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Jones

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[54] **CARTONING MACHINE FOR CARTONS HAVING LINERS**

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[52] **U.S. Cl.** **53/27,** 53/175, 53/252, 93/36.01

[51] **Int. Cl.** **B65b 41/18**

[58] **Field of Search** ..... 53/27, 169, 175, 251, 252, 53/148; 93/36.01, 77 CL, 12 R, 12 C, 35 PT, 59 CE, 59 ES

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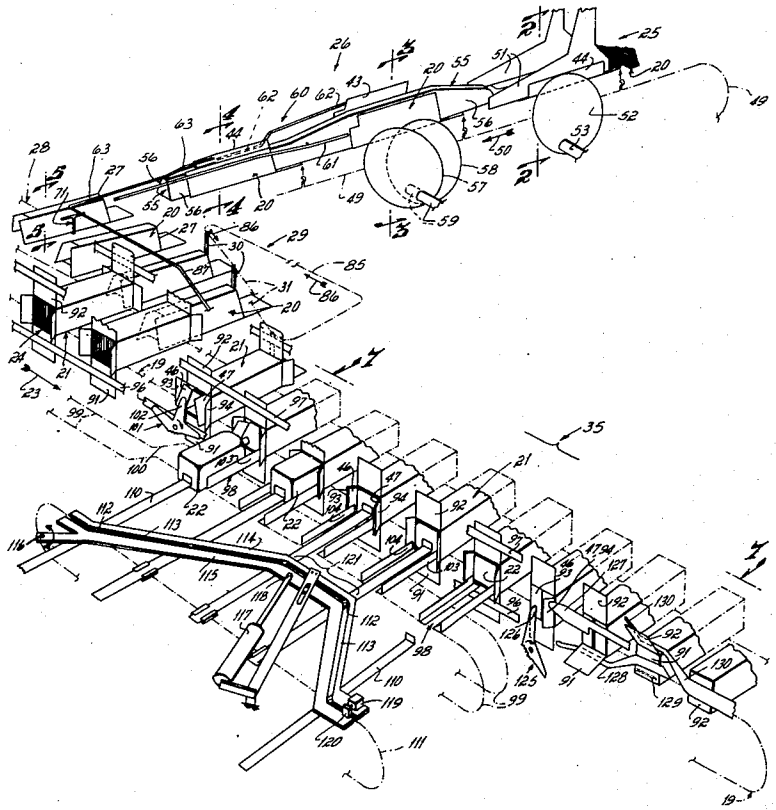
Attorney, Agent, or Firm—Wood, Herron & Evans

[57] **ABSTRACT**

Constant motion apparatus for inserting a six sided corrugated liner into carton and thereafter inserting a product into the carton. A corrugated liner is formed and conveyed perpendicularly to a carton conveyor. The liner is thrust from its former to a liner conveyor running parallel to the carton conveyor. From the liner conveyor each liner is pushed into the carton which thereafter receives a product. Means are provided for closing the liner and carton end flaps and sealing the carton end flaps.

10 Claims, 11 Drawing Figures



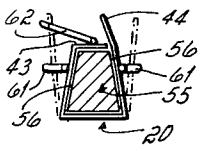


Fig. 4

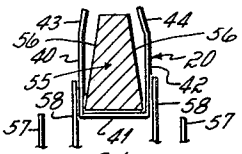


Fig. 5B

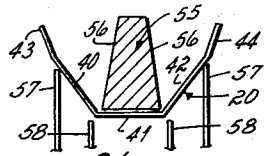


Fig. 5A

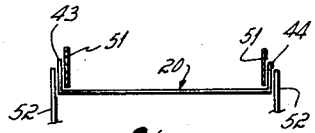


Fig. 2

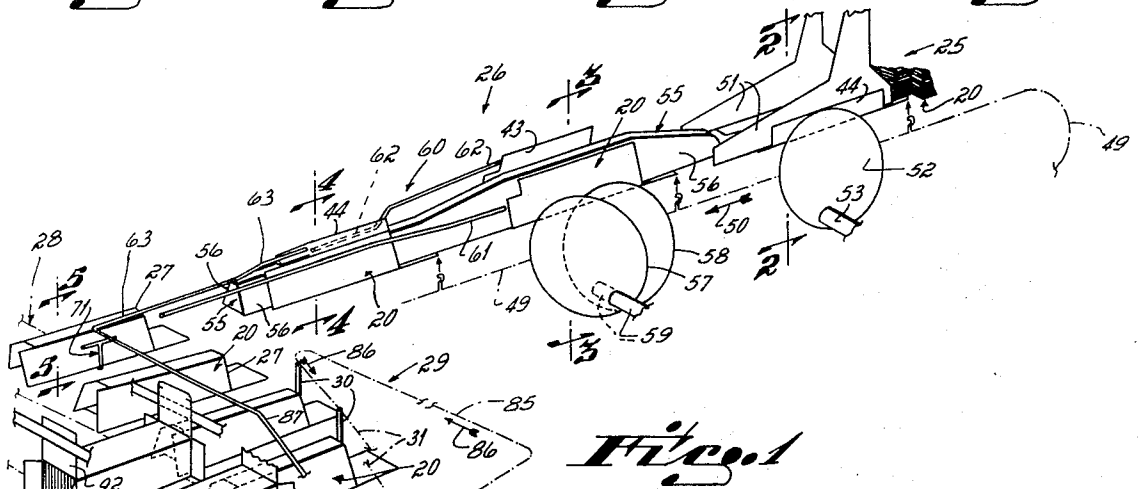


Fig. 1

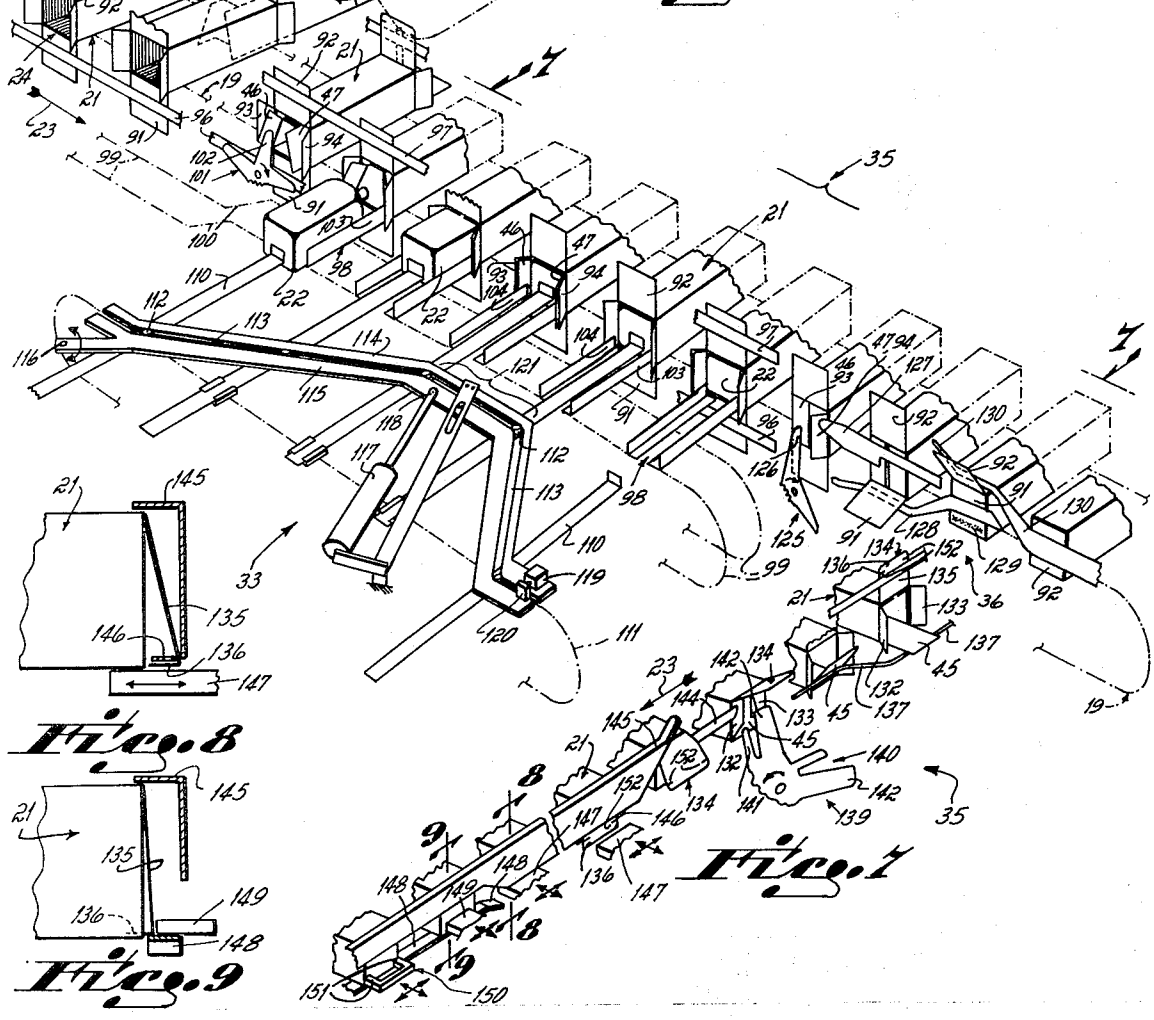


Fig. 7

Fig. 8

Fig. 9

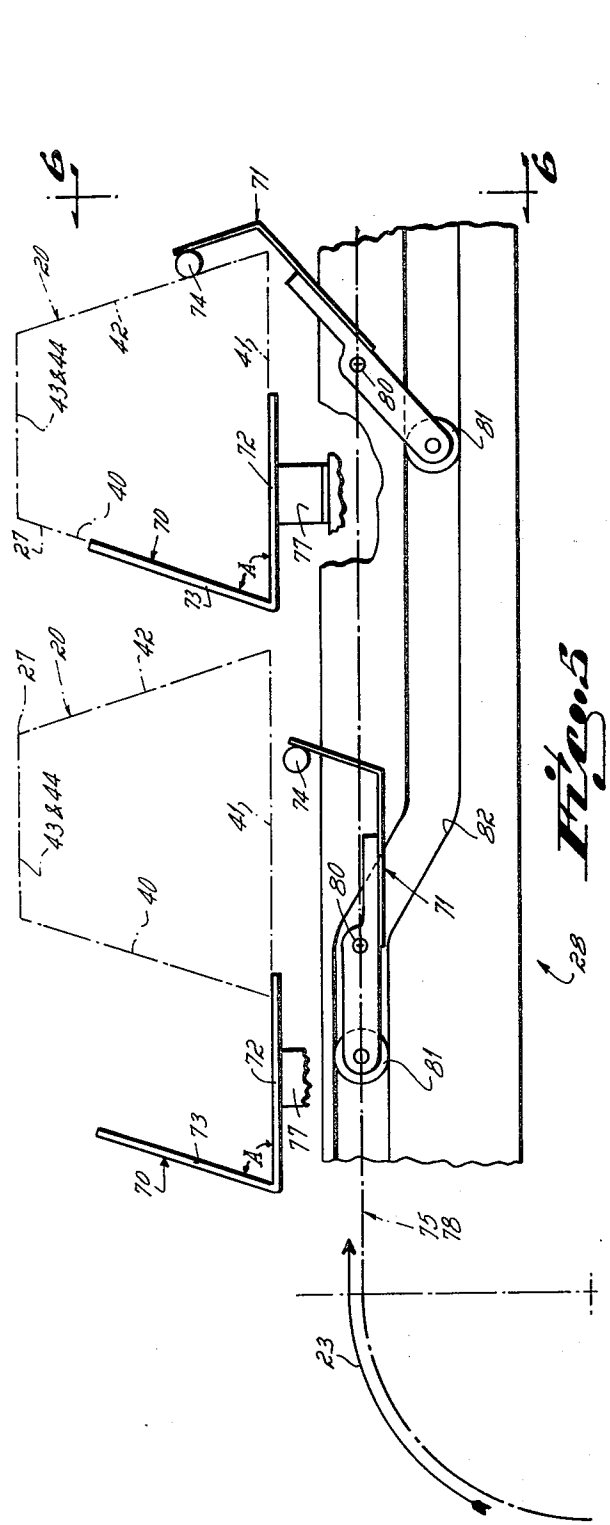


Fig. 5

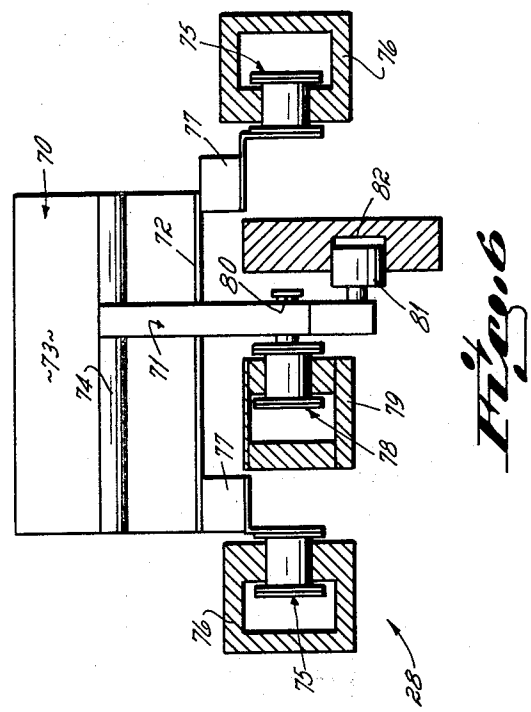


Fig. 6

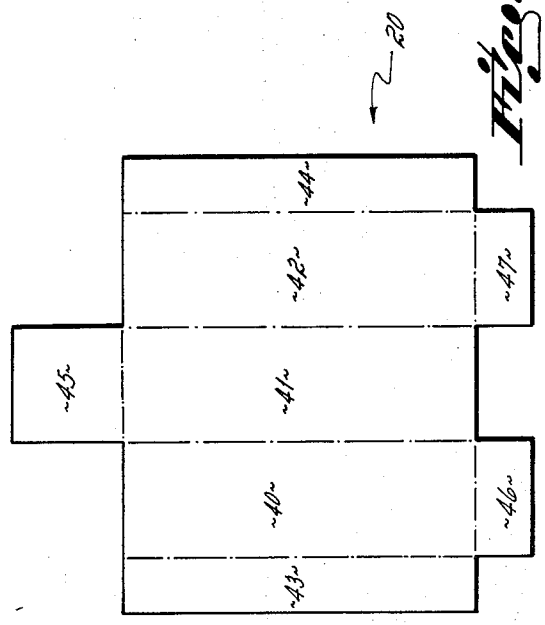


Fig. 10

CARTONING MACHINE FOR CARTONS HAVING LINERS

This invention relates to a cartoner, and more particularly the invention relates to a cartoner wherein a corrugated liner is first formed, then inserted into a carton, a product being thereafter inserted into the lined carton.

One prior approach to inserting liners in cartons is exemplified by U.S. Pat. No. 2,263,501. There, a carton is formed about a mandrel and pushed transversely into a traveling carton by a plunger having two reciprocatory components of motion, one transversely to the direction of motion of the carton and the other parallel to the direction of motion of the carton. This approach, requiring the reciprocatory motion of the liner inserter, tends to be limited in the speeds which it is capable of attaining due to the limitations imposed upon it by the reciprocating mechanism.

Another approach to making lined cartons includes apparatus for depositing a liner in a product bucket, depositing a product in the product bucket, and forming the liner about the product. Thereafter, the product and liner are thrust into a carton. This apparatus has been used for four sided liners and has been operated at speeds of about one hundred twenty cartons per minute.

An objective of the present invention has been to provide a cartoner including a liner inserter capable of forming and inserting into a carton a six sided liner, that is, a liner having four side walls and opposed end walls, the cartoner being capable of doubling cartoning speeds of existing apparatus of the type described above. It should be understood, however, that while the invention is particularly applicable to difficult to handle six sided liners, it is also adaptable for use in forming and inserting four or five sided liners.

Another objective of the invention has been to provide a cartoner which eliminates reciprocating mechanisms for forming and inserting the liner into the carton. More specifically, the apparatus of the present invention employs constant motion, endless conveyor for driving liner blanks through a former; for receiving and conveying liner blanks parallel to the carton; and for pushing the formed liner blanks into the cartons as they are conveyed parallel to the cartons.

Another objective of the invention has been to provide a new method of cartoning wherein liners are initially formed into a trapezoidal section configuration and inserted into a carton, the trapezoidal configuration being maintained until a product is thrust into the carton to spread the liner into a rectangular configuration.

Another objective of the invention has been to provide, in cartoning apparatus, apparatus for closing both liner and carton flaps after a product has been introduced into the carton.

Another objective of the invention has been to provide apparatus for conveying and forming a six sided liner, the liner having four side walls formed by three whole walls and two partial walls adapted to abut to form the fourth wall.

Another objective of the invention has been to provide liner conveying apparatus adapted to receive and hold a liner in a trapezoidal configuration, the liner thereafter being thrust into a carton in the trapezoidal configuration.

Another objective of the invention has been to provide apparatus for loading products into cartons and having a safety feature for minimizing product breakage.

These and other objectives of the invention will become more readily apparent from the following detailed description taken in conjunction with the accompanying drawings in which:

FIG. **1** is a diagrammatic perspective view of the cartoning apparatus;

FIG. **2** is a cross-sectional view taken along lines **2—2** of FIG. **1**;

FIGS. **3A** and **3B** are cross-sectional views taken along lines **3—3** of FIG. **1**;

FIG. **4** is a cross-sectional view taken along lines **4—4** of FIG. **1**;

FIG. **5** is a cross-sectional view taken along lines **5—5** of FIG. **1**;

FIG. **6** is a cross-sectional view taken along lines **6—6** of FIG. **5**;

FIG. **7** is a diagrammatic perspective view illustrating the top closing apparatus taken generally along lines **7—7** of FIG. **1**;

FIG. **8** is a cross-sectional view taken along lines **8—8** of FIG. **7**;

FIG. **9** is a cross-sectional view taken along lines **9—9** of FIG. **7**; and

FIG. **10** is a plan view of a liner blank.

GENERAL ORGANIZATION AND OPERATION

The apparatus of the present invention is for forming and inserting a double faced corrugated liner blank **20** into a carton **21** and thereafter inserting an article **22** into the carton. The cartons are previously erected and conveyed by a constant motion endless conveyor **19** in the machine direction indicated by arrow **23** and in the form indicated at **24** with the carton flaps open so as to present a tube adapted to receive a liner. The liners are fed as flat blanks from a magazine **25** through a former conveyor **26** during which the flat blanks are formed as trapezoidally configurated liners indicated at **27.** The former conveyor **26** conveys the blanks perpendicularly toward a liner conveyor **28** which receives the liners and conveys them parallel to and in alignment with the cartons **21.** A liner pusher **29** carries a series of spaced pusher elements **30** in an angulated path indicated at **31** toward the liner conveyor. As the pusher elements move toward the liner conveyor, they engage the liners **20** and thrust them into the cartons **21,** the liners maintaining their trapezoidal configuration when thrust into the cartons. After the liners have been thrust into the cartons, a product loader **33** engages the products, depicted as bottles **22,** and thrusts them into the cartons. Top flap closing mechanism **35** closes the top flaps of the carton as the cartons are being loaded and bottom flap closing mechanism **36** closes the bottom flaps of the cartons after the product has been inserted into the cartons.

LINER BLANK FORMER AND CONVEYOR

The blank which is to be inserted into the carton is illustrated in FIG. **10** and has three full walls **40, 41, 42** and two partial walls **43, 44** at the ends of the blank, the partial walls being adapted to abut each other to form a fourth wall. A top flap **45** is hinged to panel **41** and two bottom flaps **46, 47** are hinged to the walls **40, 42,** respectively, the bottom flaps **46, 47** being adapted to

abut each other to form a bottom wall. The blanks are of double faced corrugated board which has been cut and creased to define the walls and flaps described above. The blanks **20** are fed from a magazine **25** with the bottom flaps **46, 47** leading and the top flap **45** trailing. The blanks are ejected from the magazine in a known manner and are captured by an endless conveyor **49** having a lug which engages the edge of the top flap **45** to move the blanks along a path indicated by the arrow **50,** that direction being perpendicular to the machine direction **23** of the cartoner. The blank first passes under rails **51** which are aligned with the hinge creases for the partial walls **43, 44.** The partial walls **43, 44** are engaged respectively by a pair of forming discs **52** which are eccentrically mounted on a rotating shaft **53.** The rotation of the discs **52** as the liner passes under the rails **51** causes the discs to engage the partial walls **43, 44** to break them about their hinge lines, as shown in FIG. **1** and a cross-sectional view of FIG. **2.**

As the blank is continued to be conveyed in the direction **50,** it passes under a forming mandrel **55** having upwardly and inwardly tapering side walls **56** (FIGS. 3A and 3B). A pair of outer forming discs **57** and a pair of inner forming discs **58** are eccentrically mounted on a rotating shaft **59** on either isde of the mandrel **55.** As the shaft **59** is rotated, the outer forming discs engage the walls **40, 42** to pre-break them along the creases by which they are connected to the wall **41** (FIG. 3A). After the pre-break, the inner discs **58** engage the walls to finish breaking them about their creases. thereby swinging the walls **40, 42** to a perpendicular attitude with respect to the wall **41** (FIG. 3B). In this attitude, the blank is advanced to a plowing station **60.** The plowing station **60** has a pair of lower rails **61** which engages the walls **40, 42** to swing them past their perpendicular orientation to lie flat against the tapered walls **56** of the forming mandrel **55,** as shown in FIG. **4.**

The plowing station has an upper rail **62** which engages the partial wall **43** to fold it on top of the mandrel. Downstream of the rail **62** is a second upper rail **63** adapted to engage the partial wall **44** to fold it over the top of the mandrel so that it slightly overlaps partial wall **43** and creates a trapezoidal section configuration of the liner. After the folding of the partial wall **44,** the liner is ready to be thrust into the liner conveyor **28.**

LINER CONVEYOR

Referring to FIGS. **1, 5** and **6,** the liner conveyor, running in the machine direction and perpendicularly to the liner former, is adapted to receive a liner **20** and capture it between an L-shaped trailing lug **70** and a movable leading lug **71.** The trailing lug has a horizontal leg **72** and a generally vertical leg **73** which is somewhat inclined to create an acute angle with the horizontal leg as indicated at (A) with which to receive the walls **40** and **41** of the liner. The movable lug **71** has at its upper end a transverse bar **74** which is engageable with the wall **42** of the liner to hold it in its angulated attitude.

The trailing lug **70** is carried between two endless conveyor chains **75** which ride in tracks **76.** Brackets **77** are mounted on the conveyor chains **75** and are fixed to the horizontal leg **72** of the trailing lug **70.** The movable lug **71** is carried by a single conveyor chain **78** which rides in a track **79** between the other two conveyor chains **75.** Longitudinal adjustment of the chains **75** and **78** permits a variation in the spacing of the lugs **70, 71** and adapts the machine to accommodate different sizes of liners. The lug **71** is pivotally mounted to the conveyor chain by a pin **80** intermediate the ends of the lug. A cam roller **81** is rotatably mounted at the lower end of the lug and rides in a cam track **82.** The cam track creates a path for the roller **81** which maintains the lug **71** in a generally horizontal attitude with the bar **74** below the plane of the horizontal leg **72** at the location where the liner **20** is thrust onto the liner conveyor. Downstream of that location, the cam track causes the roller to move downwardly, thereby swinging the lug **71** upwardly to bring the bar **74** into engagement with the wall **42** of the liner, forcing the wall past vertical to hold the trapezoidal configuration.

By way of example, the liner former moves the liner into the liner conveyor at a high speed of about 25 – 30 inches per cycle. The liner conveyor moves at less than one-third that speed, namely, about 8 inches per cycle. The liner begins its introduction into the liner conveyor just after a trailing lug has passed the point of introduction, thereby permitting the liner to just clear the trailing lug of the previously introduced liner. By the time the liner is completely thrust transversely into the liner conveyor, the trailing lug **70** has caught up to the liner and the leading lug has advanced to a position at which the bar **74** will clear the liner as it is swung into engagement with the wall **42.**

LINER PUSHER

The liner conveyor runs parallel to the carton conveyor with the lugs **70, 71** carrying the liner in alignment with the cartons **21** carried by the carton conveyor **19.** Thus, the liners are in a position to be thrust gradually into the cartons as the cartons and liners are conveyed side-by-side downstream. The liner pusher **29** is an endless chain **85** which carries the pusher elements **30** in the direction of the arrows **86.** The chain has an angulated path **31** which carries the lugs **30** from an outermost position of engagement with a liner just introduced into the liner conveyor to an innermost position immediately adjacent the end of a carton. In the traverse along the path **31,** each element **30** thrusts a liner from between the trailing and leading lugs **70, 71** of a liner conveyor into the carton.

The trapezoidal configuration of the liner **20** maintains the liner dimensionally small compared to the inside dimensions of the carton so as to facilitate its introduction into the carton. An extension **87,** in the machine direction **23,** of the rail **63** combined with the frictional engagement of the liner partial walls **43, 44** with each other and with the adjacent wall of the carton maintains the liner in the trapezoidal configuration until the product is introduced, the product spreading the liner walls **40, 42** apart to its final rectangular configuration.

CARTON LOADER

The cartons **21** are conveyed on a constant motion endless conveyor indicated diagrammatically at **19** in a conventional manner. At its bottom end, each carton has two bottom flaps **91** and **92** and two side flaps **93** and **94.** The side flaps **93, 94** lie adjacent the liner bottom flaps **46** and **47** which will be first folded across the bottom of the carton. Thereafter, the carton bottom flaps **91** and **92** will be folded upon themselves with the

flap **92** being glued to flap **91** to seal the bottom of the carton.

As the cartons are conveyed toward the product loader **33,** the flaps **91** and **92** are held open by rails **96** and **97.** The articles **22** to be loaded into the cartons are carried in product buckets **98** on an endless conveyor **99** which follows the path **100** bringing the product buckets up into alignment with the cartons as the product loading station is reached. The liner flaps **46, 47** and carton side flaps **93, 94** are spread open by the combined action of a star wheel **101** and the upward movement of the product buckets **98.** The star wheel **101** is rotated clockwise as viewed in FIG. **1** comparatively slowly so that its arm **102** projects between the liner between flaps **46, 47** and moves slowly out of the way as the trailing bottom flap **46** catches up to the arm **102** and wipes against the arm to bend substantially flush with the bottom of the carton. As the flap **46** is bent out of the way, the product bucket, having a leading wall **103** and a trailing wall **104,** moves up into position, and in so doing its leading wall **103** engages the flap **47** bending it out of the way. The trailing wall **104** of the product bucket engages flap **46** holding it out of the way. Thus, all flaps are held out of the way of introduction of the article **22.**

The product loader includes a series of spaced pushers **110** carried on an endless conveyor **111** and adapted for sliding movement toward and away from the carton conveyor. The pushers **110** are in alignment with the product buckets, and as they are moved toward the carton conveyor they thrust the articles into the cartons. Each pusher has a cam roller **112** which rides in a cam track **113** causing the pushers to drive the articles into the cartons. The cam track includes a fixed bar **114** and a movable bar **115** pivoted at **116** to the frame of the cartoner. A double acting piston and cylinder **117** connected at **118** to the movable bar **115** holds the movable bar **115** in its normal operative position. In that position, a microswitch **119** is contacted by a bracket **120** on the movable bar, the microswitch detecting any jam in the loading operation which would cause the movable bar **115** to move away from the fixed bar **114** against the pressure of the piston and cylinder **117.**

It is common practice to design the cam track and product conveyor relationship so as to cause the pushers to be quickly withdrawn from the product buckets as soon as the products have been thrust into the cartons and to cause the product buckets conveyor to pass downwardly around its end sprocket as soon as the products have been introduced. In the present invention, the cam track and product bucket conveyor have been designed to provide a one cycle dwell indicated at **121** to provide a factor of safety against breakage of the product in the event of a jam. For example, if a product jammed against a liner and tended to spring back out before the machine could stop, a product bucket swinging downwardly could smash the product between the downwardly moving product bucket and the carton conveyor before the machine could stop after the jam was detected. In accordance with the present invention, a jam would normally be detected by the time the pusher achieved the innermost extremity of its motion, thus causing the microswitch **119** to interrupt the power to the conveyor drive systems. The dwell indicated at **121** during which the product buckets remain at the same level as the carton conveyors permits the machine to stop and gives the operator an opportunity to clear the jam before breakage occurs.

BOTTOM FLAP CLOSING MECHANISM

After the product has been introduced into the carton, the bottom flaps are closed. The first closing operation utilizes a star wheel **125** having arms **126** each of which has a more rapid motion in the machine direction than the advance of the carton so that an arm **126** of the star wheel can swing behind the trailing carton flap and swing it to a closed position, carrying with it the liner bottom flap **46.**

A plow **127** is in the path of movement of the carton to engage the leading carton flap **94** and close it, carrying with it the leading liner bottom flap **47.** The plow **127** also maintains the trailing carton and liner flaps **93** and **46** closed as the carton passes beyond the star wheel. While the flaps are held closed, a second plow **128** engages the carton flap **91** and swings it to a closed position, thereby holding the earlier flaps closed. Glue is applied to the outside surface of the flap **91** as indicated at **129.** A third plow **130** engages the outermost flap **92** and plows down on top of the flap **91** to which the glue had been applied, thereby sealing the flap **92** against the flap **91.**

TOP FLAP CLOSING MECHANISM

Projecting from the top of the carton is the top liner flap **45,** two side flaps **132** and **133** and a tuck flap **134** having a top panel **135** and a tuck panel **136.** As the carton moves in the machine direction, the liner flap is first contacted by a plow rail **137** which urges the flap **45** upwardly at an angle of about 45°. A star wheel **139** is located immediately downstream of the plow rail **137** and has a series of bifurcated fingers **140** creating a leading plow element **141** and a trailing plow element **142.** The leading plow element engages the upwardly raised liner flap **45** to swing it over the top of the carton. The trailing finger **142** engages the trailing side flap **133** to swing it over the liner flap **45.**

Downstream of the star wheel **139** is a plow **144** which engages the leading side flap **132** and forces it to swing over the liner flap **45.** A third plow **145** is downstream of the plow **144** and engages the tuck flap **134** to force it to swing downwardly. A forming blade **146** is located below the plow **145** in line with the hinge line between the tuck panel **136** and the top panel **135.** A knife **147** having transverse and longitudinal components of motion swings into engagement with the tuck panel **136** and folds it over the blade **146.** The two positions of the knife **147** are shown, the positions being separated by the broken lines in FIG. **7.**

Downstream of the blade **146** is a guide rail **148** which maintains the tuck panel in its folded condition as the carton moves beyond the blade **146.** While held in the folded position by the guide **148,** a tucking member **149** having transverse and horizontal components of motion engages the top panel **135** and forces the tuck panel **136** into the carton. Downstream of the tucking member is a locking element **150** having transverse and longitudinal components of motion. The locking member has two arms **151** which are engageable with the corners of the tuck flap to cause the locking slits **152** (right end of FIG. **7**) to be captured by the side flaps **132, 133** to lock the tuck flap in the carton.

OPERATION

In the operation of the apparatus, the cartons are erected by conventional mechanism and conveyed with a constant motion by a carton conveyor **19** in the machine direction. Liner blanks **20** are drawn from the magazine **25** and conveyed into the forming section **26.** There, the walls of the liner are progressively folded upon the previously formed creases until the liner assumes the trapezoidal configuration shown at the end of the forming section. The thus formed liner is thrust into the liner conveyor **28** and captured between the trailing lug **70** and the movable lug **71** as it swings its bar **74** up into engagement with the wall **42** of the liner. The liner conveyor **28** carries the liners in alignment with the corresponding cartons for a short distance, during which the liner pusher **29** engages the liners, through its elements **30,** and thrusts them transversely into the carton as they are conveyed by the liner conveyor.

The flaps at the bottom of the carton and liner are opened by the star wheel **101** and product buckets **98** and held open as the product is thrust into the carton. In thrusting the product into the carton, the liner walls are spread apart from the trapezoidal configuration into a rectangular configuration in which the partial walls **43, 44** abut each other. After the carton has been loaded, the closing mechanisms **35, 36** close the top and bottom of the carton respectively.

I claim:

1. A method of packaging comprising the steps of,
erecting a tubular carton having end flaps,
forming a tubular liner having three walls and two partial walls adapted to abut to form a fourth wall,
overlapping said partial walls to form a trapezoidal section,
longitudinally thrusting said liner into said carton,
longitudinally thrusting an article into said liner,
and sealing said carton.

2. A method as in claim **1** further comprising,
conveying said carton transversely,
conveying said liner longitudinally while erecting said liner, and thereafter conveying said liner both longitudinally and transversely as it is thrust into a carton.

3. A method as in claim **1** further comprising expanding said trapezoidal section to a rectangular section as said article is thrust into said carton.

4. Apparatus for lining a carton comprising,
an erected carton conveyor traveling in a first direction with tubular cartons oriented transversely of said first direction,
a liner former including a conveyor for forming liner blanks into tubes and conveying them in a second direction perpendicular to said first direction with said blanks oriented in a direction transverse to said first direction,
a liner conveyor located between said carton conveyor and said liner former and traveling parallel to said carton conveyor,
and a liner pusher located adjacent said liner conveyor and including means to push liners from said liner conveyor into cartons on said carton conveyor.

5. Apparatus as in claim **4** further comprising,
means on said liner conveyor for compressing each liner into a trapezoidal section configuration prior to its engagement by said liner pusher.

6. Apparatus as in claim **5** in which said last named means comprises,
a trailing L-shaped transport lug having a vertical leg at an acute angle to a horizontal leg,
a pivoted leading lug,
and means for swinging said leading lug from a position below said horizontal leg to a position above said horizontal leg in which said leading lug engages a wall of the liner.

7. Apparatus as in claim **6** in which said liner former thrusts said blank between said lugs while said leading lug is below said horizontal leg.

8. Apparatus as in claim **6** further comprising,
means for driving all conveyors in continuous motion,
said liner former thrusting said liner between said lugs and with the leading edge of said liner being introduced a substantial distance ahead of said L-shaped lug.

9. Apparatus as in claim **8** in which the lineal speed of said liner, as it is introduced between said lugs, is approximately three to four times the lineal speed of said lugs.

10. Apparatus for lining a carton comprising,
a constant motion carton conveyor traveling in a first direction,
an endless liner conveyor traveling adjacent to and parallel to said carton conveyor,
a liner former including an endless conveyor and forming means through which said conveyor carries a liner blank, said liner former transferring formed liners to said liner conveyor,
and means for pushing liners from said liner conveyor into said cartons on said carton conveyor.

* * * * *