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Vickers et al.

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[45] **July 29, 1975**

[54] **PACKAGING MACHINE USING TWO-BLANK CARTON SYSTEM**

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[73] Assignee: **Stone Container Corporation**, Chicago, Ill.

[22] Filed: **June 17, 1974**

[21] Appl. No.: **480,160**

Related U.S. Application Data

[63] Continuation-in-part of Ser. Nos. 285,211, Aug. 31, 1972, Pat. No. 3,817,018, and Ser. No. 446,124, Feb. 27, 1974, Pat. No. 3,872,650.

[52] **U.S. Cl.** **53/32**; 53/185; 53/207

[51] **Int. Cl.** **B65b 11/18**

[58] **Field of Search** 53/32, 207, 208, 185

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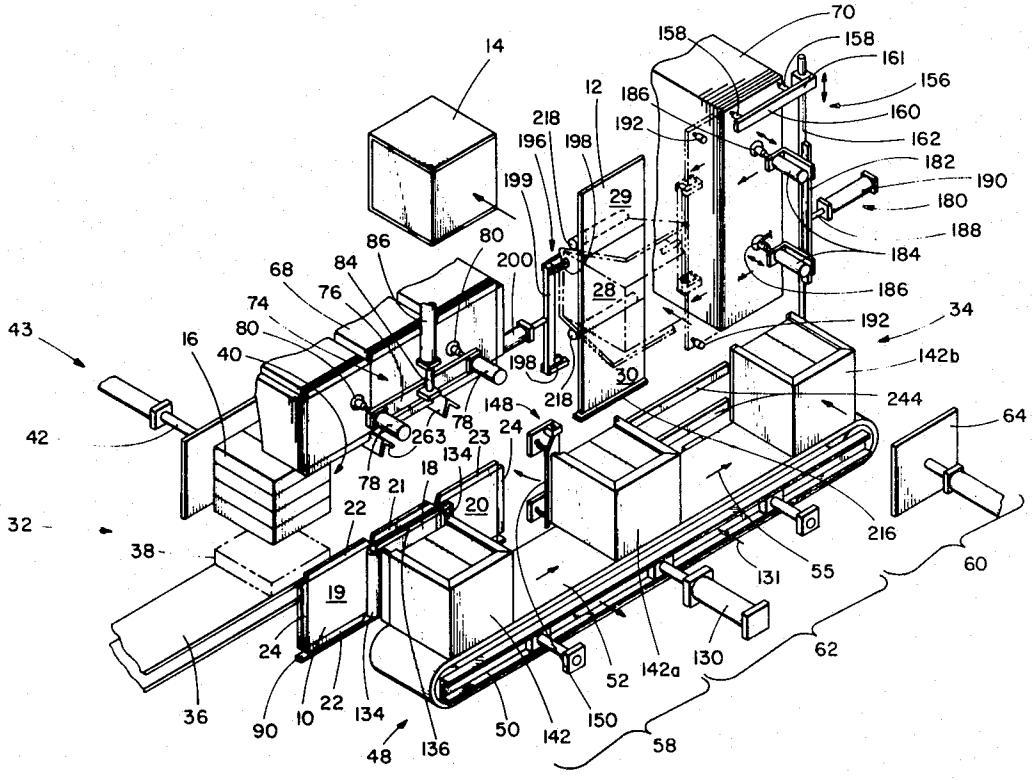
Primary Examiner—Travis S. McGehee

Attorney, Agent, or Firm—Silverman & Cass, Ltd.

[57] **ABSTRACT**

A packaging machine operative to sequentially fold separate cooperating carton blanks about lading and discharge a sealed package containing the lading in a automatic operation. The packaging machine is particularly adapted to cooperate with a lading loading ram which could be provided by a conventional case packer having a discharge horn through which the ram moves a quantity of lading. The carton blank system includes a body blank having a center panel and alternate side panels with flanges hingedly connected along the longitudinal edges of the panels and along the ends of the side panels and a cover blank having a center panel and alternate side panels. The machine includes means for positioning the body blank in a generally vertical plane opposite the loading ram, means for folding the flanges and the panels about the lading in cooperation with said loading ram to form a generally U-shaped formation, means for holding the said formation in place, means for moving the formation to an end flange folding station and thereafter to a discharge station, means for positioning a cover blank opposite the outlet of the discharge station, means for moving the formation against the cover blank, means for folding the cover blank about the formation, and means for securing the inner facing margin of the cover blank to the outer facing surfaces of the folded flanges of the body blank to form a sealed package or carton. Formation and sealing of the package is achieved along a horizontal path of movement.

23 Claims, 11 Drawing Figures



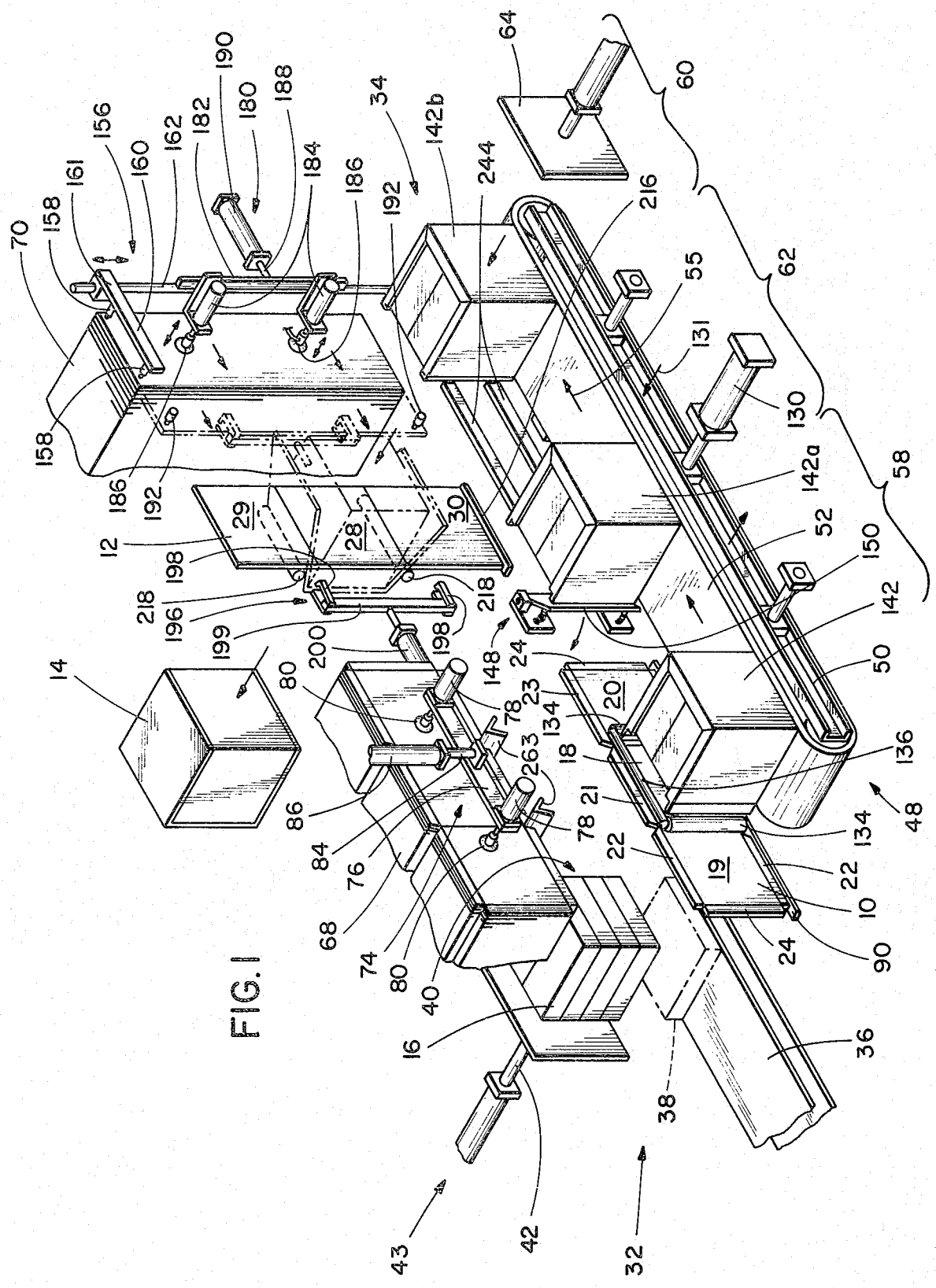

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142a
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FIG. 1

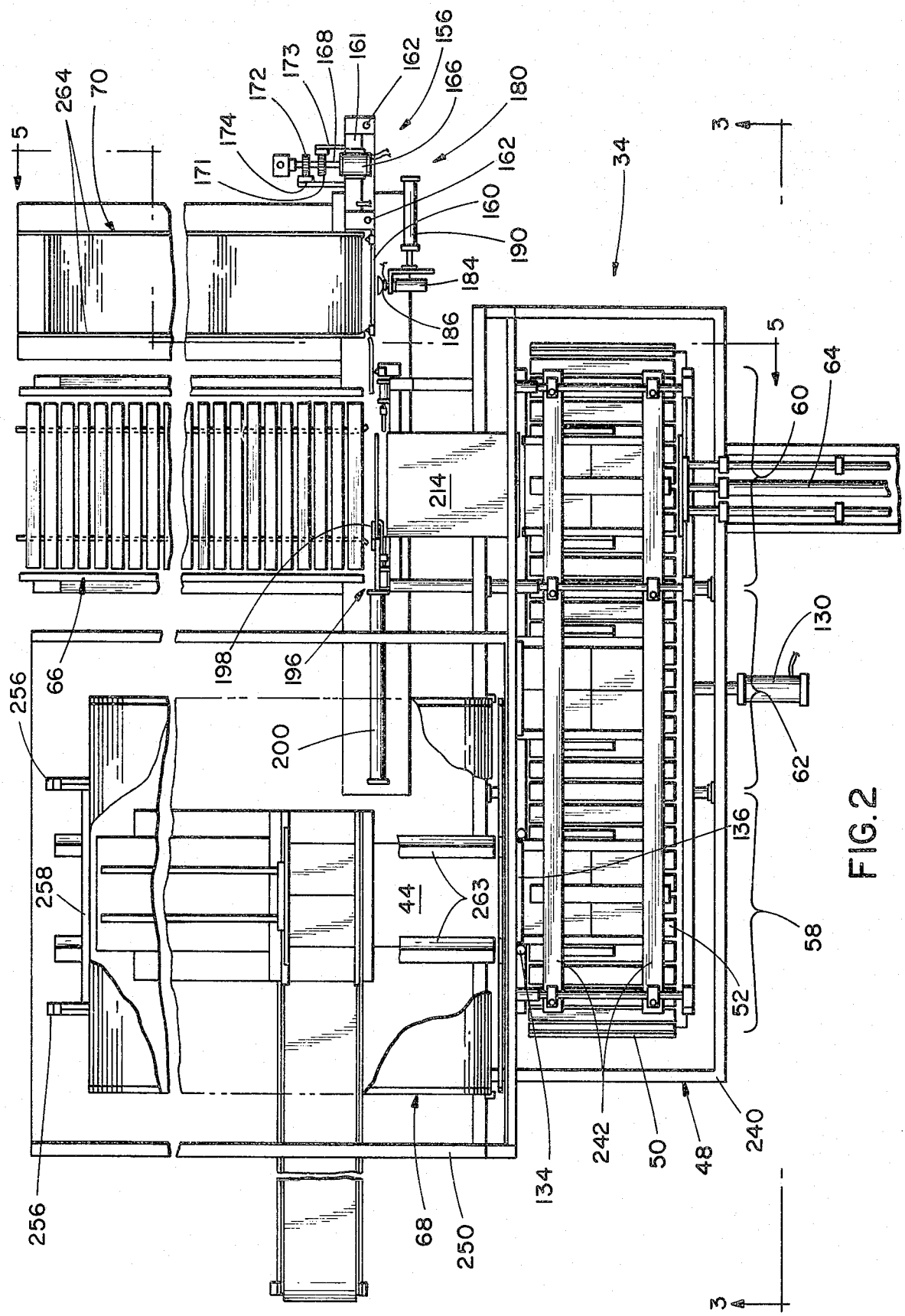

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256
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FIG. 2

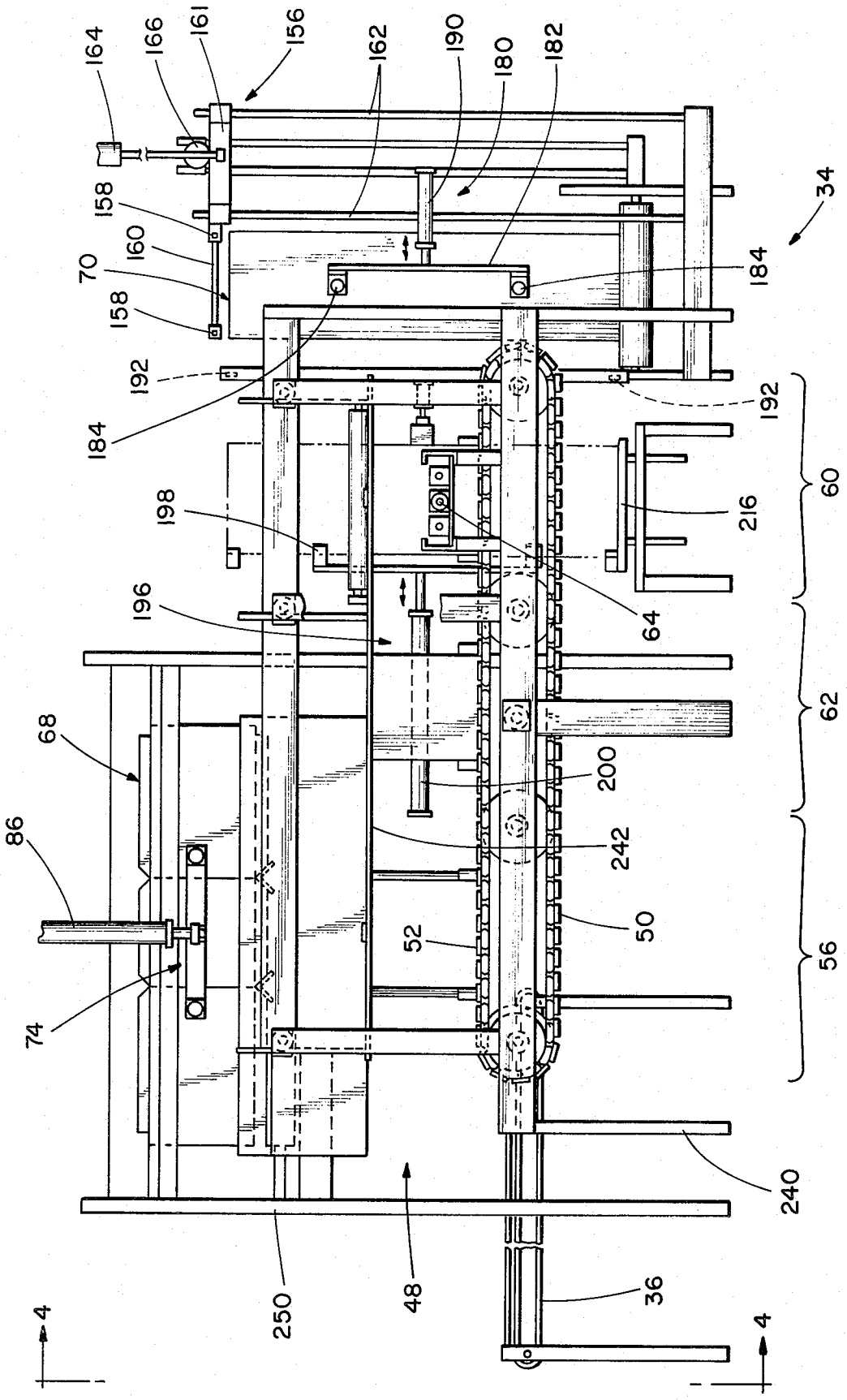

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FIG. 3

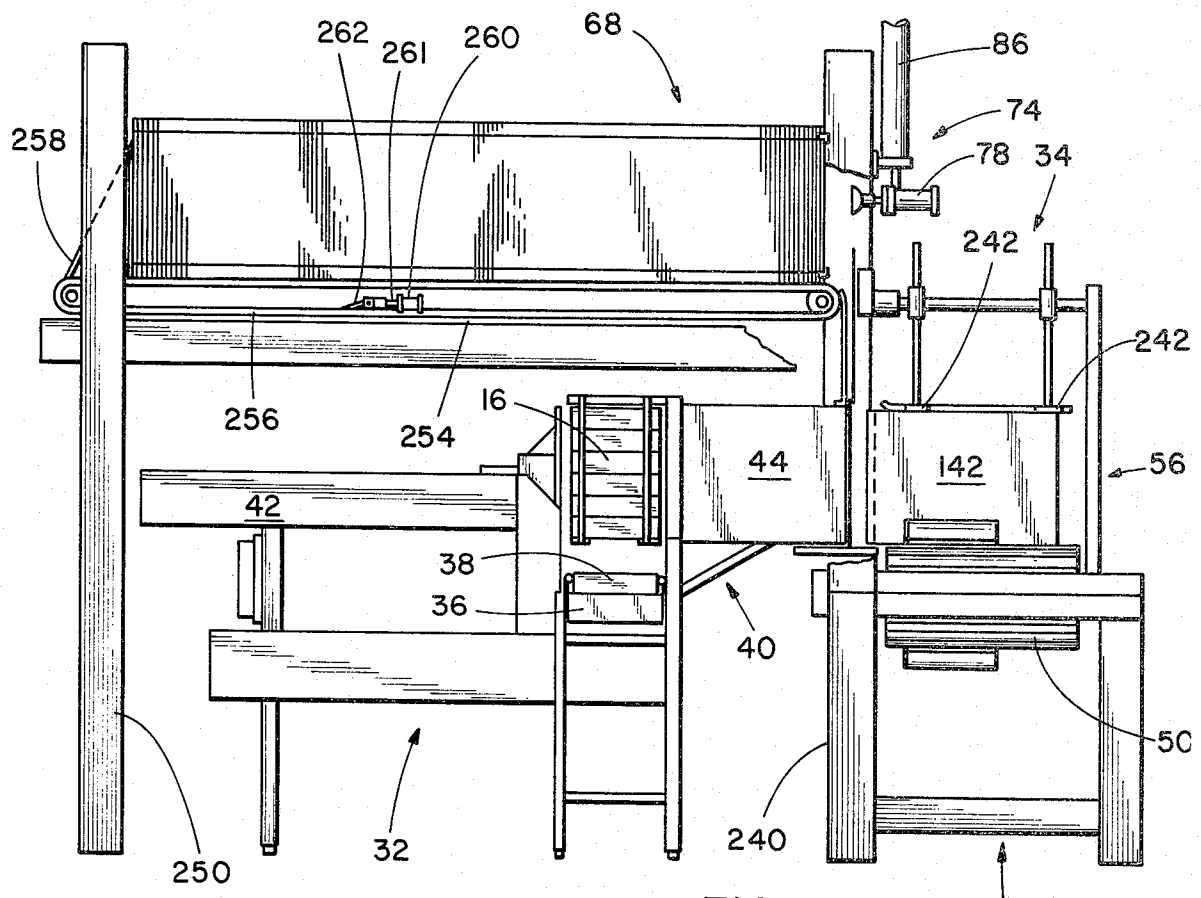

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FIG.4

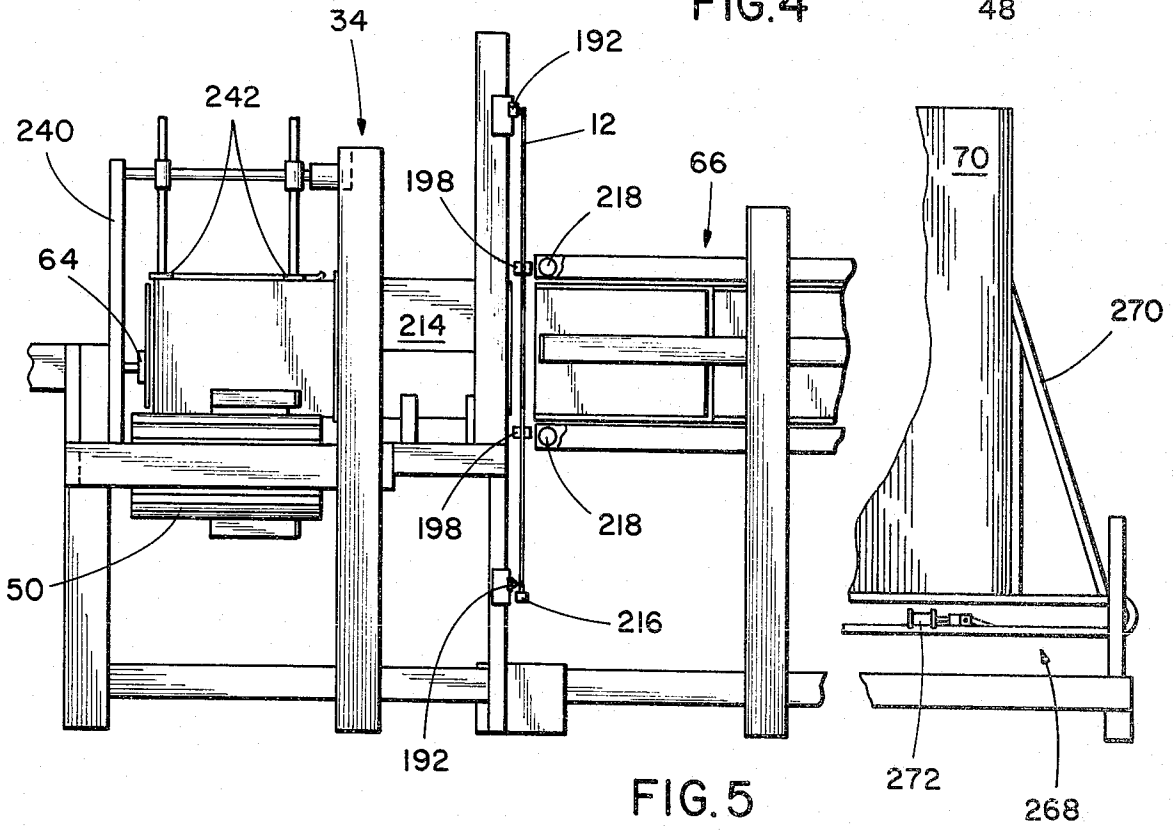

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FIG.5

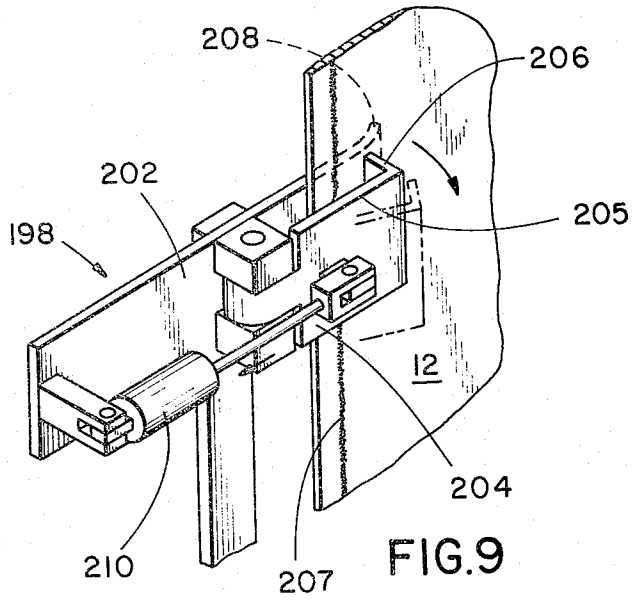


FIG.9

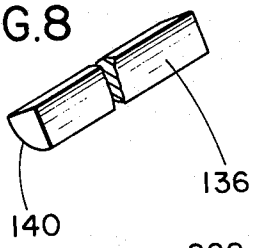


FIG.8

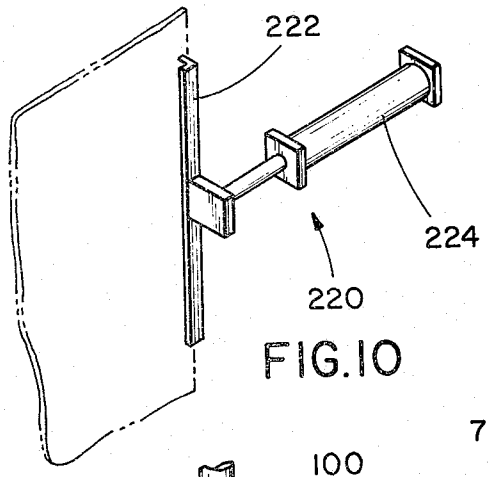


FIG.10

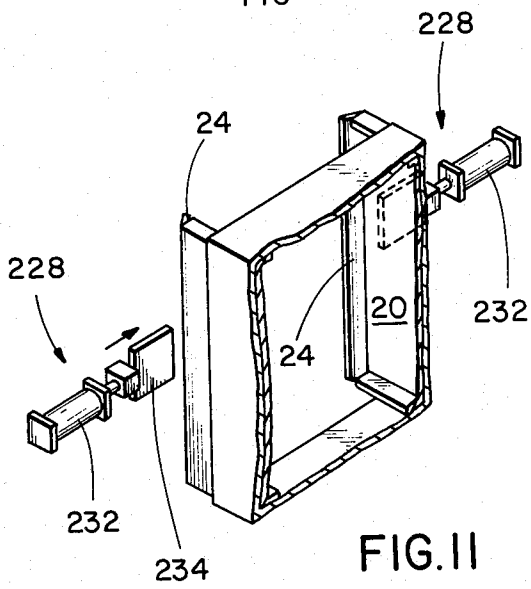


FIG.11

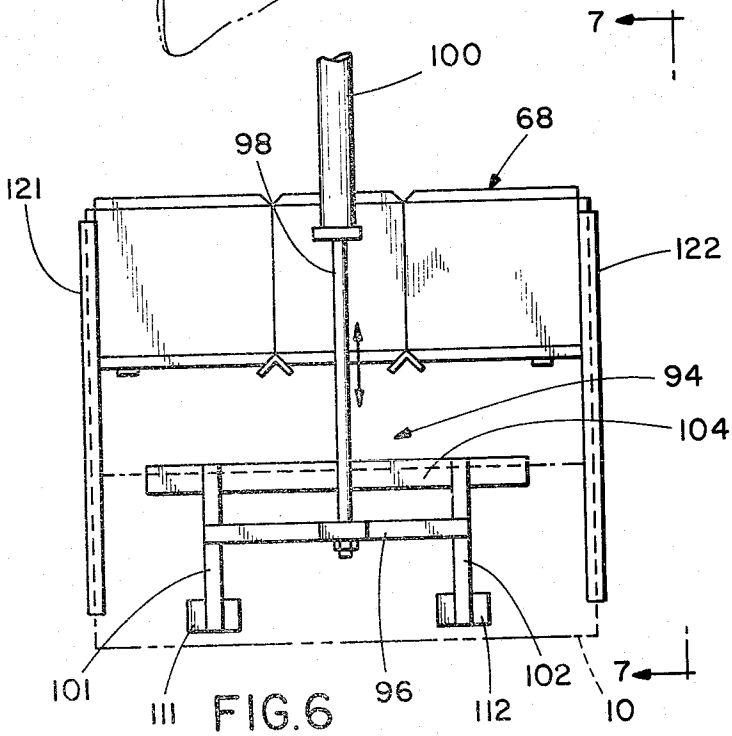


FIG.6

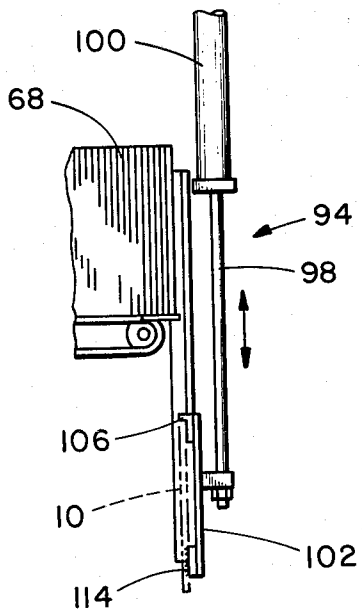


FIG.7

PACKAGING MACHINE USING TWO-BLANK CARTON SYSTEM

CROSS-REFERENCES TO RELATED APPLICATIONS

This application is a continuation-in-part of the earlier copending applications of James L. Vickers, namely, application Ser. No. 285,211 filed Aug. 31, 1972, now U.S. Pat. No. 3,817,018, and application Ser. No. 446,124 filed Feb. 27, 1974, now U.S. Pat. No. 3,872,650. The present application and the prior applications referred to above are owned by the same assignee.

BACKGROUND OF THE INVENTION

This invention relates to a machine and method for forming a sealed package or carton containing lading utilizing two generally rectangular blanks of paperboard material, one of which is unflanged and the other of which has flanges along both the longitudinal and end edges thereof.

A method of the general type with which this invention is concerned is disclosed in United States application, Ser. No. 285,211 and United States application, Ser. No. 446,124 referred to above. According to the prior method, the flanged blank is positioned at a first station of a machine and the lading is positioned adjacent the center panel thereof. Then the flanged blank is folded into a U-shaped formation partially surrounding the lading. The longitudinal flanges are folded inwardly generally perpendicular to the associated panels and the end flanges are then folded to a position generally perpendicular to the associated side panels. Next, an unflanged blank is positioned adjacent the folded blank and lading with the center panel of the unflanged blank adjacent the folded end flanges of the folded blank. Then the unflanged blank is folded into a generally U-shape around the exposed lading with the margin of the unflanged blank enaging the flanges of the folded flanged blank so that the entire lading is enclosed between the folded blanks. The flanges of the folded blanks are adhesively secured to the margin of the unflanged blank for sealing the package with the lading enclosed.

In prior application, Serial Number 446,124 referred to above, there is disclosed a machine for forming the sealed package according to the method described above. The machine includes a setup station where a quantity of lading is positioned on and supported by the center panel of a body blank having flanges along the edges thereof. The machine further includes a first mechanism for folding the body blank into a generally U-shaped formation partially surrounding the lading as the lading and body blank are moved downwardly and such that the center panel forms an end wall and the side panels form two side walls of a partially formed carton, a second mechanism for folding the flanges along each longitudinal edge of the blank to a position generally perpendicular to the associated side walls and end wall as the body blank and lading are moved downwardly, a third mechanism for folding end flanges to a position generally perpendicular to the associated side walls as the formation is moved laterally from a holding station, a fourth mechanism for positioning an unflanged cover blank above an assembly station to which the formation comprising the folded body blank and lading has been moved and in a position where the center panel of the cover blank overlies the end flanges of the folded body blank, a fifth mechanism for folding the cover blank into a generally U-shaped formation surrounding the lading exposed in the first formation while and as the first formation is being moved upwardly and such that the margin of the cover blank overlies the flanges of the body blank, and a sixth mechanism for securing the flanges of the body blank to the margin of the cover blank to form a sealed package or carton with lading enclosed therein.

The machine embodying the herein invention differs from the machine disclosed in application, Serial Number 446,124, in that it utilizes different mechanisms arranged in a different manner for folding a body blank and cover blank about lading. Additionally, the folding operation in the present machine is entirely along a horizontal path of movement with attendent advantages over the prior machines referred to which will be discussed hereinafter.

SUMMARY OF THE INVENTION

According to the invention there is provided a machine for forming a sealed package containing lading from a generally rectangular body blank of paperboard material and a generally rectangular cover blank of paperboard material. The body blank included a center panel, alternate, hingedly connected side panels and flanges hingedly connected along the longitudinal edges of the center and side panels and along the ends of the side panels. The cover blank included a center panel and alternate hingedly connected side panels. Said machine includes first means for positioning the body blank in a generally vertical plane adjacent the outlet of a lading moving station from which a quantity of lading is moving horizontally in one direction, conveying means positioned for horizontal movement in a direction laterally of said one direction, said conveying means including a receiving station adjacent said lading moving sation and a discharge station spaced downstream from said receiving station, second means at said receiving station for folding the body blank into a generally U-shaped formation partially surrounding a quantity of lading with the center panel forming an end wall and the side panels forming two side walls of the formation as the quantity of lading is moved from the lading moving station, engages the body blank and moves onto said conveying means, third means at said receiving sation for folding the flanges along each longitudinal edge of the body blank to positions generally perpendicular to the associated side walls and end wall during movement of the lading against the body blank and onto said conveying means, fourth means for folding the end flanges to a position generally perpendicular to the associated side walls, said conveying means being operative to move the folded body blank and lading to said discharge station, fifth means for positioning the cover blank in a generally vertical plane adjacent said discharge station, sixth means at said discharge station for moving the folded body blank and lading laterally off of said conveying means and against the cover blank, seventh means at said discharge station for folding the cover blank into a U-shaped formation partially surrounding the lading with the margin of the cover blank positioned overlying the flanges of the folded body blank as the folded body blank formation is moved off of said conveying means and eighth means adjacent said discharge station for securing the flanges

of the body blank to the adjacent facing margin of the cover blank.

Also, according to the invention there is provided a method for forming a sealed package containing lading from a generally rectangular body blank of paperboard material and a generally rectangular cover blank of paperboard material, the body blank including a center panel, alternate, hingedly connected side panels and flanges hingedly connected along the longitudinal edges of the center and side panels and along the ends of the side panels, and the cover blank including a center panel and alternate hingedly connected side panels, said method including the steps of positioning the body blank in a generally vertical plane adjacent the outlet of a lading moving station; moving a quantity of lading horizontally in one direction and against the body blank; folding the body blank into a generally U-shaped formation partially surrounding the lading with the panels lying in generally vertical planes and with the center panel forming an end wall and the side panels forming two side walls of the formation as the lading is moved from the lading moving station; folding the flanges along each longitudinal edge of the body blank to positions generally perpendicular to the associated side walls and end wall during movement of the lading against the body blank; folding the end flanges to positions generally perpendicular to the associated side walls; moving the folded body blank and lading in a direction laterally of said one direction to a discharge station, positioning the cover blank in a generally vertical plane adjacent the discharge station, moving the folded body blank and lading in a third direction laterally of said second direction and against the cover blank; folding the cover blank into a U-shaped formation partially surrounding the lading with the margin of the cover blank positioned overlying the flanges of the folded body blank as the folded body blank formation is moved against said cover blank and securing the flanges of the body blank to the adjacent facing margin of the cover blank.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a flow diagram illustrating the manner in which two blanks are folded about a quantity of lading to form a sealed package and illustrating the successive steps that are followed in practicing the packaging method of the invention;

FIG. 2 is a top plan view of the packaging machine of the invention with portions broken away to show details;

FIG. 3 is a side elevational view of the machine as viewed along line 3—3 of FIG. 2;

FIG. 4 is an end elevational view of the packaging machine as viewed along line 4—4 of FIG. 3;

FIG. 5 is an end elevational view of the machine viewed along line 5—5 of FIG. 2 and with portions broken away;

FIG. 6 is an elevational view of one embodiment of a body blank moving mechanism;

FIG. 7 is an end elevational view of the mechanism shown in FIG. 6 as viewed along line 7—7 of FIG. 6;

FIG. 8 is a fragmentary perspective view of one of the flange folding members of the machine;

FIG. 9 is an enlarged fragmentary view of a portion of a gripping mechanism for gripping and moving a cover blank;

FIG. 10 is a perspective view of a blank edge pusher forming part of one embodiment of a cover blank moving mechanism; and

FIG. 11 is a perspective view of a pair of secondary end flange folding mechanisms.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring now to FIG. 1, the invention is shown as utilizing two separated blanks of paperboard material comprising a body blank 10 and a cover blank 12 which form a sealed package 14 by wrapping the two blanks around a quantity or stack of lading 16. The body blank 10 includes a center panel 18 and alternate hingedly connected side panels 19 and 20. Flanges 21, 22, and 23 are hingedly connected along the side edges of the panels 18, 19, and 20 and end flanges 24 are hingedly connected along the ends of the side panels 19 and 20. The cover blank 12 is unflanged and includes a center panel 28 and alternate hingedly connected side panels 29 and 30.

The method and machine of the invention are particularly adapted for use with a conventional semiautomatic case packer, generally designated 32, a portion of which is shown in FIG. 1. The machine of the invention is designated generally by the reference numeral 34.

Referring to FIGS. 1 and 4, the case packer 32 includes an infeed conveyor 36 on which articles of lading 38 are moved to a lading ejecting station 40. At station 40, the articles 38 are elevated by a conventional elevating mechanism until a quantity of the articles is grouped to form the stack 16 of lading. Then a pusher mechanism or lading moving ram 42 is activated to push the stack 16 in a horizontal direction, indicated by the arrow 43 through a discharge funnel 44 at the lading ejecting station 40, as seen in FIGS. 2 and 4. The discharge funnel 44 is commonly referred to as a horn. In the conventional case packer use, a partially formed carton set up from a one-piece use, a partially formed carton set up from a one-piece blank and closed on five sides would be fitted over the horn to receive a quantity of lading ejected through the horn 44 and thereafter deposited on a conveyor. Then, the partially assembled packages must be sealed manually by folding the end flaps of the carton. With the machine 34 of the present invention, the packaging of each lading stack 16 is effected automatically and continuously using a two-blank carton system.

The machine 34 includes a conveyor mechanism 48 which includes an endless conveyor assembly 50 having an upper run or reach 52 which moves in a horizontal direction 55 laterally of the direction 43 of the pusher mechanism 42. The conveyor mechanism 50 includes a receiving station 58 at one end and a discharge station 60 at the other end of the conveyor assembly 50. Additionally, the conveyor mechanism 48 includes an intermediate station 62 where end flanges 24 of a folded body blank 10 are folded.

The machine 34 further includes a pusher mechanism 64 at the discharge station for moving a folded body blank formation off the conveyor assembly 50 and against a cover blank 12, a compression chamber 66 into which the resulting two-blank formation is moved, a magazine 68 of body blanks, a magazine 70 of cover blanks, and various other mechanisms for moving a blank from either of the magazines 68 or 70

to a desired position adjacent the receiving station **58** or the discharge station **60**, and various devices and mechanisms to be described below for effecting the folding of a body blank **10** about the lading **16** at the receiving station **58** and for folding a cover blank **12** about the folded body blank formation at the discharge station **60**. The operation of the machine and a detailed description of the various devices and mechanisms referred to above will now be described having particular reference to FIG. **1**.

In the embodiment shown in FIG. **1**, there is illustrated a vacuum or suction cup assembly **74** which is utilized for moving a body blank **10** from the magazine **68** downwardly to a position between the lading ejecting station **40** and the receiving station **58**. The assembly **74** includes a framework **76** which mounts two pneumatic or hydraulic cylinders **78** each of which has a suction cup **80** mounted to the distal end of a piston rod extending therefrom. The suction cups **80** are connected by fluid lines not shown to a source of vacuum. The framework **76** is secured to the lower end of a vertically movable piston rod **84** which extends from a pneumatic or hydraulic operated cylinder **86**.

In the operation of the assembly **74**, the cylinders **78** are actuated to move the suction cups **80** forward toward the outlet end of the magazine **68** and into engagement with one side of a blank **10**. Then vacuum is applied to the suction cups **80** so that they can hold the blank **10** thereto. Next, the cylinders **78** are actuated to retract the suction cups **80** with a blank held thereto. Subsequently, the cylinder **86** is operated to move the framework **74** downwardly thereby to carry the blank **10** downwardly. When the piston rod **84** has reached the lower extent of its vertical movement, vacuum is released from the suction cups **80** to allow the blank **10** to slide downwardly. Although not shown in FIG. **1**, it will be understood that vertically extending guide members are provided for maintaining proper positioning of the body blank **10** as it is moved downwardly. Also, and as is shown in FIG. **1**, a seating member or bar **90** is situated between the lading ejecting station and the receiving station in position to provide a stop or rest for supporting the cover blank **10** two stations **40** and **58**.

Referring to FIGS. **6** and **7** a modified form of a cover blank moving assembly is illustrated and generally designated by the reference numeral **94**. The mechanism **94** operates without the use of vacuum in moving a cover blank from the magazine **68**. The moving mechanism **94** includes a framework **96** connected to the lower end of a piston rod **98** extending from a pneumatic or hydraulic cylinder **100**. The framework **96** is generally H-shaped and includes vertically extending legs **101** and **102**. As shown an edge-engaging member **104** extends between and is secured to the upper ends of the legs **101** and **102** and has a shoulder **106** (FIG. **7**) dimensioned and arranged to engage the upper one of the two longitudinal edges of the blank **10**. Attached to the lower end of each leg **101** and **102** is a pad **111**, 112. Each of the pads has a plurality of teeth **114** extending outwardly and downwardly therefrom as shown in FIG. **7**. These teeth are arranged to engage and dig into a body blank at the outlet end of the magazine **68** adjacent the lower longitudinal edge of the blank **10** and in cooperation with the shoulder **106** move the blank **10** downwardly between two guide rails **121** and **122** to the desired position adjacent the entrance and to the receiving station **58**.

From FIG. **7**, it is apparent that the mechanism **94** has a "thinner" profile than the assembly **74** which permits the mechanism **94** easily to move between the lading ejecting station **40** and the receiving station **58**. To provide space between the outlet end of the lading ejecting station **40** and the entrance to the receiving station **58**, the conveyor assembly **50** is spaced a short distance from the lading ejecting station and the conveying mechanism **48** includes a cylinder **130** for moving the conveyor assembly **50** toward and away from the horn **44** in a direction laterally of the direction of movement of the conveyor assembly **50** as indicated by the arrow **131**. As will be described in more detail hereinafter, several functions are accomplished when this lateral movement is effected, one of which is the movement of the receiving station **58** closer to the lading ejecting station **40**. In this way, folding members, more specifically a pair of vertical folding rollers **134** and a pair of flange folding bars **136**, are moved closer to the blank **10** if not into actual engagement with the blank **10**. As shown the rollers **134** are located on either side of the entrance to the receiving station **58** and the folding bars **136**, only one of which is shown in the Figures, are positioned above and below the entrance to the receiving station **58**.

As shown in FIG. **1**, after the quantity of lading **16** has been assembled, the pusher mechanism **42** is operated and moves forward in the direction indicated by the arrow **43** to move the quantity **16** of lading through the discharge funnel or horn **44** (FIGS. **2** and **4**) and aganist the blank **10** positioned adjacent the discharge end of the lading ejecting station **40** and the entrance end to the receiving station **58** of the conveyor mechanism **50**. As the lading **16** is moved against the blank **10**, it forces the blank **10** against the rollers **134** and the bars **136** which fold over the panels **19** and **20** and the flanges **21–23**.

In the first folding operation, the blank **10** is first positioned as shown, the cylinder **130** is operated to move the conveyor **50** closer to the lading ejecting station **40** and then the pusher **42** is operated to move the lading **16** through the discharge horn **44** and against the center panel **18** of the blank **10**. Further movement causes the panels **19** and **20** to engage the rollers **134** which fold the panels **19** and **20** against the lading **16** to form the body blank **10** into a generally U-shaped formation partially surrounding the lading **16**. At the same time, the folding bars **136** fold over the flanges **21**, **22**, and **23** to a position **90** degrees with respect to the associated panels **18**, **19** and **20**. To facilitate the folding action, the folding bars **136** preferably have a curved or beveled surface **140** which is best shown in FIG. **8**. In this way, the folding bars **136** function as plow members which plow over the flanges **21**, **22** and **23** as the pusher **42** is moving the lading through the funnel **44** and into the receiving station **58** of the conveyor mechanism **50**. The resulting formation **142** of folded blank **10** and lading **16** is now at the upstream end of the upper run **52** of the conveyor assembly **50**. Next, the cylinder **130** is operated to move the conveyor assembly **50** back to its former position.

Then the conveyor assembly **50** is indexed to move the formation **142** to the intermediate or end flange folding station **62**. In FIG. **1**, a formation **142***a* is shown in this position. A subsequent quantity of lading **16** is

then stacked at the lading ejecting station and another body blank **10** is moved into position. After these two subsequent events have occurred, the cylinder **130** is again actuated to move the conveyor assembly forward. This will result in the movement of the end flanges **24** of the formation **142***a* against a pair of end flange folding mechanisms **148** only one of which is shown in FIG. **1.** Each of the mechanisms **148** includes a vertically extending pivotally mounted plate **150** which is spring-biased to an inclined position toward the conveyor mechanism **50** as shown in FIG. **1.** It will be apparent that as the conveyor assembly **50** is moved laterally in the direction indicated by the arrow **131,** the end flanges **24** will engage the plates **150** and will be bent inwardly of the formation **142***a* as the plate **150** is moved backwardly to a position perpendicular to the direction of the arrow **131** at which point the end flanges **24** will be completely folded over to positions perpendicular to the associated panels **19** and **20.**

At the same time, a subsequent blank **10** is being folded into a U-shaped about lading to form another formation **142** at the receiving station **58** as shown in FIG. **1.** Next, the cylinder **130** is operated and the conveyor assembly **50** is indexed again, this time to bring the formation **142***a* to the discharge station with the end flanges **24** folded over as shown by the formation **142***b* at the discharge station in FIG. **1.** At the same time the second formed formation **142** is moved to the position of the formation **142***a*. The previously described operations are repeated and while the conveyor assembly **50** is in the forward position, the pusher mechanism **64** is operated to push the formation **142***b* out of the discharge station and against a cover blank **12.** Prior to this operation, however, other mechanisms have been operated to move a cover blank **12** from the outlet end of the magazine **70** to a desired position adjacent the exit end of the discharge station **60.** Also, if the cover blanks **12** had not been previously treated with an adhesive along the margin on one side thereof, adhesive is applied to the margin of the cover blank **12** as will be described below.

Referring to FIGS. **1, 2,** and **3,** there is illustrated adjacent the outlet end of the magazine **70** an adhesive-applying device **156.** The device **156** includes two applicator heads **158** mounted at spaced-apart locations on a horizontally extending arm **160** which extends from a framework **161** journaled on two vertical guide rods **162.** A suitable drive mechanism such as the piston and cylinder device **164** shown in FIG. **3** is connected to the arm **160** for moving the same upwardly or downwardly thereby to move the heads **158** in one vertical stroke along the longitudinal side margins on one side of a cover blank **12** at the outlet end of the magazine **70.** Of course, other suitable drives such as a motor and chain arrangement can be utilized. An adhesive pump **166** is mounted on the framework **161** and is operated when the framework **161** is moved upwardly or downwardly to pump adhesive to the applicators **158.** For this purpose, the pump **166** has a shaft **168** extending therefrom and first and second one-way pinion gears **171** and **172** are mounted thereon. A rack **173** is positioned adjacent to and engages the pinion **171.** Likewise, a rack **174** is positioned adjacent to and engages the pinion **172.** The pinion gears **171** and **172** are mounted with one-way clutches onto the shaft **168** such that on one stroke of upward or downward movement the pinion **172** will rotate on the rack and freely on the shaft **168** while the pinion **171** will rotate on the rack **173** and be fixed to the shaft **168** thereby causing rotation of the shaft **168** in one direction. Then, when the framework **161** is moved in the opposite direction, the pinion gear **171** will rotate freely and the pinion **172** will rotate the shaft **168** in said one direction. In this way, on either upward or downward movement of the framework **161,** the shaft **168** will always be rotated in the same direction to properly operate the pump **166** for pumping adhesive to the applicators **158.**

After the platform **161** has been moved upwardly or downwardly and an adhesive has been applied to the longitudinal margins of the cover blank **12** at the outlet of the magazine **70,** a blank moving mechanism **180** is operated to move the cover blank **12** laterally of the magazine **70.** The moving mechanism **180** illustrated in FIGS. **1, 2,** and **3** includes a suction cup assembly similar to the suction cup assembly **74.** In this respect the mechanism **180** includes a frame member **182** mounting two cylinders **184** from which extend piston rods having suction cups **186** at the distal ends thereof. The suction cups **186** are connected to a source of vacuum not shown. The frame member **182** is mounted to the distal end of a piston rod **188** extending from a hydraulic or pneumatic cylinder **190.**

After adhesive has been applied to the longitudinal margin of the blank **12,** the cylinders **184** are operated to move the suction cups **186** against the cover blank **12** and vacuum is applied thereto to secure the cover blank **12** to the mechanism **180.** Then the cylinder **190** is operated to move the whole assembly laterally to the left viewing the same in FIG. **1** to move the cover blank **12** from the outlet end of the magazine **70.** During this movement, a pair of vertically spaced apart adhesive applicators or glue heads **192** are operated to apply adhesive to the upper and lower margins of the cover blank **12** adjacent the end edges of the cover blank **12.** After the cover blank **12** has been moved a short distance laterally of the magazine **70,** operation of the cylinder **190** is terminated and operation of a gripping mechanism **196** is initiated to move a pair of grippers **198** into position to grip the cover blank **12** adjacent one longitudinal edge thereof. The gripping mechanism **196** includes a vertical positioned frame member **199** which mounts the pair of grippers at each end thereof. A piston and cylinder mechanism **200** is connected to the frame member **199** for moving the frame member to and from the position shown in FIG. **1.** As best shown in FIG. **9,** each gripper **198** includes a pair of jaws **202** and **204** one or both of which can be mounted for pivotal movement to and from a jaw open position and a jaw closed position. In the embodiment of the gripper **198** illustrated in FIG. **9,** one jaw **202** is stationary and the other jaw **204** is pivotable between an open position and a closed position. Also, it will be noted that the jaw **204** is L-shaped with a long leg **205** and a short leg **206** forming the gripping portion so that the jaw **204** can extend about a line **207** of adhesive on the margin adjacent the one edge of the blank **12.** Also, it will be noted that the fixed jaw **202** has an outwardly bent end or lip **208** to facilitate movement of the gripper **198** past the edge of the cover blank **12.** In this respect, when the cylinder **200** is operated, the jaw **204** is in an open position and this permits the lip **208** to slide behind the cover blank **12** until the path of movement of the gripping portion **206** of the jaw **204** is beyond the line of adhesive **207,** at which point a cylinder

210 is operated to move the jaw 204 to the jaw closed position and thereby grip the cover blank 12 as shown in FIG. 9. Then the cylinder 200 is operated to retract the gripping mechanism 196 thereby to pull the cover blank 12 to a desired position adjacent the outlet end of a discharge funnel 214 (FIG. 3) at the discharge station 60.

In the desired position, the cover blank 12 rests on a support member 216 (FIGS. 1 and 3) and the cylinders 210 are now operated to move the jaw 204 to a jaw open position thereby to release the cover blank so it can be folded about the exposed lading 16 and the folded flanges of body blank 10 when the formation 142*b* is moved against the cover blank 12. It will be understood that the vertical spacing between the grippers 198 can be varied so as to provide for the most efficient folding of the cover blank 12 when the panels 29 and 30 engage a pair of folding rollers 218 as the formation 142*b* is moved against the center panel 28 of the cover blank 12.

In a modified embodiment of the machine 34, the blank moving mechanism 180 is replaced by a blank edge pusher 220 shown in FIG. 10. The edge pusher 200 includes a vertical member 222 having an L-shaped cross section embodying a shoulder for engaging the longitudinal side edge of a cover blank 12 to move the same laterally from the magazine 70 towards the position adjacent the outlet end of the discharge station 60. The mechanism 220 also includes a piston and cylinder device 224 connected to the member 222 for moving the same. It will be apparent that since the blank edge pusher 220 does not firmly grip the cover blank 12 as does the mechanism 180, the pusher 220 is only operable to move the cover blank 12 a short distance from the magazine 70. Of course, it is only necessary to move the cover blank 12 a distance sufficient to enable the gripping mechanism 196 to engage and grip the cover blank 12 adjacent the opposite longitudinal edge thereof as shown in phantom lines in FIG. 1. The stroke of cylinder 200 can be adjusted for whichever device, mechanism 180 or pusher 220, is utilized.

When the cover blank 12 has been moved to the desired position adjacent the exit end of the discharge funnel 214 at the discharge station 60, the pusher 64 is operated to move the formation 142*b* into the funnel 214 and then into engagement with the cover blank 12. The walls of the funnel 214 will maintain the side panels 19, 20 and side flanges 21–23 folded in place. However, the end flanges 24 may tend to spring outwardly due to the natural flexibility of the paperboard material. Accordingly, if desired, a pair of secondary end flange folding device 228 may be provided as shown in FIGS. 2 and 11. Each of the secondary end flange folding devices 228 includes a pneumatic or hydraulic cylinder 232 suitably mounted adjacent the outlet of the funnel 214. The distal end of the piston rod extending from each cylinder 232 is connected to a vertically extending plate 234 which may have any desired vertical dimension and in FIG. 11 is shown with a short vertical dimension. Inasmuch as the end flanges 24 had been initially folded at the flange folding station 62, the flanges 24 will not spring all the way out to their original position but instead will only spring slightly outwardly so as to be inclined as shown in FIG. 11.

In one mode of operation of the machine 34, the cylinders 232 are operated to move the plates 234 to a position adjacent the end of the funnel 214 when the pusher 64 is operated to move the formation 142*b* into the funnel 214. The length of the stroke of movement of the pusher 64 in this mode of operation is such that the formation 142*b* is moved up to but not past the extended position of the plates 234. In this respect, the end flanges 24 will be moved into engagement with the plates 234 and bear thereagainst so as to fold them back to their folded position extending 90 degrees from the side panels 19 and 20. It will be understood that the secondary flange folding devices 228 move with the funnel 214 and the conveyor assembly 50 when the conveyor assembly 50 is moved by the cylinder 130. The plates 234 will now hold the end flanges 24 in the folded positions until a subsequent operation of the pusher 64 which will push a subsequent formation 142*b* into the funnel 214. At this point in time the devices 228 are operated to retract the plates 234 and allow the formation 142*b* in the funnel 214 to be moved against the cover blank 12. Also, it will be understood that the funnel 214 will have been moved a short distance forward toward the cover blank 12 and to a position where the exit end thereof is closely adjacent the center panel of the cover blank 12. The pusher 64 is now operated and will move one formation 142*b* into the funnel while moving the formation 142*b* in the funnel against the cover blank 12 the side panels 29, 30 of which engage the rollers 218 to cause folding over of the cover blank 12 about the exposed lading and folded flanges 21–23 as shown in phantom lines in FIG. 1. As the cover blank 12 is being folded over as shown in FIG. 1, the two blanks 10 and 12 as well as the lading 16 are moved into the compression chamber 66.

The compression chamber 66 may take any one of several forms and typically will have side walls and top and bottom walls which can be moved toward and away from each other so that the distance between the walls can be made slightly less than the dimensions of a carton or package 14 formed from the two blanks 10 and 12 with the lading 16 enclosed therein. As a result pressure is applied to the side walls of the carton thereby to hold the margin of the cover blank 12 against the folded flanges 21–23 of the body blank 10 while the adhesive therebetween sets. The frictional pressure of the walls of the compression chamber 66 against the thusly formed package will also serve to retard movement of a completed package through the compression chamber 66. As a result, the wall formed by the center panel 18 of the body blank 10 will bear against the center panel 28 of the cover blank 12 of a subsequently formed package and thereby force the margins of the center panel 28 of the cover blank 12 of the subsequent package against the end flanges 21–23 of the body blank 10 of the subsequent package to hold them against each other while the adhesive therebetween sets.

It will be understood from the foregoing description of the construction and operation of the machine 34 that it is designed to operate automatically and intermittently. In this respect it will take a short time to collect a quantity of lading and stack it in the manner shown in FIG. 1 and the machine will operate in a stepwise fashion in the manner just described to automatically and intermittently in step by step fashion form packages which are fully sealed by the time each completed package 14 reaches the outlet end of the compression chamber 66. Also it will be understood that the machine 34 will include suitable electrical, hydrau-

lic and/or pneumatic controls of known type for controlling the opertaion of the machine **34** such that the above-described operations are performed in a proper timed sequence.

It will be apparent from FIGS. **2**, **3**, and **4** that the conveyor mechanism **50** includes a framework **240** for supporting the conveyor assembly **50**. Also, it will be noted that the framework **240** supports a pair of guide plates **242** (FIG. **2**) which hold the folded flanges **21–23** at the upper side of the formation **142** in place as the formation **142** is intermittently moved by the conveyor assembly **50** from the receiving station **58** to the discharge station **60**. Also, it will be understood that the folded flanges at the lower side of the formations **142** will be held in place by the slats forming the upper run **52** of the endless conveyor assembly **50**. Moreover, and as best shown in FIG. **1**, there are two elongate guide plates **244** extending between the intermediate station **62** and the discharge station **60**. These guide plates **244** are arranged to engage the folded end flanges **24** and hold the same in place while the formation **142***a* is being moved to the position of the formation **142***b* at the discharge station **60**.

The magazine **68** is supported by a framework **250** above the lading ejecting station **40** as shown in FIG. **4**. Also, a chain conveyor mechanism **254** including a pair of chains is located beneath and forms a part of the magazine **68**. A bracket **258** is secured to the chains **256** and is arranged to engage the back side of the stack of body blanks **10** in the magazine **68**. A pair of dual acting piston and cylinder devices **260** are arranged to engage the chains so as to urge the bracket **258** against the back side of the stack of body blanks **10**. In this respect, the distal end of a piston rod **261** from each piston and cylinder device **260** has a pall **262** which ratchetly engages lugs (not shown) on one of the conveyor chains **256**. Control pressure is applied to the device **260** and suitable control valves are utilized in conjunction therewith such that pressure is applied to extend the piston rod until the piston reaches the forward end of the cylinder **260** at which time fluid pressure is applied to the forward end of the cylinder **260** to retract the piston to the rearward end of the cylinder causing the pall **262** to ratchet over other lugs. Then pressure is again applied to the rearward end of the cylinder **260** to cause the pall to engage another lug and thereby continuously urge the bracket **258** against the back side of the stack of body blanks **10** in the magazine **68**.

As best shown in FIGS. **1** and **2**, the magazine **68** also includes a pair of guide rails **263** which have an inverted V-shaped cross section. It will be noted that each of the cover blanks has a V-shaped notch therein at the junction between the flanges **22**, **23** connected to the side panels **19**, **20** and the flanges **21** connected to the center panel **18**. Each V-shaped notch allows the flanges to be folded over and form a miter joint therebetween as shown in the formations **142** in FIG. **1**. The V-shaped notches also facilitate and permit proper guiding and locating of the cover blanks as they are moved through the magazine **68** by reason of the mating fit between the inverted V-shaped support members **263** received in the V-shaped notches. Thus, the members **263** hold the body blanks **10** in proper alignment during their movement through the magazine **68** so that as each body blank **10** reaches the outlet end of the magazine **68**, it is in proper position to be moved downwardly to the folding position between the lading ejecting station **40** and the receiving station **58**.

As shown in FIGS. **2** and **5**, the magazine **70** is positioned adjacent and laterally to the side of the compression chamber **66**. In the magazine **70**, the cover blanks **12** are also arranged in a horizontally extending stack but with the cover blanks **12** supported on an end edge thereof as opposed to a side edge, as is the case with the body blanks **10** in the magazine **68**. The magazine **70** has side walls **264** (only shown in FIG. **2**) to maintain the cover blanks in proper alignment. Also, the magazine **70** includes a conveyor chain arrangement **268**, including a bracket **270**, and a pair of piston and cylinder devices **272**. The piston and cylinder devices **272** operate in the same manner as the piston and cylinder devices **260** to continuously urge the bracket **270** against the back end of the stack of cover blanks **12**.

From the foregoing description it will be apparent that the machine **34** provides a number of advantages some of which have been described above and others of which are inherent in the machine. Specifically, the machine **34** can be fully automatic as well as semiautomatic in operation. Also, the movement of the lading through the machine is on one horizontal level although in three directions through the machine. Moreover, the component parts of the machine such as the conveyor mechanism **48**, the magazines **68** and **70** and the compression chamber **66** are arranged to take up a relatively small amount of space and are very conveniently arranged to fit around and about a conventional case packing machine. Accordingly, the scope of the invention is only to be limited as necessitated by the accompanying claims.

What it is desired to cover by Letters Patent in the United States is:

1. A machine for forming a sealed package containing lading from a generally rectangular body blank of paperboard material and a generally rectangular cover blank of paperboard material, the body blank including a center panel, alternate, hingedly connected side panels and flanges hingedly connected along the longitudinal edges of the center and side panels and along the ends of the side panels, and the cover blank including a center panel and alternate hingedly connected side panels, said machine including first means for positioning the body blank in a generally vertical plane adjacent the outlet of a lading moving station from which a quantity of lading is moved horizontally in one direction, conveying means positioned for horizontal movement in a direction laterally of said one direction, said conveying means including a receiving station adjacent said lading moving station and a discharge station spaced downstream from said receiving station, second means at said receiving station for folding the body blank into a generally U-shaped formation partially surrounding a quantity of lading with the center panel forming an end wall and the side panels forming two side walls of the formation as the quantity of lading is moved from the lading moving station, engages the body blank and moves onto said conveying means, third means at said receiving station for folding the flanges along each longitudinal edge of the body blank to positions generally perpendicular to the associated side walls and end wall during movement of the lading against the body blank and onto said conveying means, fourth means for folding the end flanges to a position generally perpendicular to the associated side walls,

said conveying means being operative to move the folded body blank and lading to said discharge station, fifth means for positioning the cover blank in a generally vertical plane adjacent said discharge station, sixth means at said discharge station for moving the folded body blank and lading laterally off of said conveying means and against the cover blank, seventh means at said discharge station for folding the cover blank into a U-shaped formation partially surrounding the lading with the margin of the cover blank positioned overlying the flanges of the folded body blank as the folded body blank formation is moved off of said conveying means and eighth means adjacent said discharge station for securing the flanges of the body blank to the adjacent facing margin of the cover blank.

2. The machine according to claim **1** wherein said first means for positioning the body blank include a vacuum cup assembly comprising at least two vacuum cups, means for moving said vacuum cups in a given direction to and from a position adjacent the outlet end of a magazine for body blanks whereby, when said vacuum cups are disposed adjacent the outlet end of the magazine, vacuum can be applied to said cups for pulling a body blank from the magazine and holding the same in a vertical plane and means for moving said vacuum cup assembly with the body blank held thereto in a direction transversely of said given direction thereby to move the body blank to a position adjacent the outlet of the lading moving station.

3. The machine according to claim **1** wherein said first means for positioning the body blank include a blank gripping assembly comprising at least two pads having inclined teeth arranged thereon, an elongate shoulder formation fixed to said assembly and spaced from said pads and means for moving said assembly toward and away from the lading moving station and past the outlet of a magazine containing a supply of body blanks, said pads being arranged to engage a body blank at the magazine outlet adjacent one edge of the blank and said shoulder formation being arranged to engage the opposite edge of the body blank when said moving means is operated to move said assembly toward the lading moving station, said teeth on said pad being inclined toward the lading moving station so as to dig into one face of the body blank up movement toward the lading moving station and to disengage and brush across the one face of the body blank upon movement away from the lading moving station.

4. The machine according to claim **1** wherein said second means for folding the panels of the body blank include a pair of generally upright rollers each positioned on one side of said receiving station and operable to engage and fold over the side panels of the body blank as the lading engages the center panel of the body blank and pushes the body blank onto said conveying means.

5. The machine according to claim **1** wherein said third means for folding the flanges along the longitudinal edges of the body blank include two elongate horizontally extending members positioned respectfully at the top and bottom of said receiving station, each member having a curved baffle-forming surface facing toward the lading moving station, and said baffle-forming surfaces being arranged to engage and fold over the flanges connected to the side edges of the center and side panels as the lading engages the body blank and moves the body blank onto said conveying means.

6. The machine according to claim **1** wherein said conveying means include upper elongate plate means extending horizontally between said receiving station and said discharging station and arranged to engage the folded flanges on the upwardly facing side of the folded body blank formation and to maintain the flanges folded during the conveying of the formation to said discharge station.

7. The machine according to claim **1** wherein said conveying means include an endless conveyor assembly having an upper run for supporting and transporting the body blank formation and means for moving said conveyor assembly laterally of the direction of movement of said upper run thereby to move said receiving station toward and away from the lading moving station.

8. The machine according to claim **7** including an intermediate station located adjacent said conveying means intermediate said receiving station and said discharge station, said fourth means being located at said intermediate station and including a pair of spring biased vertically extending horizontally deflectible plates, each plate being positioned to engage one of the end flanges after the folded body blank formation has been indexed by said conveyor assembly to said intermediate station and said conveyor assembly is moved by said moving means laterally of the direction of movement of said upper run to move said receiving station toward the lading moving station for receiving another body blank and lading and simultaneously to move the first folded body blank formation toward said deflectible plates which engage and fold over the end flanges.

9. The machine according to claim **8** wherein said conveying means include elongate plate means extending horizontally between said intermediate station and said discharge station and position along one side of said conveyor assembly for engaging the folded end flanges to maintain the end flanges folded when said conveyor assembly is again indexed to move the folded body blank formation from said intermediate station to said discharge station.

10. The machine according to claim **1** wherein a discharge funnel is positioned at said discharge station adjacent one side of said conveying means, said sixth means being located at the opposite side of said conveying means and being operative to push said folded body blank formation into said discharge funnel and subsequently to push a second body blank formation against the body blank formation in the funnel thereby to push the first body blank formation against a cover blank which is positioned at the outlet end of said discharge funnel.

11. The machine according to claim **10** including secondary end flange folding members positioned at said outlet end of said discharge funnel, said secondary end flange folding members being movable to positions adjacent opposite sides of said funnel for engaging and refolding the end flanges which may have sprung outwardly due to the resiliency of the paperboard material before the folded body blank formation engages the cover blank.

12. The machine according to claim **1** wherein said fifth means for positioning the cover blank include a suction cup assembly comprising at least two suction cups, a mechanism for moving said cups in a given direction to and from a position adjacent the outlet end

of a magazine containing a supply of cover blanks whereby, when said cups are positioned adjacent the outlet end of the magazine, the suction cups can be connected to a source of vacuum for pulling a cover blank from the magazine, and means for moving the suction cup assembly in a direction transversely of the given direction to move a cover blank to the position adjacents said discharge station.

13. The machine according to claim 1 wherein said fifth means for positioning a cover blank include gripper means operable to grip a cover blank adjacent one edge thereof and pull the cover blank from a source of cover blanks to the position adjacent the discharge station.

14. The machine according to claim 13 wherein said gripper means includes at least two grippers, each gripper including a pair of jaws and at least one of said jaws being pivotable to and from a blank-engaging position, said gripper means being operable when said blank has been moved to a position adjacent the discharge station to cause said movable jaw to move to a nongripping position thereby releasing the cover blank to allow the cover blank to be folded about the folded body blank formation as the formation is moved from said discharge station against the cover blank.

15. The machine according to claim 13 wherein said fifth means further include a blank edge pusher positioned adjacent one side of a magazine containing a supply of cover blanks said blank edge pusher including seating means for engaging a side edge of a cover blank when said blank edge pusher is operated to move a cover blank at least part way from the magazine and to a position where said gripper means can reach and grip the cover blank adjacent the opposite side edge of the cover blank.

16. The machine according to claim 1 wherein said seventh means for folding the cover blank include a pair of horizontally extending folding rollers vertically spaced apart adjacent said discharge station and being operative to engage the side panels of the cover blank adjacent the respective connection of each side panel to the center panel of the cover blank when and as the folded body blank formation is moved from said discharge station against the cover blank.

17. The machine according to claim 1 wherein said eighth means for securing the cover blank to the body blank include vertically reciprocable means for applying adhesive to the longitudinal margin of the cover blank prior to the movement of the cover blank to the position adjacent said discharge station said means being operable on one stroke of movement to apply two strips of adhesive to the cover blank, each strip being along one longitudinal margin of the cover blank and subsequently on a reverse stroke of movement to apply adhesive to a subsequent cover blank in a similar manner.

18. The machine according to claim 1 wherein said eighth means for securing the cover blank to the body blank include means for applying adhesive to the margins of the cover blank adjacent the end edges of the cover blank as the cover blank is moved to the position adjacent said discharge station.

19. The machine according to claim 1 wherein said eighth means include a compression chamber located adjacent the outlet end of said discharge station, said compression chamber including means for applying pressure to the outer facing margin of the side panels of the cover blank to hold the same in engagement with the flanges of the body blank bearing against the inner facing margin of the side panels while an adhesive therebetween sets, and said means for applying pressure to the side panels of the cover blank being operative to retard movement of a package through the compression chamber so that the center panel of a cover blank of one package will engage and bear against the center panel of the body blank of a preceding package in said compression chamber thereby to urge the inner facing margin of the center panel of the cover blank of the subsequent package against the end flanges of the body blank of the subsequent package and hold the same in place while the adhesive therebetween sets.

20. The machine according to claim 1 including a magazine containing a supply of body blanks, said magazine being supported above the lading moving station and including means for urging the body blanks toward an outlet end of said magazine located above and generally in alignment with the outlet of the lading moving station and the entrance to said receiving station, each body blank having two V-shaped notches in each longitudinal side edge thereof, each notch separating the flange connected to a side panel from the flange connected to the center panel and said magazine including two elongate supporting members each having an inverted V-cross section whereby each support member receives therein one of the V-shaped notches on one side of each body blank and together said support members serve as a guide means for maintaining the body blanks in proper alignment as they are urged toward the outlet end of said magazine.

21. The machine according to claim 19 including a magazine containing a supply of cover blanks, said magazine being elongate and being disposed parallel to and alongside of said compression chamber, and said magazine including means for urging the cover blanks toward an outlet end of said magazine, said outlet end of said magazine being aligned with the outlet of said discharge station and the inlet to said compression chamber.

22. A machine for forming a sealed package containing lading from a generally rectangular body blank of paperboard material and a generally rectangular cover blank of paperboard material in combination with a semiautomatic case packer, the body blank including a center panel, alternate, hingedly connected side panels and flanges hingedly connected along the longitudinal edges of the center and side panels and along the ends of the side panels, and the cover blank including a center panel and alternate hingedly connected side panels, said case packer including an infeed conveyor, a lading ejecting station adjacent to and above said conveyor, a discharge funnel at said station and means for grouping lading on the conveyor, for raising the lading and for ejecting the lading through said discharge funnel, and said machine including means for positioning the body blank in a generally vertical plane adjacent the outlet of said discharge funnel from which a quantity of lading is ejected horizontally in one diection, conveying means positioned for horizontal movement in a direction laterally of said one direction, said conveying means including a receiving station adjacent said lading ejecting station and a discharge station spaced downstream from said receiving station, means at said receiving station for folding the body blank into a generally U-shaped formation partially surrounding a quan-

tity of lading with the center panel forming an end wall and the side panels forming two side walls of the formation as the quantity of lading is ejected from the lading ejecting station, engages the body blank and moves onto said conveying means, means at said receiving station for folding the flanges along each longitudinal edge of the body blank to positions generally perpendicular to the associated side walls and end wall during movement of the lading against the body blank and onto said conveying means, means for folding the end flanges to a position generally perpendicular to the associated side walls, said conveying means being operative to move the folded body blank and lading to said discharge station, means for positioning the cover blank in a generally vertical plane adjacent said discharge station, means at said discharge station for moving the folded body blank and lading laterally off of said conveying means and against the cover blank, means at said discharge station for folding the cover blank into a U-shaped formation partially surrounding the lading with the margin of the cover blank positioned overlying the flanges of the folded body blank as the folded body blank formation is moved off of said conveying means and means adjacent said discharge station for securing the flanges of the body blank to the adjacent facing margin of the cover blank.

23. A method for forming a sealed package containing lading from a generally rectangular body blank of paperboard material and a generally rectangular cover blank of paperboard material, the body blank including a center panel, alternate, hingedly connected side panels and flanges hingedly connected along the longitudinal edges of the center and side panels and along the ends of the side panels, and the cover blank including a center panel and alternate hingedly connected side panels, said method including the steps of positioning the body blank in a generally vertical plane adjacent the outlet of a lading moving station; moving a quantity of lading horizontally in one direction and against the body blank; folding the body blank into a generally U-shaped formation partially surrounding the lading with the panels lying in generally vertical planes and with the center panel forming an end wall and the side panels forming two side walls of the formation as the lading is moved from the lading moving station; folding the flanges along each longitudinal edge of the body blank to positions generally perpendicular to the associated side walls and end wall during movement of the lading against the body blank; folding the end flanges to positions generally perpendicular to the associated side walls; moving the folded body blank and lading in direction laterally of said one direction to a discharge station, positioning the cover blank in a generally vertical plane adjacent the discharge station, moving the folded body blank and lading in a third direction laterally of said second direction and against the cover blank; folding the cover blank into a U-shaped formation partially surrounding the lading with the margin of the cover blank positioned overlying the flanges of the folded body blank as the folded body blank formation is moved against said cover blank and securing the flanges of the body blank to the adjacent facing margin of the cover blank.

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UNITED STATES PATENT AND TRADEMARK OFFICE

CERTIFICATE OF CORRECTION

PATENT NO. : 3,896,601

DATED : July 29, 1975

INVENTOR(S) : James L. Vickers and Edmund A. Waycie

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Column 2 of Abstract, line 2, change "a" to --an--;
Column 4, line 40, delete the words "use, a partially formed";
line 41, delete the words "carton set up from a one-piece";
Column 5, line 44, after "10", insert --which has been lowered into the desired position between the--;
Column 7, line 21, change "shaped" to --shape--;
Column 8, line 44, change "vertical" to --vertically--;
Column 9, line 24, change "200" to --220--;
Column 11, line 2, change "opertaion" to --operation--;
Column 13, line 45, change "up" to --upon--;
Column 14, line 37, change "position" to --positioned--;
Column 15, line 8, change "adjacents" to --adjacent--;
Column 15, line 29, before "said", insert a comma (,).

Signed and Sealed this

fourteenth Day of *October 1975*

[SEAL]

Attest:

RUTH C. MASON
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents and Trademarks