cartons supplied by the manufacturer were not of uniform shape and size, or were slightly displaced in the magazine, there would be times where the bladelike device would fail to transfer a carton to the bottom sealer. The expedient of side seaming the cartons, reverse bending the same and feeding them directly into the bottom sealing machine, in accordance with the present invention, gives the user better control of the product and also results in a saving in that the cartons do not have to be stacked and stored for future use and then again handled when ready for use. Furthermore, the expedient of forming the side seam in the packaging plant rather than purchasing the side seamed cartons resulted in a saving in the initial cost of the cartons.

Accordingly, the present invention has for one object to provide apparatus for producing flat tubular cartons from prescored carton blanks characterized by novel structure adapted to produce the cartons in a rapid, efficient and economical manner.

The invention has for another object to provide novel and improved apparatus of the character specified characterized by novel carton blank feeding mechanism arranged to withdraw successive carton blanks from a stack thereof at a rapid rate.

The invention has for a further object to provide novel and improved apparatus of the character specified having novel provision for opening and reversely folding a flat tubular carton in a rapid and efficient manner.

With these general objects in view and such others as may hereinafter appear, the invention consists in the apparatus for producing cartons and in the various structures, arrangements and combinations of parts hereinafter described and particularly defined in the claims at the end of this specification.

BRIEF DESCRIPTION OF THE DRAWINGS

In the drawings illustrating the preferred embodiment of the invention:

FIG. **1** is a side elevation of apparatus for producing cartons embodying the present invention;

FIG. **2** is a plan view of the apparatus shown in FIG. **1**;

FIGS. **3** to **7** illustrate in perspective the different steps followed in producing a side seamed carton from a prescored carton blank;

FIG. **8** is a perspective view of a carton provided with a bottom seal;

FIG. **9** is a side elevation view of the carton blank feeding device;

FIG. **10** is a view similar to FIG. **9** showing the parts in a different position of operation;

FIG. **11** is a cross sectional view at a larger scale of the lower end of the magazine showing a blank partially withdrawn;

FIG. **12** is a cross sectional view of the carton blank feeding device as seen from the line **12—12** of FIG. **9**;

FIG. **13** is a plan view of the receiving end of the carton folding and side seaming conveyr;

FIG. **14** is a detail view of the carton blank transfer rolls shown in a different position of operation;

FIG. **15** is a cross sectional view taken on the line **15—15** of FIG. **1**;

FIG. **16** is a cross sectional view taken on the line **16—16** of FIG. **1**;

FIG. **17** is a front elevation, partly in cross section, of the side seam pressing mechanism as taken on the line **17—17** of FIG. **1**;

FIG. **18** is a view in side elevation of the side seam forming mechanism and the carton opening and reverse folding mechanism disposed at the discharge end of the side seam conveyer;

FIG. **19** is a plan view of the mechanism shown in FIG. **18**; and

FIGS. **20** to **24** are detail views in plan elevation showing the different positions of operation of the reverse folding and carton advancing or discharge mechanism.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to the drawings and particularly to FIG. 1, in general the present apparatus includes carton blank feeding mechanism **10** adapted to withdraw successive lowermost carton blanks **12** from a stack **14** thereof supported in a magazine **16.** The upright stack is arranged at an angle of about 40° from the vertical for convenience in loading the magazine and also to reduce the height of the unit.

The carton blanks **12** are prescored and, in operation, successive blanks withdrawn from the stack are advanced longitudinally to present the leading ends thereof first between advancing rolls **18, 20** and then between transfer rolls **22, 24** the latter being arranged to present the cartons to a horizontal conveyer indicated generally at **26** wherein a marginal edge, comprising the side seam flap **27,** of the blank is provided with adhesive by a glue applying roller **28** during the advance of the carton blank. The side wall panels along the outer edges of the carton, including a narrow panel **29** on one side and a wider panel **31** on the other side, are then folded inwardly by folding rails indicated generally at **30** to present the longitudinal marginal edges in overlapping and adhesive engagement. The carton is thus folded along two score lines and provided with a side seam, the latter being firmly pressed to set the seal by a presser roll **32** during the continuous advance of the blank.

In practice, the blanks thus folded and sealed to form a flat tube may be discharged from the apparatus and stored for future use, or the side seamed cartons may be fed directly to a magazine from which they are withdrawn and opened by conventional means to be delivered to a bottom sealing machine. However, in the illustrated embodiment of the invention, novel provision is made for opening the carton and effecting reverse folding thereof along the two remaining score lines whereupon the carton is transferred directly to a bottom sealing machine. The carton opening, folding and transferring mechanism is indicated generally at **34** in FIGS. **1** and **2,** and includes a guide roll **36** and a pair of advancing rolls **38, 40** which serve to press the reverse folds and to advance the cartons to the bottom sealing machine, not shown.

Referring now to FIGS. **9** and **10** for a more detailed description of the carton blank feeding mechanism **10,** it will be seen that successive lowermost carton blanks **12** in the stack are arranged to be withdrawn by engagement with a plurality of laterally spaced friction belts **42** arranged to run over spaced idler pulleys **44** fast on a shaft **46** and spaced drive pulleys **48** fast on a shaft **50.** The friction belts **42** are run continuously and each belt comprises a rubber belt having a plurality of small upstanding resilient projections thereon.

In order to control the withdrawal of successive blanks in timed relation to the operation of the machine, a plurality of laterally spaced lifting rolls **52,** which extend between the spaced belts **42,** are arranged to alternately elevate the stack **14** to lift the lowermost blank **12** away from the belts and to lower the stack to present the lowermost blank in frictional engagement with the belts to effect withdrawal of a blank. The rolls **52** are mounted on a rod **53** carried by spaced arms **54** which are mounted on a shaft **56.** A second arm **58** carried by the shaft **56** is connected by a link **59** to one arm **60** of a bell crank mounted to rock on a shaft **62.** The second arm **64** of the bell crank carries a roller **66** for cooperation with a cam **68** fast on a cam shaft **70.**

As herein shown, the rear edge of the lower end of the stack **14** engages a roller **72** carried by an arm **74** which is adjustably mounted in the magazine **16.** The roller **72** carries some of the weight of the stack and is extended slightly forwardly of the rear edge of the stack so as to cause the leading edges of the lowermost group of blanks to feather out forwardly as shown. The forward end of the stack carries a plurality of angular guides **76** against which the feathered edges of the lowermost group of blanks rests. The guides **76** are vertically adjustable and are arranged to cooperate with driven rolls **78** to assist in freeing the lowermost blank from the stack. In operation, the spacing between the lower ends of the guides **76** and the periphery of the rolls **78** is about one and one-half times the thickness of the carton blank. When the lifting rolls **52** are rocked to their elevated position, as shown in FIG. **10,** the blanks are raised above the friction belts **42** and, conversely, when the stack is lowered by the rolls **52,** as shown in FIG. **9,** the lowermost blank is engaged by the belts and carried under the guides **76** into the grip of the driven feed rolls **18, 20** spaced a short distance forwardly of the front end of the magazine. In practice, the friction belts are operative to feed the forward end of the blank for a short distance only before the feed rolls **18, 20** take over the blank advancing operation, the rolls being driven at a surface speed equal to the linear speed of the belts **42.** As shown in FIG. **11,** the spacing between the guides **76** and the rolls **78** permits only one blank at a time to be withdrawn from the underside of the stack. In operation, the lifting rolls **52** must be actuated to elevate the stack before the trailing end of the blank being withdrawn leaves the magazine whereby to prevent release of a succeeding carton immediately following the first. IN operation, the cam operated lifting rolls thus serve to control the spacing of the carton blanks in timed relation to the operation of the machine. FIG. **9** shows the lifting rolls **52** in their lowered position to permit withdrawal of the lowermost blank, and FIG. **10** shows the lifting rolls in their elevated position wherein the stack is lifted away from the friction belts **42.**

The leading ends of successive carton blanks **12** advanced by the feed rolls **18, 20** are received between the continuously driven transfer rolls **22, 24** to be delivered to the horizontal conveyer **26.** As herein shown, the upper transfer rolls **22** are provided with cutouts **23** to receive the leading ends of the blanks and to ease their transition from an inclined position to a horizontal position on the conveyer **26.**

The drives to the carton blank feeding device **10** include a chain and sprocket drive **80** from the cam shaft **70** to the shaft **50** on which the pulleys **48** are mounted. The shaft **50** is connected by spur gears **82, 84, 86** to a shaft **88** on which the rolls **78** are mounted for cooperation with the guides **76.** The shaft **50** is also connected by spur gears **90, 92** to a shaft **94** which carries the upper feed rolls **18.** The shaft **94** is carried by spring pressed block bearings **96** slidingly mounted in the side frames and the shaft **46** on which the pulleys **44** are mounted is also carried by block bearings **98** adjustably mounted in the frames to serve as a belt tightener.

The cam shaft 70 is driven by a chain and sprocket connection 100 to a shaft 102 which latter is connected by bevel gears 104, 106 to a longitudinally extended shaft 108. The latter shaft is connected by bevel gears 110, 112 to a driven shaft 114. The shaft 114 is connected by spur gears 116 to a shaft 118 which in turn is connnected by a chain and sprocket drive 120 to a main cam shaft 122 forming a part of a bottom sealing machine to which reference has been made.

As illustrated in FIGS. 1 and 2, the horizontal conveyer 26 includes a pair of laterally spaced chains 124 provided with longitudinally spaced lugs or flights 126 arranged to engage the rear or trailing edges of a blank 12 delivered to the conveyer by the transfer rolls 22, 24. The chains 124 are continuously driven and are arranged to run over upper sprockets 128, 130 mounted on shafts 132, 134, respectively, at each end of the conveyer; lower sprockets 136, 138 mounted on shafts 102, 114; and intermediate guide sprockets 140, 142. The sprockets 138 are fast on the shaft 114 to effect driving of the chains 124. The shaft 132 is connected by spur gears 144 to the shaft 146 on which the upper rolls 22 are mounted. The upper rolls are supported in block bearings 148 slidably mounted in the supporting frame.

In operation, the surface speed of the transfer rolls 22, 24 is faster than the linear speed of the chains 124 of the conveyer 26 so that a carton blank 12 deposited on the conveyer comes to rest momentarily after leaving the transfer rolls until the chain lugs 126 engage the trailing end to start the blank forward to carry it through the machine. As shown in FIGS. 1 and 13, the drive to the shaft 132 on which the lower roll 24 is mounted comprises a chain and sprocket drive 145 from the shaft 102. It will be understood that the sprockets 128 on shaft 102 over which the carrier chains 124 run comprises idlers and that the chain and sprocket drive 145 is designed to effect rotation of the shaft 132 at a rate such that the carton blank 12 will be deposited on the conveyer 26 prior to arrival of the lugs 126. As herein shown, the blank is guided between side guides 150, 152 and under hold down rails 154, 156. The blank is first carried past the adhesive applying roller 28 where the underside of the side seam flap 27 is provided with a coating of adhesive.

As shown in FIGS. 1 and 18, the adhesive applying roller 28 is relatively narrow and is mounted for adjustment on a shaft 158 arranged to be rotated in timed relation to the advance of the carton by chain and sprocket connections from the shaft 114 including a connection 159 to a shaft 160, a second connection 161 to a shaft 162 and a final connection 164 to the shaft 158. In practice, the roller 28 is rotated at a surface speed slightly less than the linear speed of the conveyer chains 124 so that the trailing end of the carton side seam flap will not receive a surplus of adhesive such as would occur if the applying roller were traveling faster than the blank. The applying roller 28 is arranged to run in a glue pot 166 provided with a quick setting hot melt adhesive. As herein shown, the glue pot is carried by parallel arms 168 arranged to be lowered by a handle 170 to permit convenient cleaning and servicing of the same. One of the guide rails, 152, is provided with a short rail 172 overlying a portion of the applying roller and under which the side seam flap 27 extends, the rail 172 serving to retain the flap in operative engagement with the applying roller during the adhesive applying operation.

The carton blank is then guided under shoes 174, 176 whose outer edges are aligned with score lines 178, 180, respectively, of the carton blank and past stationary folding rails 182, 184 shaped and bent to effect inward folding of the side wall panels 29 and 31 through 180 degrees. As herein shown, the hold down rails 154, 156 and the shoes 174, 176 are mounted for lateral adjustment on rods 186 carried by arms 188. The arms 188 are clamped to a longitudinally extended rocker shaft 190 journaled in bearing brackets 192 attached to the frame. The folding rails 182 on one side of the conveyer 26 are likewise carried by and adjustably mounted on arms 194 clamped to the rocker shaft 190. The folding rails 184 on the other side of the conveyer are carried by and adjustably mounted on arms 196 clamped to a rocker shaft 198. The side guides 150, 152 are adjustable on tie rods 191 extending between side rails 193. With this construction it will be seen that the operating elements of the side seaming conveyer are adjustable for different sizes of cartons within predetermined minimum and maximum limits. As shown in FIG. 19, the side seamed carton passes under a guide plate 195 on one side and under a rod 197 on the other side which serve to complete the creased fold along the score lines 178, 180.

In practice, the hold down and folding elements are spring urged downwardly to a predetermined and adjustable stop position as indicated in FIG. 16 and are capable of rocking upwardly in the event of a jam. Suitable controls, not shown, may be provided for stopping the machine when such a jam occurs. It will be understood that the wider side wall panel 31 comprises the first folded panel whereby to present the adhesive coated flap 27 face up whereupon the narrower panel 29 is folded down on top of the flap 27 to provide the side seam indicated at 200. Immediately thereafter, during the continued advance of the carton, the side seam 200 is subjected to a pressing operation by driven pressure rolls including the roll 32 previously referred to and a cooperating roll 204 arranged to spread and set the adhesive.

During the pressing operation, the carton is supported on a continuously moving belt 206 which is coextensive with the chain conveyer 26. The belt 206 and the driven rolls 32 and 204 are arranged to travel faster than the carrier chains 124 in order to pull the carton ahead of the lugs 126 during the transfer from the chains to the belt. Thus, in practice, the pressure rolls not only press the glue seam but also accelerate the carton away from the chain lugs and into a pocket 208 of a spider 210 forming a part of the carton opening, folding and transferring mechanism 34. As herein shown, the belt 206 runs over a drive pulley 212 fast on a drive shaft 222 and over a driven pulley 214 mounted to rotate on a stud 216 fast in a bracket 218. The drive shaft 222 is rotated by a chain and sprocket drive 220 from the carrier chain sprocket shaft 134 and is designed to effect a linear speed of the belt 206 at a faster rate than the linear speed of the carrier chains 124. The lower pressure roll 204 is also mounted on the pulley shaft 222. The upper roll 32 is mounted on a shaft 224 and is connected to rotate with the lower roll by spur gears 226. As herein shown, the upper roll shaft 224 is journaled in a bracket 228 pivotally mounted at 230 and is rocked in a direction to urge the roll 32 into cooperat-

ing engagement with the lower roll **204** by a compression spring **232** coiled about a rod **233** and interposed between a yoke **234** forming a part of the bracket **228** and a shaft **236** journaled in spaced arms **238** extended from a bracket **240** attached to the machine frame. In practice, the rod **233** may extend through the shaft **236** and connections to the lower end of the rod may be made to effect manual rocking of the bracket **228** to an inoperative position when desired. As herein shown, the lower end of the rod **233** may be provided with a hub **235** having a cam surface at its upper end engaging the handle **237** and rocking of the handle will effect rocking of the pressure roll **32** upwardly.

In operation, it may be desired to limit the pressing operation to the side seam area **200** only as defined by the flap **27** of the carton blank **12,** that is, to maintain the roll **32** elevated until the closing flap area at one end has passed and again lifting the roll before it engages the closing flaps at the other end of the carton so as to avoid squeezing glue out of the ends of the seam onto the closing flaps. This may be accomplished by rocking the upper roll **32** into and out of cooperating engagement with the lower roll **204** through cam operated linkage, not shown, connected to the rod **233.** Another expedient employed to effect pressing along the side seam area only and not along the extended end closing flaps is to provide a cutout in the lower roll **204** to avoid cooperation with the upper roll except during that portion of each cycle when the side seam portion **200** passes between the rolls. In any event, the passage of the carton between the rolls **32, 204** also serves to advance the carton to the carton opening, reverse folding and transferring device **34.**

In order to further assist in advancing the carton into a pocket **208** of the spider **210,** a roller **242** carried by an arm **244** is arranged to cooperate with the discharge end of the belt **206** adjacent the pulley **214.** The arm **244** is mounted to pivot on a stud **246** and is pressed downwardly by a coil spring **248** carried between an extension **250** from the arm **244** and a second arm **252** clamped to the stud **246.** The stud **246** is adjustably mounted in an elongated slot **254** formed in a bracket **256.**

As herein shown, the spider **210** comprises spaced hub members **264** adjustably clamped to a shaft **258** and is provided with four equally spaced carton receiving pockets **208** arranged to be indexed through ninety degrees each cycle of operation of the machine. Each pocket is defined by spaced elements **260** having V-shaped grooves facing toward each other. EAch grooved element **260** is carried by a bracket **262** attached to its respective hub member **264.** Each pair of elements **260** defining a pocket **208** are spaced apart a distance slightly less than the width of the side seamed carton deposited therebetween so that the carton will be forced into a slightly open position. The receiving end of each pocket **208** is shaped to accept the full width of the leading end of the carton and then tapers inwardly for a short distance to a point where the spacing between the grooves is less than the full width of the carton. The leading end of the carton comes to rest against an adjustable stop **266** carried by each bracket **262.**

As illustrated in FIG. **18,** the shaft **258** which carries the spider **210** is arranged to be indexed **90** degrees each cycle of operation through connections including a Geneva drive mechanism, indicated generally at **268,** and which includes a driving member **270** fast on a shaft **272** and a driven member **274** fast on a shaft **276.** The shaft **272** is connected by a chain and sprocket drive **278** to the main drive shaft **122.** The driven member **274** of the Geneva is fast on the shaft **276** and the latter is connected by a train of gears **282** to the spider shaft **258.**

The purpose of the indexing mechanism is to bring successive cartons from a horizontal to a vertical or upright position in order to accommodate the bottom sealing machine which is arranged to receive the cartons in an upright position. After the carton has been indexed to a vertical position in its partly open condition, provision is made for removing or stripping the carton from its pocket; opening the carton to its squared up condition during such removal; and then folding the carton in a reverse direction as it leaves its pocket to be received between the driven rolls **38, 40** which serve to transfer the carton to the bottom sealing machine and also serve to crease the remaining score lines **288, 290,** resulting in a carton that has been prebroken on all four vertical score lines and properly glued to produce the desired squared up shape in the completed carton.

As herein shown, a pair of spaced carton stripping or removing arms **292** are mounted on a shaft **294** and are adjustably secured to an arm **295** fast on the vertical rocker shaft **294** journaled in a bracket **296.** The shaft **294** is arranged to be rocked in timed relation to the movement of the pockets through cam operated linkage including an arm **298** fast on the lower end of the rocker shaft **294** and a link **300** connecting the arm **298** to a cam lever **302.** The cam lever **302** is pivotally mounted at **304** in a bracket **306** and is provided with a cam roll **308** cooperating with a closed cam **310** fast on the cam shaft **122.**

Referring now to FIGS. **20** to **24,** FIG. **20** shows a carton **12** supported along its folded score lines **178, 180** between spaced V-groove elements **260, 261** with the carton partially open. The stripping arms **292** are shown in their retracted position in FIG. **20,** and a stationary angle plate **312** is shown positioned intermediate the V-groove elements. The arms **292** are disposed above and below the V-groove elements, and in operation the adjacent extended edges of the carton are engaged by grooved portions **314** formed in rounded members **316** carried by the arms **292,** the opposite edge of the carton remaining in its V-groove element **260.** Continued movement of the arms **292** as shown in FIGS. **21** and **22** opens the carton to a squared up position, the stationary angle plate **312** serving to support one side wall **291** of the carton at this time with the rounded members **316** bearing against an end wall **293** and with the opposite end wall **29** still in engagement with its V-groove element **261** Further movement of the arms **292** effects folding of the carton along the previously unbent score lines **288, 290** by pressure of the rounded members against the trailing end wall **293** while the carton is supported between the angle plate **312** and the V-groove element **261.** As shown in FIGS. **23** and **24,** the leading end of the carton now becomes free of the V-groove element **261** and the V-grooves **318** formed in the blocks **320** carried by the arms **292** become operative by engaging the newly folded trailing, edge defined by the score line **288** and advancing the carton between guide rails **322, 324** and between driven rolls **38, 40** which form a part of the bottom

sealing machine and by which the carton is delivered to the machine to be squared up and elevated onto a mandrel for supporting the carton during closing and sealing the bottom flaps of the carton. The driven rolls **38, 40** also serve to crease the newly folded edges defined by the score lines **288, 290** to break the carton along the score lines as described. A guide roll **36** is provided adjacent the rail **322** on one side of the carton, and a guide plate **332** movable into and out of operative engagement with the other side of the carton whereby to prevent opening of the carton during its transfer to the creasing and advancing rolls **38, 40.** It will be understood that in practice successive cartons are advanced to the bottom sealing machine at the rate of about **100** cartons a minute. As shown in FIG. **18,** the guide plate **332** is carried by a curved arm **334** fast on a shaft **336** journaled in a bracket **338.** A second arm **340** fast on the shaft **336** is connected by a link **342** to one arm **344** of a cam lever pivotally mounted on a stud **346** carried by a bracket **348** attached to the machine frame. The second arm **350** of the cam lever is provided with a cam roll **352** cooperating with a cam **354** fast on the cam shaft **122.**

Referring again to FIGS. **9** and **10,** provision is made for latching the cam lever **64** in an upraised position to maintain the stack **14** in an elevated position when it is desired to discontinue feeding of the carton blanks. This may be done by a manual control or by an automatic control of any usual or preferred construction. In either event, a normally closed solenoid valve **356,** see FIG. **9,** which connects a source of air from a pipe **357** to an air cylinder **358** is actuated to open the valve **356** upon closing of the circuit **359.** Opening of the valve effects extension of the stem **360** which engages one arm **362** of a bell crank pivotally mounted on a stud **364** carried by a bracket **366.** The arm **363** is spring urged in a clockwise direction and the second arm **368** of the bell crank is connected to one arm **370** of the latch **371** by a rod **372** fixed in the arm **370** and slidingly mounted in the arm **368.** The rod **372** is provided with a nut **373** to limit the sliding movement and to effect positive disengagement of the latch. A compression spring **374** coiled about the rod **372** is arranged to rock the latch in a counterclockwise direction on the stud **364** to present the latch **371** in the path of an extension **376** to the cam lever **64.** This type of control is of advantage when it is desired to automatically discontinue the feed of the cartons in the event that a jam occurs in the side seaming device such as to cause elevation of the folding elements wherein a microswitch **378** may be placed to close the circuit **359** to the solenoid valve **356** in such event, or a manually operated switch may be provided in the circuit. Another form of control for discontinuing the feed of carton blanks, as illustrated in FIG. **9,** may comprise a photoelectric scanning unit indicated at **380** which is arranged to detect an oversupply of completed cartons at a forward point in the packaging line, and to actuate the solenoid valve **356** whereby to effect latching of the cam lever **64.**

From the above description it will be seen that the present apparatus is capable of producing flat tubular or side seamed cartons from prescored carton blanks in a rapid, efficient and economical manner. It will also be observed that the present apparatus provides novel carton feeding mechanism, and novel mechanism for transferring the cartons directly into the bottom sealing machine whereby to provide a continuous carton producing process lending itself to more accurate and trouble-free handling of the cartons as distinguished from the use of previously prepared side seamed cartons. While the apparatus illustrated and described is particularly adapted for feeding cartons directly into a bottom sealing machine, it will be apparent that the side seamed carton could be stacked and stored for future use, in which case the rate of production could be substantially increased.

While the blanks herein illustrated and described comprise unlined blanks, it will be understood that a lining material may be affixed to the prescored blanks to produce lined cartons.

While the preferred embodiment of the invention has been herein illustrated and described, it will be understood that the invention may be embodied in other forms within the scope of the following claims.

Having thus described the invention, what is claimed is:

1. The combination with a magazine for holding a stack of blanks, of a conveyor having a horizontal run and curved end runs for moving blanks deposited thereon through successively arranged stations for application of adhesive and folding to form knock-down cartons, means supporting the magazine in a rearwardly inclined position with its lower end inclined upwardly toward the receiving end of the conveyor in a plane tangent to the curved run at the receiving end, means at the lower end of the magazine movable in frictional engagement with the lower sides of successive lowermost blanks and in said inclined plane for initiating movement of the blanks from the magazine toward the conveyor, means at the lower end of the magazine at the forward side defining an opening through which the lowermost blanks are adapted to be moved by said means for initiating movement of the blanks from the magazine comprising spaced guides at the forward side, and rollers spaced therefrom at a distance such as to permit only one blank at a time to be moved from the lower end of the stack through said opening, means for arranging the blanks at the lower end of the stack in shingled relation such that the leading end of the lowermost blank is foremost and in registration with said opening, comprising forwardly and downwardly inclined surfaces at the inner side of the guides and a forwardly and downwardly curved surface at the inner side of the rear side of the magazine, the latter supporting the lower end of the stack at the rear side above the plane of the lower end, feed rolls situated between the guides and the conveyor for gripping the upper and lower sides of the leading ends of the blanks in said inclined plane and advancing the blanks upwardly in said inclined plane toward the receiving end of the conveyor, and transfer rolls at the receiving end of the conveyor for receiving the leading ends of the blanks delivered thereto by said feed rolls and drawing them on the horizontal run of the conveyor.

2. A combination according to claim **1,** wherein the means for initiating movement of the blanks from the lower end of the magazine comprise spaced parallel belts having horizontal runs travelling in said upwardly inclined plane and having raised projections on their surfaces.

3. A combination according to claim **2,** wherein the horizontal runs of the belts extend beyond the forward side of the magazine to the bite between the feed rolls.

4. A combination according to claim 2, wherein the linear speed of the belts and the surface speed of the feed rolls and transfer rolls is the same.

5. A combination according to claim 2, wherein there are cleats spaced longitudinally of the conveyor for engagement with the trailing ends of the blanks and the surface speed of the feed rolls and transfer rolls is greater than the linear speed of the conveyor so that blanks are drawn onto the conveyor ahead of the cleats.

6. A combination according to claim 1, wherein there is means for elevating the guides to enable removing a jammed blank.

7. A combination according to claim 1, wherein the curved surface is a roll and there is means for adjusting its position to vary the elevation of the lower end of the stack relative to said inclined plane.

8. A combination according to claim 2, wherein there are rolls supported in engagement with the lower end of the stack between belts and means operable to raise and lower the rolls to periodically raise the stack from the belts and lower it into engagement with the belts to control the spacing between successive blanks, and means for disabling said last-named means when the rolls are in their raised position to discontinue feed in the event of jamming.

9. A combination according to claim 8, wherein said last means comprises a latch and there is sensing means operable in response to jamming to engage said latch.

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