United States Patent [19]

Klemm

[11] **3,850,085**

[45] **Nov. 26, 1974**

[54] **METHOD AND APPARATUS FOR FABRICATING AN ELONGATED CARTON**

[76] Inventor: **Lee E. Klemm,** N93 W25465 Bittersweet Ct., Sussex, Wis. 53089

[22] Filed: **May 11, 1973**

[21] Appl. No.: **359,319**

[52] **U.S. Cl.** .... **93/49 M,** 93/49 R, 93/52

[51] **Int. Cl.** **B31b 1/36**

[58] **Field of Search** .... 93/52, 49 R, 49 M, 53 M, 93/53 R, 84 R

[56] **References Cited**

UNITED STATES PATENTS

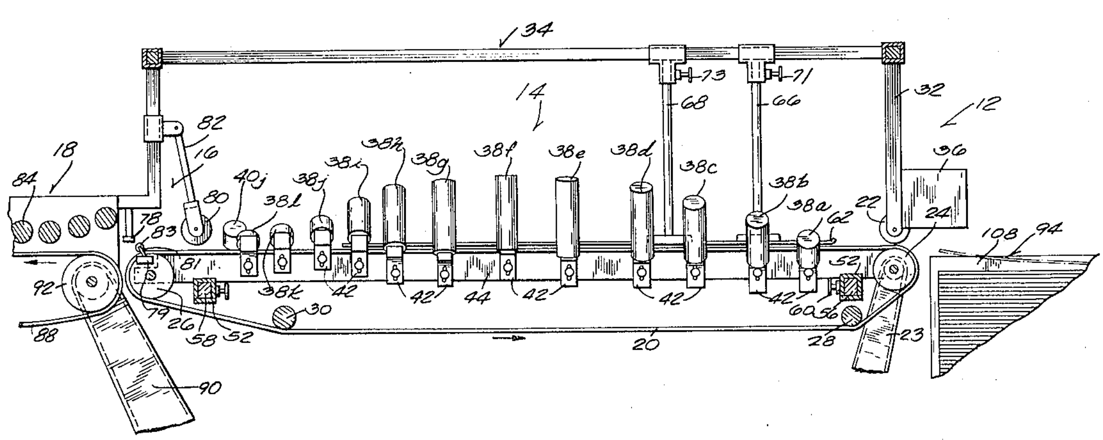
3,105,419	10/1963	LaBombard	93/52
3,153,991	10/1964	Goodrich	93/52 X
3,225,666	12/1965	Reimers	93/52 X
3,266,391	8/1966	Lopez	93/52
3,270,628	9/1966	Clem	93/52
3,291,007	12/1966	McDowell	93/52 X
3,530,643	9/1970	Levi	93/52 UX

Primary Examiner—Roy Lake
Assistant Examiner—James F. Coan
Attorney, Agent, or Firm—Michael, Best & Friedrich

[57] **ABSTRACT**

The method and apparatus for fabricating an elongated carton from a carton blank including a forming means for continuously and progressively folding the outer side panels of a carton from one end to the other as the carton is moved through the forming means. The forming means is comprised of two sets of stationary roller assemblies mounted on opposite sides of the travel path of the carton with one of said roller assemblies adapted to progressively fold one outer panel of the carton blank and the other of said roller assemblies adapted to progressively fold the other outer side panel of the carton blank. A bead of liquid adhesive is applied to the carton blank through a stationary glue dispensing head positioned above the travel path of the carton blank at the outlet of the forming means. A compression means including a power conveyor belt and a plurality of rollers compresses the side panels into overlapping contact with each other after the adhesive has been applied thereto and further maintains such compression on the overlapped panels until the adhesive has set. The carton is driven through the forming, gluing and compression means by the action of a powered conveyor belt and a stationary roller mounted adjacent the top surface of the belt at one end thereof.

10 Claims, 12 Drawing Figures



PATENTED NOV 26 1974

3,850,085

SHEET 1 OF 4

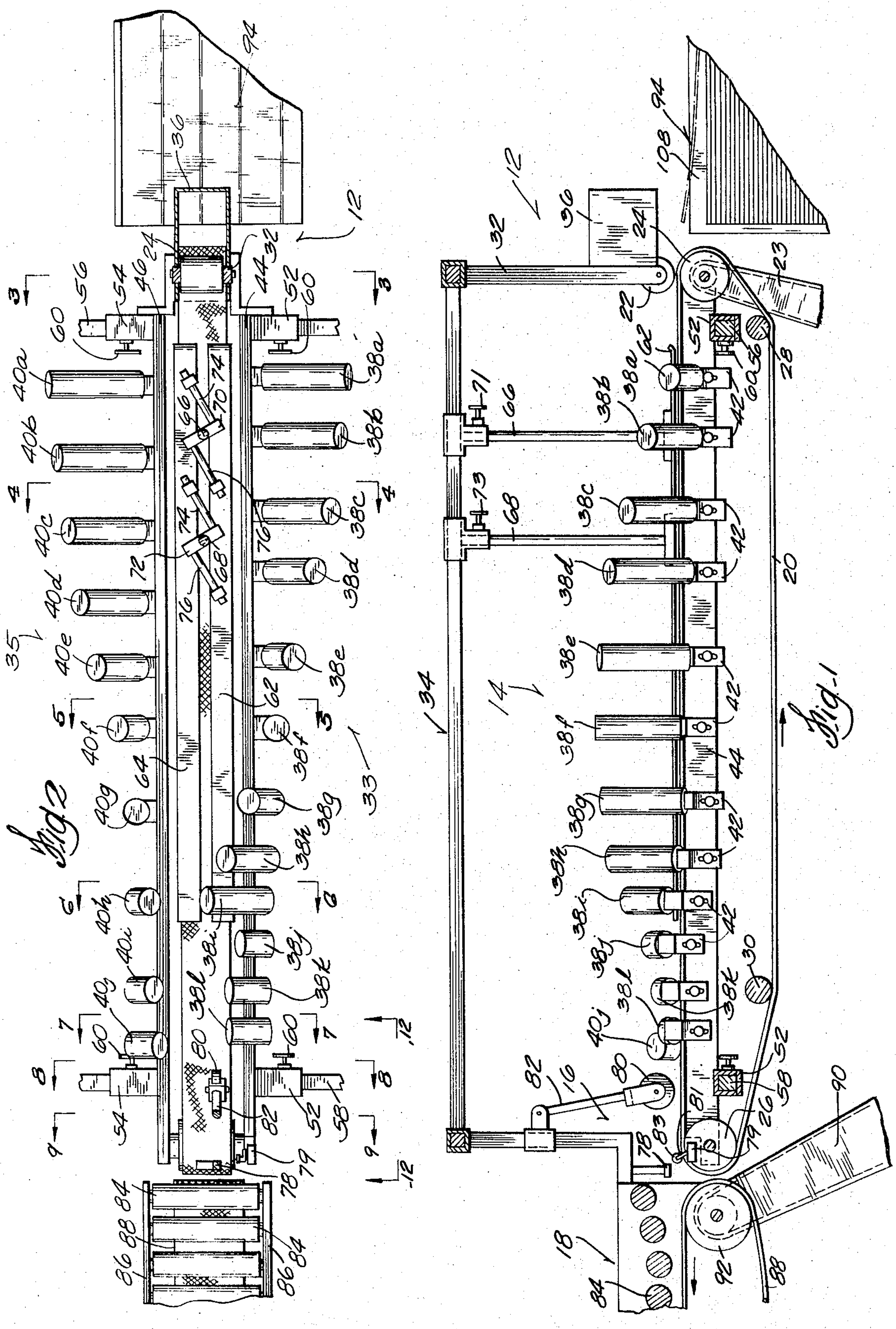


Fig. 1

Fig. 2

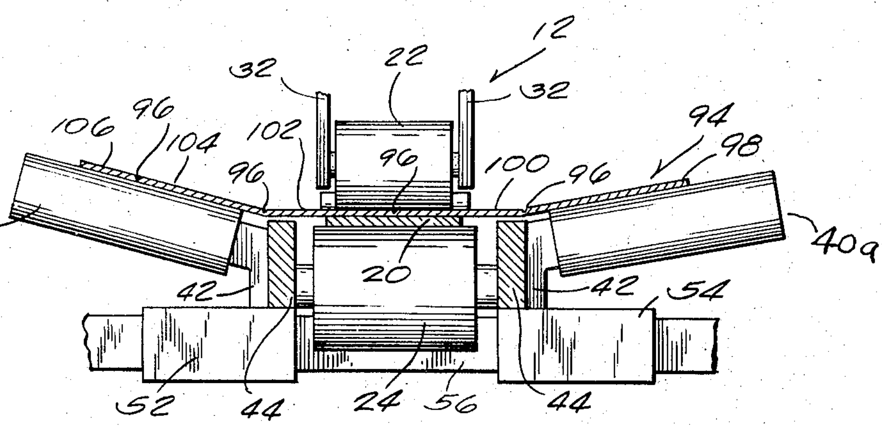


Fig. 3

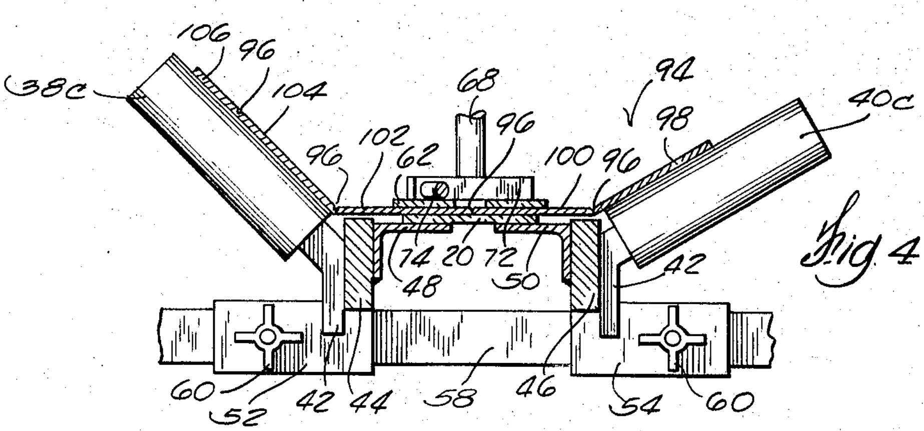


Fig. 4

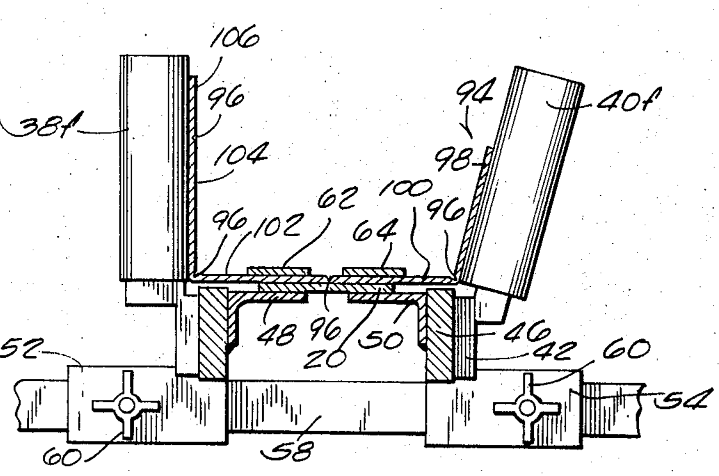
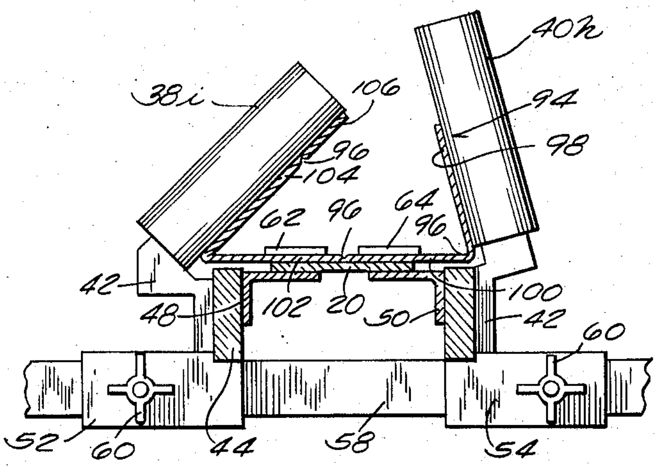


Fig. 5

Fig. 6



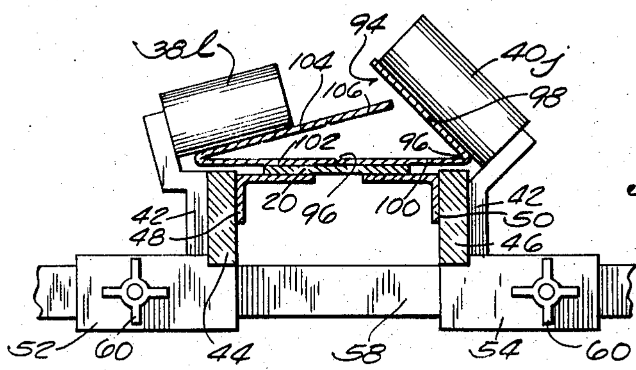


Fig. 7

Fig. 8

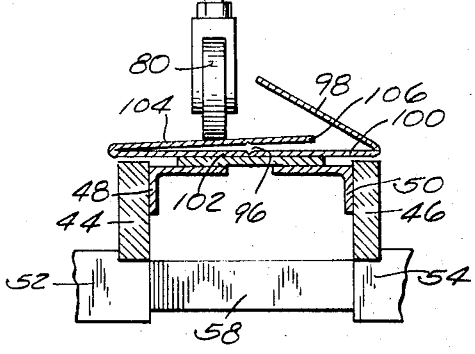
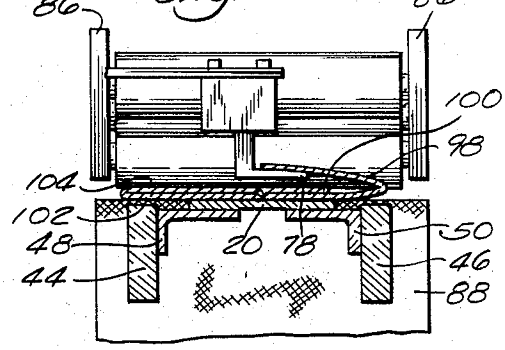


Fig. 9



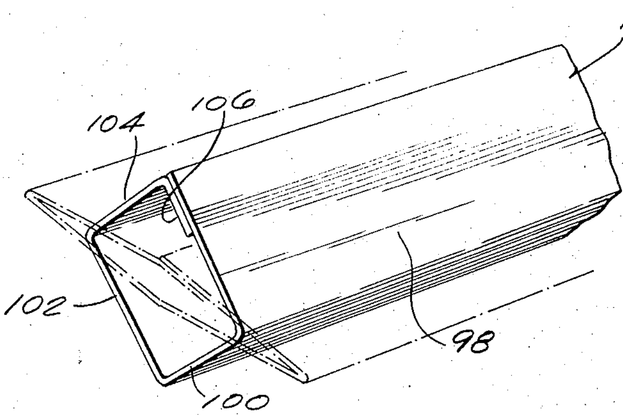


Fig. 10

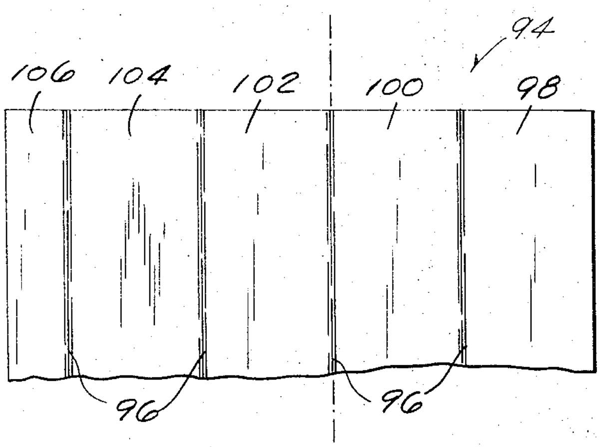


Fig. 11

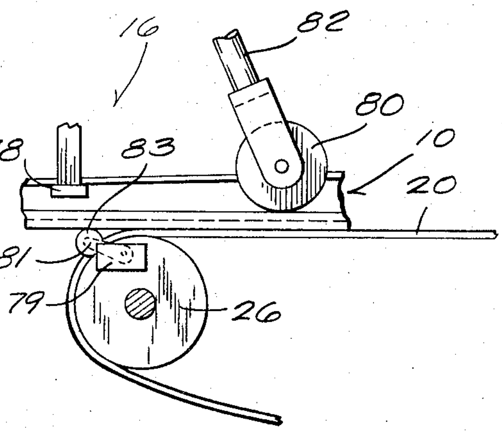


Fig. 12

METHOD AND APPARATUS FOR FABRICATING AN ELONGATED CARTON

BACKGROUND OF THE INVENTION

I. Field of the Invention

This invention relates to a method and apparatus of fabricating an elongated carton from a carton blank.

II. Description of the Prior Art

Prior to this invention elongated cartons of the type involved herein were fabricated by essentially a hand operation. The principal object of this invention, therefore, is to provide a method and apparatus wherein elongated cartons can be rapidly mass produced with a minimum of manual labor required.

SUMMARY OF THE INVENTION

The method and apparatus of fabricating an elongated carton from a carton blank including a forming means for continuously and progressively folding the outer side panels of a carton from one end to the other as the carton travels through the forming means. The forming means is adapted to fold the outer horizontal side panels of the carton blank upwardly to a vertical position and then downwardly and inwardly from such position to a substantially overlapped position. A gluing means is provided for applying adhesive to one of the side panels as it moves from the forming means and a compression means is provided for compressing the side panels into overlapping contact with each other after the adhesive has been applied thereto. Said compressing means is further adapted to maintain compression on such overlapped panels until the adhesive has set. A drive means including a power driven belt and a stationary roller mounted adjacent the top surface of the belt is provided to drive the carton through the forming means.

DESCRIPTION OF THE DRAWINGS

FIG. **1** is a side elevation view of the apparatus of this invention;

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

FIGS. **3, 4, 5, 6, 7, 8** and **9** are fragmentary sectional views taken along lines **3—3, 4—4, 5—5, 6—6, 7—7, 8—8** and **9—9** of FIG. **2** respectively except that in each view the cross-section of a carton blank is shown in the position it would be in at each sectional view shown;

FIG. **10** is a fragmentary perspective view of a fabricated carton made by the method and apparatus of the present invention;

FIG. **11** is a fragmentary top plan view of a carton blank before it is made into a carton like that shown in FIG. **10**; and

FIG. **12** is an enlarged fragmentary side elevation view taken along line **12—12** of FIG. **2.**

As indicated previously, the method and apparatus of the present invention is particularly adapted for fabricating cartons which have a relatively long length and relatively short cross-sectional dimensions. A fabricated carton of the type referred to is shown in FIG. **10** and is identified therein by the reference numeral **10.**

Referring now to FIGS. **1** and **2,** the apparatus of the present invention has four major operating components or means, namely, a drive means **12,** a folding or forming means **14,** a gluing means **16** and a compression means **18.**

Drive means **12** is comprised of a drive belt **20** and a stationary roller **22** mounted adjacent to and in contact with (or closely spaced from) the top surface of the belt at the extreme right-hand end thereof as viewed in FIG. **1.** Belt **20** is driven by any suitable prime mover (not shown) in the direction shown by the arrow in FIG. **1** by a belt or chain drive **23.** The belt is mounted on a pair of main support rollers **24, 26** and a pair of idler rollers **28, 30.** Roller **22** is mounted on a pair of vertical supports **32** which are attached to the main frame structure **34.** The roller **22** is provided with a guard **36.**

Forming means **14** is comprised of a pair of forming roller assemblies **33** and **35** mounted on opposite sides of belt **20.** Assembly **33** is comprised of a plurality of forming rollers **38*a*–38*l*** mounted on a horizontal support member **44** by means of brackets **42.** Forming roller assembly **35** is comprised of a plurality of forming rollers **40*a*–40*j*** mounted on a support member **46** by means of brackets **42.** The brackets **42** are adjustably secured (for vertical adjustment) on the respective support members **44** and **46.** A pair of angle members **48, 50** are welded or otherwise fastened to support members **44, 46** (see FIGS. **4–9**) which together provide a support surface for belt **20.**

The spacing between support members **44** and **46** (on which rollers **38** and **40** are mounted) can be adjusted by means of collar members **52** and **54** slidably mounted on horizontal frame members **56** and **58** located at opposite ends of the forming means **14.** Each collar member has a headed set screw **60** threaded therein so that the respective forming roller assemblies can be securely set in the desired position. The reason for providing the adjustment mechanism for the forming roller assemblies **33** and **35** will be described in detail hereinafter.

A pair of elongated hold-down shoes or plates **62, 64** are mounted adjacent belt **20** by a pair of vertical support rods **66, 68.** An adjustment mechanism (FIG. **2**) comprised of blocks **70** and **72** mounted for rotation on rods **66** and **68** and link members **74** and **76** which interconnect the blocks with the shoes is provided for adjusting the spacing between shoes **62** and **64.** Such adjustment is accomplished by first loosening headed set screws **71** and **73** and then rotating rods **66** and **68** to the desired position. The set screws are then tightened to hold the parts in the desired position.

As best illustrated by a sequential viewing of FIGS. **3–7,** the angular position of the folding rollers **34** and **40** going from the inlet to the outlet of the folding means **14** follows a definite pattern. Referring to FIG. **3,** the first set of rollers **38*a*** and **40*a*** angle outwardly from the vertical a substantial degree so that at the inlet of station **14** the rollers extend outwardly from and are almost in horizontal alignment with the belt **20.** Moving from rollers **38*a*** and **40*a*** to subsequent rollers such as rollers **38*c*** and **40*c*,** as shown in FIG. **4,** it will be seen that the outward angle from the vertical of such rollers becomes progressively less until a vertical angle is reached as in the case of rollers **38*f*** (FIGS. **5** and **2**) and **40*g*** (FIG. **2**). Moving from such rollers **38*f*** and **40*g*** to subsequent rollers such as rollers **38*i*** and **40*h*,** as shown in FIG. **6,** and rollers **38*l*** and **40*j*,** as shown in FIG. **7,** it will be seen that the angle of such subsequent rollers moves progressively downwardly from the vertical and inwardly towards the center line of the machine.

It will also be noted that the rate of above described angle progression from a position outwardly from the vertical, up towards the vertical and then inwardly from the vertical, differs somewhat in one roller assembly as compared with the other. More specifically, the rate of angular progression of the rollers of assembly **33** (on the left side of the machine as viewed from the inlet end) is greater than that of the rollers of assembly **35.** This difference in rate of angular progression is best illustrated in FIGS. **5, 6** and **7.** The function and operation of the roller assemblies described above will be described in detail hereafter.

The gluing means **16** is located at the exit or outlet of the forming means **14** and is comprised of an adhesive dispensing head member **78** connected to a supply of adhesive liquid (not shown) by any suitable means. As best shown in FIG. **12,** switch means **79** having an actuation arm **81** with a roller **83** is provided to control the flow of liquid adhesive from dispensing head **78** in response to the passage of a carton through the gluing station. Since the particular mechanism employed for transmitting liquid adhesive under pressure from a supply reservoir to the dispensing head **78** in response to the actuation of switch means **79** does not form a part of the present invention, a description of such mechanism is not contained herein. A hold-down wheel **80** mounted on an overhead support structure **82** is provided at the gluing station **16** to aid in the final holding phase of the carton as will be described in detail hereinafter.

The final means is the compression means **18** located immediately adjacent and downstream from the gluing means **18** as best shown in FIG. **1.** Compression means **18** (only partially shown) is comprised of a plurality of upper rollers **84** mounted between side frame members **86, 86** and a power-driven belt member **88** mounted beneath rollers **84** with its upper face spaced a short distance therefrom. Belt **88** is driven (in the direction shown by the arrow in FIG. **1**) by any suitable prime mover (not shown) by means of a belt or chain drive **90** and a drive roller **92.**

OPERATION

As will now be explained, the method and apparatus of the present invention is designed to fabricate a carton **10** like that shown in FIG. **10** from carton blanks **94** (FIG. **11**) which have been prescored as at **96** to form four (4) panels **98, 100, 102, 104** and a glue tab **106.** As shown in FIG. **1,** in the preferred embodiment a stack of carton blanks **94** (which are preferably made from corrugated cardboard) is positioned adjacent the entrance to drive station **12.** The operator picks up a blank **94** and inserts the forward end thereof between roller **22** and moving belt **20.** A guide wall member **108** (positioned parallel to the intended line of travel) may be provided to aid the operator in lining up the blank with the machine so that it will be in proper alignment as it moves into the forming means **14.** More specifically, the carton must be inserted into the machine with the score line **96** between panels **100** and **102** located on the center line of the machine.

The friction of moving belt **20** on the bottom surface of the blank and the roller **22** on the top surface will cause it to move into the forming means. As the blank moves into the forming means, the forward edge thereof will move under hold-down shoes **62, 64.** The continued friction between the belt **20** and the blank as it passes under shoes **62, 64** further aids in driving the carton blank through the machine. Thus, the carton blank is in effect initially pulled into the forming means **14** by the action of roller **22** and belt **20** and is subsequently pushed through such means as the elongated carton blank continues its travel through the drive means **12.**

As the blank passes through the forming means, it will be continuously and progressively folded along its length from front to rear. Such folding action can best be understood by referring to FIGS. **3–9** which show the progressive stages of folding of a carton as it passes through the folding means. It will be appreciated at the outset that the side panels of a particular carton are not folded as a unit but instead are folded progressively from the leading edge of the carton to the rear edge of the carton. Thus, in the description that follows the operation will be described in relation to the front edge segment of a carton as it passes through each of the sectional views shown in FIGS. **3–9.**

As shown in FIG. **3,** the carton blank is only slightly folded as it enters the forming means with the end side panels **98** and **104** bent upwardly only slightly from the horizontal about score lines **96.**

As shown in FIGS. **4** and **5,** as the leading edge of the carton continues to move through the forming means, panels **98** and **96** will become folded further in an upward direction by the action of forming rollers **38*b*–38*f*** and **40*b*–40*f*** in cooperation with hold-down shoes **62, 64.** It will be noted that panel **104** with glue flaps **106** thereon has been folded to a greater degree than has panel **98.**

As the carton continues to move through the folding means, the forward edge of panels **104** and **98** will be further folded upwardly to a vertical position and then downwardly and inwardly as shown in FIGS. **6, 7** and **8.** When the carton reaches the hold-down wheel **80,** as shown in FIG. **8,** panel **104** and glue tab **106** will have been folded almost completely parallel to panels **102** and **100,** whereas panel **98** will not be completely folded to thereby allow a space between the upper surface of glue tab **106** and the overlapping under surface of panel **98** for purposes of applying a bead of liquid adhesive to the glue tab.

As shown in FIGS. **9** and **12,** a bead of liquid adhesive (not shown) is applied to tab **106** by adhesive dispensing head **78.** The flow of glue onto tab **106** is controlled by switch means **79.** When the leading edge of the carton engages roller **83** on arm **81,** the arm will be pivoted downwardly to close the switch. This will initiate a flow of glue from head **78** which flow will continue as long as the carton is moving over the switch, causing it to remain in closed position. When the rear end of the carton moves past the switch, arm **81** thereof will pivot upwardly to thereby open the switch and shut off the flow of glue.

From the gluing means **16** the carton passes to the compression means **18** which performs two principal functions. First, as the carton enters the compression means, panel **98** of the carton will be folded into tight contact with the glue tab **106** on which the bead of adhesive has been applied. This action occurs as the carton moves between the plurality of upper rollers **84** and the front portion of belt **88.** The second major function of the compression means is to maintain compression on the glued joint until the glue is set. This is accomplished by simply extending the belt **88** and rollers **84** a sufficient length to provide compression on the glued joint for the period required. Experience has shown that when using a hot melt type of adhesive, a compression belt and rollers unit of approximately 12 feet in length is sufficient to provide the required period for the glue to set. The carton will, of course, be moved through the compression means by the action of moving belt **88** and will be discharged at the end of the compression means for storage and subsequent shipment.

The cartons fabricated by the above described method and apparatus will be discharged from the compression means in a substantially flat configuration like that shown in dotter lines in FIG. **10.** The cartons can be stored and shipped in such condition and then when it is desired to use the carton, the carton is moved to the position shown in solid lines in FIG. **10,** the material to be packaged in the carton and then inserted therein. Suitable end caps are then applied to the ends of the carton and the package is thereby complete.

It will be appreciated that by the use of the above described method and apparatus of the present invention elongated cartons can be mass-produced with a minimum of hand operation required. The mechanism is also adapted to handle cartons of varying cross-sectional dimensions by simply moving frame members **44** and **46** inwardly and outwardly from the center line of the machine. A corresponding adjustment of the spacing between hold-down shoes **62** and **64** must also be made. No change in the angle of the forming rollers is required when making such an adjustment. As an example of the normal range of size which can be accommodated, a commercial machine has been designed to fabricate cartons in the range of about 2 ¼ inches square to 8 inches square. As to the length of cartons which can be fabricated, the maximum length can technically be indefinitely long, there being no real limit as to how long a carton can be fabricated since the machine operates on a continuous and progressive basis. As to the maximum length which can be accommodated, experience has shown that a carton having a length of about 40 inches is required for satisfactory operation.

I claim:

1. Apparatus for fabricating a carton from a carton blank comprising:

a forming means for continuously and progressively folding the outer side panels of a carton from one end to the other as the carton is moved through said forming means, said forming means including two sets of stationary roller assemblies mounted on opposite sides of the travel path of the carton, one of said roller assemblies adapted to progressively fold one outer panel of the carton blank and the other of said roller assemblies adapted to progressively fold the other outer side panel of the carton blank;

a gluing means for applying adhesive to one of said side panels before it makes contact with the other of said side panels;

a compression means for compressing said side panels into overlapping contact with each other after the adhesive has been applied thereto;

drive means for driving a carton through said forming means, said drive means including a powered conveyor belt and a stationary roller mounted adjacent the top surface of said belt at the inlet end of said forming means; and

an elongated hold-down means for maintaining the central portion of the carton blanks in a horizontal position as the outer side panels are being folded by the action of said roller assemblies on said side panels, said hold-down means further adapted to force the cartons into frictional engagement with said powered conveyor belt to thereby aid said drive means in driving the carton blanks through the forming means.

2. Apparatus for fabricating a carton according to claim **1** in which each of said roller assemblies is comprised of a plurality of roller members mounted along the travel path of the carton, the roller members of each assembly positioned at progressively different angles from the inlet end to the outlet end of said forming means, the progressive angle of said rollers moving first upwardly from the horizontal to the vertical and then downwardly and inwardly from the vertical.

3. Apparatus for fabricating a carton according to claim **1** in which said forming means includes means for adjusting the spacing between said two sets of stationary roller assemblies to thereby accommodate carton blanks having various widths.

4. Apparatus for fabricating a carton according to claim **1** in which one set of said roller assemblies is adapted to fold one outer side panel of the carton blank at a greater angular rate than will the other roller assembly fold the other outer side panel.

5. The method of fabricating an elongated carton from a carton blank having four side panels comprising the following steps:

1. applying a frictional force to the carton blank to cause it to be moved in a linear direction, a major portion of said frictional force being applied to the carton prior to step (2) and a minor portion of said frictional force being applied to the carton during step (2);
2. progressively folding the outer two side panels of the blank from one end to the other, said outer side panels being progressively folded from a substantially horizontal position upwardly to a substantially vertical position and then downwardly and inwardly to a position wherein a portion of one outer panel overlaps and is spaced from the other;
3. applying an adhesive to one of said outer side panels in the area where the panels overlap;
4. continuing the folding operation to cause said outer panels to make contact with each other; and
5. maintaining said panels under compression until the adhesive has set.

6. The method of fabricating an elongated carton according to claim **5** in which one side panel is folded at a greater rate than the other side panel so that the panels will not interfere with each other as they are folded into overlapping relationship with each other.

7. The method of fabricating an elongated carton according to claim **5** in which said adhesive is applied by moving the carton past a stationary dispensing head from which a liquid adhesive is caused to flow onto the carton.

8. The method of fabricating an elongated carton according to claim **5** in which said progressive folding step is performed by moving the carton blank between a pair of stationary roller assemblies.

9. The method of fabricating an elongated carton from a carton blank having four side panels comprising the following steps:

1. applying a frictional force to the carton blank to cause it to be moved in a linear direction, a portion of said frictional force being applied to the carton prior to step (2) and a portion of said frictional force being applied to the carton during step (2);
2. progressively folding the outer two side panels of the blank from one end to the other, said outer side panels being progressively folded from a substantially horizontal position upwardly to a substantially vertical position and then downwardly and inwardly to a position wherein a portion of one outer panel overlaps and is spaced from the other;
3. applying an adhesive to one of said outer side panels in the area where the panels overlap;
4. continuing the folding operation to cause said outer panels to make contact with each other; and
5. maintaining said panels under compression until the adhesive has set.

10. The method of fabricating an elongated carton according to claim 9 in which said frictional force of step (1) is applied to the carton by a moving conveyor belt contacting the underside of the carton and at least one roller member contacting the top side of the carton.

* * * * *