United States Patent [19]

Heisler

[11] **3,858,490**

[45] **Jan. 7, 1975**

[54] **METHOD FOR AUTOMATICALLY FEEDING AND ERECTING FOLDED CARTONS**

[76] Inventor: **Raymond A. Heisler,** 657 Dakota Trl., Franklin Lakes, N.J. 07407

[22] Filed: **Mar. 12, 1974**

[21] Appl. No.: **450,400**

Related U.S. Application Data

[62] Division of Ser. No. 336,246, Feb. 27, 1973, Pat. No. 3,814,000.

[52] **U.S. Cl.** ..... **93/53 M,** 93/53 SD, 271/150

[51] **Int. Cl.** **B31b 1/76**

[58] **Field of Search** ..... 93/53 M, 53 SD, 53 R; 214/7, 8.5 A, 8.5 B; 271/99, 100, 101, 102, 150, 149; 53/186

[56] **References Cited**

UNITED STATES PATENTS

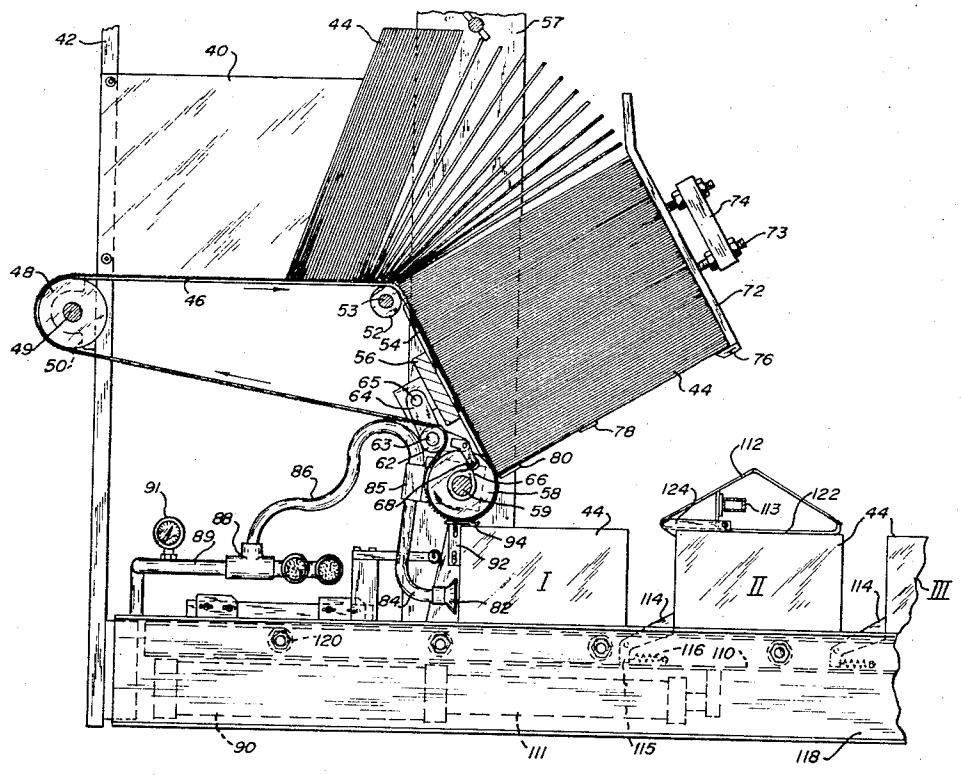
2,853,296	9/1958	Skow	271/3.1 UX
3,420,037	1/1969	Villemure et al.	93/53 SD X
3,613,525	10/1971	Lense et al.	93/53 SD
3,680,854	8/1972	Daily et al.	271/3.1 X
3,783,752	1/1974	Langen et al.	93/53 SD

Primary Examiner—Roy Lake
Assistant Examiner—James F. Coan
Attorney, Agent, or Firm—Ralph R. Roberts

[57] **ABSTRACT**

An apparatus and method is disclosed for receiving folded cartons in a vertical manner in a storage chute and to deliver and retain these cartons in a substantially horizontal delivery chute. The cartons are withdrawn one-at-a-time from this horizontal chute by an arm means on which a plurality of suction cups are mounted. By swinging this arm the vacuum cups are brought into engagement with the lowermost carton whereat vacuum is applied to the cups to cause attachment to the carton. The cups and attached carton are then swung to a transporting station. During this swing, cam means engage the moving carton to cause the carton to be erected. At the transport station the erected carton is disengaged from the vacuum cups and then moved to loading operations.

5 Claims, 6 Drawing Figures



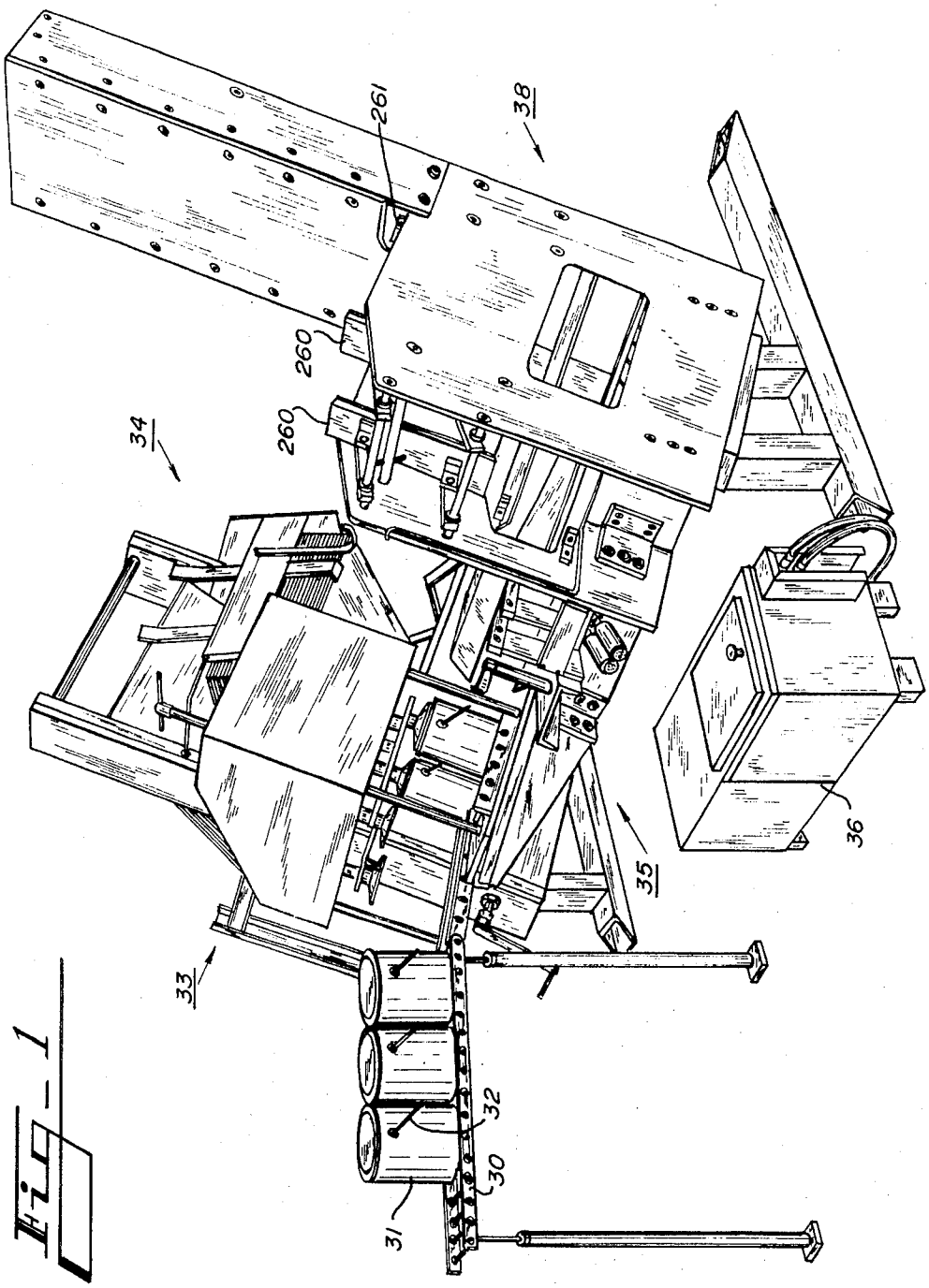


Fig. 1

Fig. 2

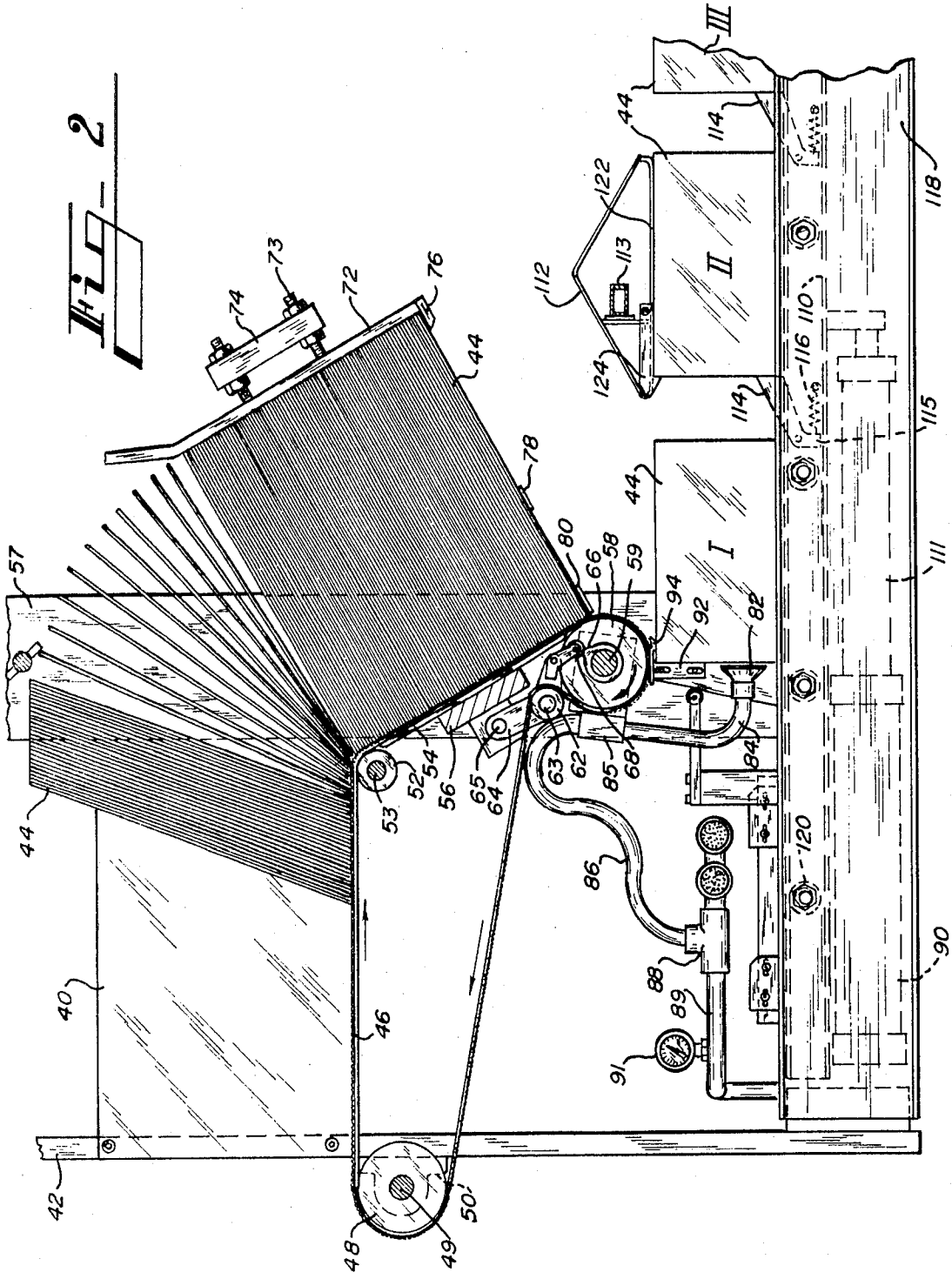

III
44
114
122
112
113
II
118
110
116
124
114
115
44
I
111
57
80
66
58
59
94
92
82
78
44
53
52
54
56
65
64
63
62
85
68
84
120
86
88
89
91
90
40
46
42
48
49
50

Fig - 3

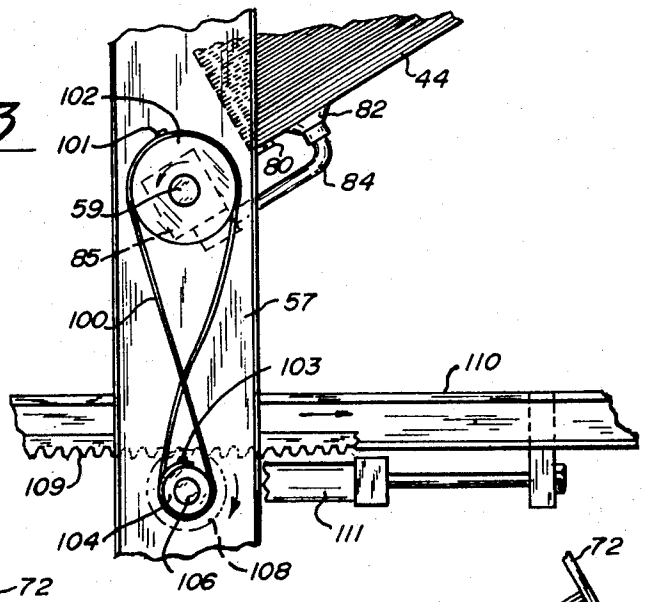
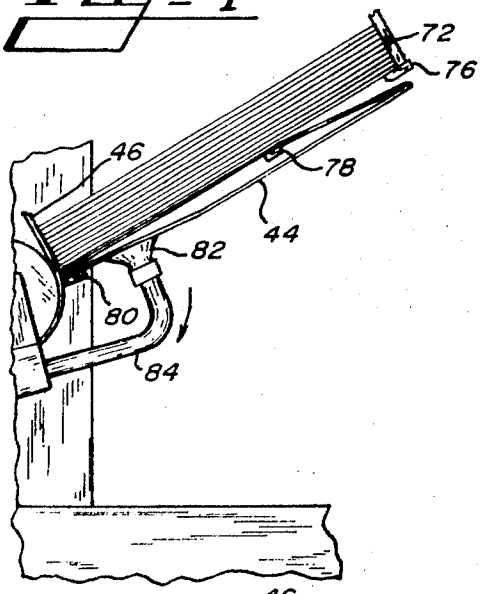


Fig - 4



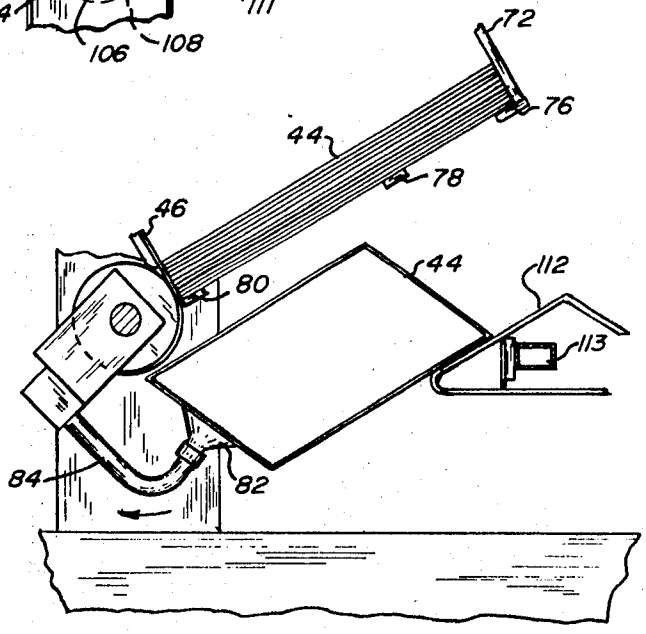


Fig - 5

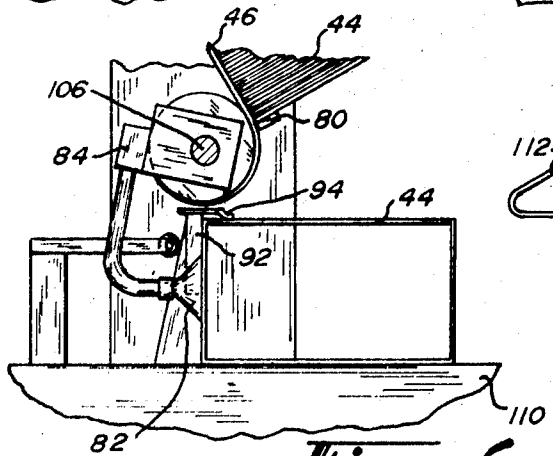




Fig - 6

METHOD FOR AUTOMATICALLY FEEDING AND ERECTING FOLDED CARTONS

REFERENCE TO RELATED APPLICATIONS

This application is a divisional application resulting from a requirement for restriction in the case of a divisional application filed Feb. 27, 1973 and having Ser. No. 336,246, now U.S. Pat. No. 3,814,000, and entitled, "Apparatus and Method for Automatically Feeding and Erecting Folded Cartons." The parent application Ser. No. 204,892 was filed Dec. 6, 1971 and entitled, "Apparatus and Method for Orienting and Case Packing Bailed Containers," which application matured as U.S. Pat. No. 3,740,919 and issued on June 26, 1973.

BACKGROUND OF THE INVENTION

1. Field of the Invention

With respect to the classification of art as established in the U.S. Patent Office the present invention pertains to the class entitled, "Package Making" (Class 53) and the subclass therein of "group forming of contents unit" (subclass 26).

2. Description of the Prior Art

Erecting cartons from a flat stored condition is, of course, well known and is shown in many machines and patents. In the present invention the flat cartons are supplied as a group to a supply hopper in which they are initially vertically disposed. In this stored condition the cartons are fed automatically to a delivery chute whereat the advanced cartons are arranged and stacked in a mostly horizontal condition. From this hopper the cartons are withdrawn one-by-one from the bottom by means of a reciprocal rotatable arm upon which are carried a plurality of vacuum cups. These cups are pressed against and actuated to grip the carton. During the removal action the gripped carton is caused to be brought to an erected condition in a transfer frame.

Prior art devices for erecting cartons often use a vacuum cup system in combination with a moving member. These devices often are less than satisfactory in the handling of the containers at high speeds. The difficulty encountered is often due to the needed speed of movement of the arms or members containing the vacuum cups. The present invention uses a lost motion at both the grasping of the carton and at the release of the carton to permit movement of the carton and the development of a vacuum attachment and release.

SUMMARY OF THE INVENTION

This invention may be summarized at least in part with reference to its objects. It is an object of this invention to provide, and it does provide, a method for automatically feeding and erecting folded cartons upon demand and at a rate equal to other automatic packaging procedures connected therewith.

It is a further object of this invention to provide, and it does provide, a method of feeding and erecting folded cartons in which the transfer of the carton from a vertical to a horizontal stack is achieved by a conveying belt actuated with the movement of an arm having a plurality of suction cups mounted thereon. The cups and associated vacuum are used to pull the lowermost carton from the supply chute and during the movement from this chute to a delivery station the carton is engaged by cam guides to cause the carton to be opened as it is brought to and is placed on carton transporting apparatus.

In addition to the above summary the following disclosure is detailed to insure adequacy and aid in understanding of the invention. This disclosure, however, is not intended to prejudice that purpose of a patent which is to cover each new inventive concept therein no matter how it may later be disguised by variations in form or additions of further improvement. For this reason there has been chosen a specific embodiment of the apparatus for automatically erecting cartons as adopted for use with a carton conveying mechanism. This specific embodiment has been chosen for the purposes of illustration and description as shown in the accompanying drawings wherein:

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** represents a perspective view of a case packer and showing in particular an arrangement for feeding bailed containers to an orienting mechanism and delivering these containers to an erected carton as provided by the mechanism of this invention and for gluing and closing the carton after filling;

FIG. **2** represents, in an enlarged scale, a side view, partly in section, a portion of the apparatus of FIG. **1** and showing in particular the apparatus of this invention and the means for storing and feeding the cartons from a receiving station to an erecting station for delivery to an advancing conveyor and loading station;

FIG. **3** represents a fragmentary sectional side view of the carton erecting and delivery mechanism of FIG. **2** and showing in particular a lower carton in the inital stage of being grasped by a plurality of suction cups each carried by a delivery arm;

FIG. **4** represents a sectional side view of the apparatus of FIG. **3** after the suction cups have engaged the carton and with the arms beginning to move the carton downwardly a small distance;

FIG. **5** represents a sectional side view of the same apparatus as in FIGS. **3** and **4** but with the delivery arms now moved downwardly to a point of operation where the carton is about threequarters erected, and

FIG. **6** represents a sectional side view of the apparatus of FIG. **5** but with the transfer arms now moved so as to bring the carton into a fully erected condition.

In the following description and in the claims various details will be identified by specific names for convenience. The names, however, are intended to be generic in their application. Corresponding reference characters refer to like members throughout the several figures of the drawings.

The drawings accompanying, and forming part of, this specification disclose certain details of construction for the purpose of explanation of the broader aspects of the invention, but it should be understood that structural details may be modified in various respects without departure from the concept and principles of the invention and that the invention may be incorporated in other structural forms than shown.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now in particular to FIG. **1** wherein an automatic case packer is shown in which from and on a receiving conveyor **30** a succession of bailed containers **31** are carried. Each container has a pivotally attached wire bail **32** and is fed in a single-file array to an orient-

ing mechanism generally indicated as **33.** In this orienting apparatus the containers are caused to be brought into groups of two and aligned in pairs are fed into an erected carton lying at an angle. The carton is disposed with a pair of side flaps of the carton open so that the containers, with the bails in a determined array, may be fed to and slid into this open side of the carton. A carton storage and feeding apparatus is generally indicated as **34** and is adapted to receive cartons in a flat folded condition and in a substantially vertical condition. In this attitude, advancing means move these cartons to a delivery chute where these cartons are here grasped one at a time by means of a plurality of vacuum cups each carried at the end of a delivery arm. The of vacuum cups each carried at the end of a delivery arm. The grasped carton is brought into a carton-erecting mechanism generally indicated as **35.** This erecting station is more fully described in conjunction with specific details and specific arrangements as shown in FIGS. **2** through **6.**

After four bailed containers have been oriented and delivered to and into the open side of the angularly disposed carton, the carton is advanced to a flap-closing station whereat a hot-melt glue as delivered from a glue application mechanism **36** is applied as by spraying onto the flaps of the carton, after which the flaps are closed and the sealed cartons are lifted by elevating mechanism generally indicated as **38** for delivery to and onto a delivery conveyor or onto a pallet for stacking (not shown). The means of accummulating the sealed cartons is merely a matter of selection to accommodate the apparatus at the customer's plant.

Carton-Feeding and Delivery Mechanism of FIG. 2

Referring next to FIG. **2,** there is shown a side view, partly in section, of the carton-feeding and delivery mechanism **34.** As depicted, a chute **40,** carried on a framework **42,** is adapted to receive a group of flat folded cartons **44** which are delivered and stored in the chute in a substantially vertical manner. This chute **40** is open at the top and back (left end) so that, as the cartons are used, other cartons are supplied to the delivery system by an attendant without the necessity of shutting down the operation of the case packer to replenish the carton supply. The cartons **44,** as they are deposited in the chute, rest upon a toothed belt **46** which has its left end carried by an idler pulley **48** mounted on and carried by a shaft **49** supported by and rotatably retained by a pair of pillow block bearings **50** mounted on a pair of the upright members of the framework **42.**

To the right of idler pulley **48** is a smaller pulley **52** mounted on shaft **53.** This shaft is supported and rotatably retained by bearings not shown. The toothed belt **46** on its upper extent or reach extends from pulley **48** to pulley **52** in a substantially horizontal manner. After passing over pulley **52,** the belt **46** is directed downwardly at an approximately sixty to seventy degree angle. In this downward travel this extent of belt is supported by and slides on a slide plate **54.** This slide plate is secured to and is retained in a determined condition by a bolster or header member **56** which is attached to and is carried by a front frame member **57.** The belt in its downward-supported travel continues to a drive pulley **58** which is carried by drive shaft **59** rotatably retained in bearings, not shown. These bearings are secured to and carried by frame **57.**

The toothed belt **46** is directed around drive pulley **58** to a tightening pulley **62** rotatably carried on a shaft **63** secured to a pivot arm **64** whose pivoted end is mounted and retained on a pivot piin **65** carried by bolster **56.** From pulley **62** the belt **46** extends to pulley **48** and travels in the direction as indicated by the arrows. The drive or advancement of the belt **46** is intermittent and is accomplished and regulated by means of a drive system which includes a lobe provided on a cam member **66** which is secured to and rotated with shaft **59.** As shaft **59** is rotated clockwise as indicated by the arrow, the lobe **66** is brought in way of and engages a roller **68** so as to lift arm **64** around pivot pin **65.** With lobe **66** in engagement with roller **68** and the arm **64** in lifted condition the pulley **62** is moved upwardly to tighten belt **46** and cause it to be advanced with the clockwise rotation of pulley **58.**

Adjustably carried on the opposite side of the slide plate **54** and defining an angled carton-retaining means is a pair of guide rails **72.** These rails are carried on threaded studs **73** extending through a header member **74** attached to and supported by frame **57.** On the forward or downward end of each of the rails **72** is provided an inturning lip or stop **76** which engages and supports the stack of cartons and particularly the lowermost carton **44.** Extending inwardly a short distance from each side of the chute **40** is an ear or tab **78** disposed to engage this lowermost carton at its outer edge to prevent sagging or unwanted dropping of the carton **44.** In an alignment with the downwardly sloped extent of belt **46,** there is provided a pair of stops **80** which engage the lower edge and face of the carton to prevent its dropping or accidental displacement from the chute until the carton is removed by means of vacuum cups **82** carried on arms **84.**

As reduced to practice, there are four vacuum cups **82,** each attached to an arm **84.** Each arm is a bent tube carried in a bracket **85** secured to shaft **59** and moved therewith. A flexible tube or conductor **86** is attached to each arm **84** at the bracket **85** and at the other end each tube is connected to a header member **88** which is connected by a line or pipe **89** to a cylinder **90.** A gauge **91** is flow-connected to this line to indicate the amount of vacuum developed by the movement of the piston in cylinder **90** as this piston is moved by another connected power cylinder used to actuate the apparatus for erecting and transporting a carton. A stop **92** is disposed to engage a carton and to limit and retain the upper edge of this carton as it is being erected. A guide finger **94** engages and retains the erected carton during the erection and retaining sequence.

Carton-Erecting Apparatus of FIGS. 3 thru 6

Referring next to the carton-erecting mechanism of FIGS. **3** through **6,** it is to be noted that in FIG. **3** the attached vacuum cup **82** and arm **84** are in carton-engaging position. Shaft **59** as carried by front frame **57** has been rotated counterclockwise by a flexible belt **100** fixedly attached by means of a screw **101** to a driven pulley **102** which is fixedly attached to shaft **59.** The other end of the belt **100** is secured by means of a cap screw **103** to a drive pulley **104** carried on a drive or power shaft **106** also rotatably supported by front frame **57.** Shaft **106** is rotated both clockwise and counterclockwise by means of a pinion **108** driven by a rack **109** carried by a reciprocated frame **110** which is moved by a power piston portion **111** of cylinder **90.**

It is to be noted that belt **100**, as shown, is crossed but not twisted as it is secured to both pulleys **102** and **104**. A determined amount of slack or play is provided in the mounting and securing of this belt to the pulleys. This slack permits and provides a determined degree of lost motion in the relative rotation of shaft **106** as it is moved in response to the rotation of shaft **59**.

As seen in FIG. **3**, the piston portion **111** has reached the forward end of its stroke imparting a clockwise rotation to the pinion **108** as driven by rack **109** in its rightward travel. The tensioned side of belt **100** has pulled driven pulley **102** counterclockwise and the arm **84** has been swung by shaft **59** until the suction cup **82** has been brought into a pressed engagement with the undersurface of the lowermost of the cartons **44**. With the cup **82** now in engagement with the face of the carton, the power piston portion **111** is caused to move leftwardly, as well as the connected frame **110**. The piston in cylinder **90** is also moved leftwardly by the power piston portion **111**, causing a vacuum to be applied in the arms **84** and at the cups **82**. The pinion **108** is now rotated counterclockwise and when the slack in belt **100** has been taken up the pulley **102** is rotated clockwise.

Referring next to FIG. **4**, it is to be noted that the vacuum cups **82** have, by vacuum, attached themselves to the lower panel of the carton **44** and as the arm **84** is begun to be swung clockwise around shaft **59** the carton is pulled from stop **76** while the tabs **78** retain the opposite sides of the midportion of the lowest carton in the chute. Stop **80** and belt **46** insure that the lower edge of this lowest carton is restrained against sliding until the carton is substantially opened.

Referring next to FIG. **5**, it is to be noted that carton **44** has been completely pulled from the chute by the continued downward swing of arm **84** as it is moved in a clockwise direction. The carton **44**, still held by the vacuum cups **82**, has now been pulled so that its lower right face is brought into engagement with a guide **112** which prevents the carton from dropping further. A support bar **113** carries the guide **112** which has its front end contoured to also provide a guide and retaining means for an erected carton as it is advanced to the loading station.

Referring next to FIG. **6**, it is to be noted that the apparatus of FIG. **5** has now moved so that the arms **84** are at their maximum limit of downward swing. The carton **44** which is still retained by vacuum cups **82** on the ends of arms **84** has been moved until the carton is against stop **92** and under spring-loaded guide finger **94**. This stop causes the carton to be squared as it is drawn against the stop as seen in FIG. **6** and the finger **94** presses the erected carton against frame **110**.

The clockwise travel of arm **84** as provided by the rotation of shaft **59** through the movement of rack **109** is stopped when the carton **44** is fully erected as in FIG. **6**. The vacuum supplied to the vacuum cups **82** by cylinder **90** is allowed to drop to a point where it is substantially ineffective. This dropping or reducing of the vacuum occurs in the present embodiment through a combined action. A line-bleeding valve is adjusted so as to limit the amount of vacuum developed by cylinder **90** and through this bleed the vacuum to the cups **82** rapidly drops. A simultaneous action also occurs in that the ability of the cups **82** to seal themselves to a cardboard surface is less than complete. Accordingly, after the carton has been erected for a very short period of time, the ability of cups **82** to retain the erected carton **44** by vacuum ceases and the erected carton is held by finger **94**, stop **92** and frame **110**.

Reference is again made to FIG. **2** wherein it is to be noted that pivotally retained by and movable with the reciprocated frame **110** is a plurality of pusher fingers or stops **114** which are pivotally carried by and on pins **115**. Springs **116** are adapted to urge the upper or distal ends of the fingers above the carton support surfaces provided by a channel frame **118** upon which the erected carton is transported rightwardly.

On the carton-transferring stroke, the power piston **111** moves the reciprocal frame **110** rightwardly as the frame is supported by and is carried on a plurality of rollers **120**. These rollers are carried by frame **118** and permit frame **110** to be moved rightwardly a determined distance, which distance is equal to the distance between sets or pairs of fingers **114**. As the carton identified as I is moved rightwardly by stop **92** it is brought to and under the undersurface of guide bar portion **122** of guide **112**, which bar portion is spaced from surface **118** an amount sufficient to provide a snug sliding fit for an erected carton **44**. A retaining latch **124** is pivotally carried by bar **122** and as the erected carton is brought to an advanced condition indicated as II the latch **124** is first cammed upwardly until the carton passes, after which the latch drops onto the top extent of the carton so that the latch dog portion provided on the left end of said latch **124** engages the upper left corner of the carton. The carton **44** now in position II is ready to receive the bailed containers from the orienting mechanism **28**. At the end of the forward stroke of piston portion **111**, a signal is received by the control circuit and the piston in portion **111** is then moved leftwardly. During the forward transport of the erected carton from position I to position II the shaft **59** and attached arms **84** have been swung counterclockwise from the position of FIG. **6** to the position of FIG. **3**. The slack built into this action by the belt **100** permits a delayed swing of arm **84** to occur. This delay permits the erected carton at position I to be moved a short distance rightwardly before arm **84** starts to move upwardly. This initial movement of the carton insures that the suction cup **82** is disengaged from the carton and does not brush the carton during the counterclockwise upward swing of the arms **84**.

Method for Automatically Feeding and Erecting Folded Cartons

The above apparatus provides a sufficient background for establishing a method of automatically feeding and erecting folded cartons. Although the method can be performed by the above disclosed apparatus other apparatus can perform the following method steps. This method for automatically feeding and erecting folded cartons includes the steps of: (a) initially supplying the folded cartons to a vertical supply chute; (b) transporting and transferring the folded cartons from the initial supply chute to a substantially horizontal condition in a horizontal storage chute; (c) engaging the bottom folded carton by a plurality of suction cups carried by and on a rotatable shaft; (d) causing a source of vacuum to be connected to the suction cups to cause the folded carton to be gripped by said cups; (e) pulling the carton from its horizontally stored position to and in way of erecting finger guides and by engagement with said guides pushing the sides of the car-

ton to an erected condition at an erecting station; (f) after bringing the carton to the erected condition causing the vacuum to the cups to be terminated to release the erected carton; (g) moving the erected carton from the erecting station, and (h) with the moving erected carton at a determined distance from the vacuum cups rotating the shaft and said carried cups to bring the cups in way of the next carton to be erected.

Other method steps include transporting the cartons on an endless toothed belt moved in an intermittent manner, moving the shaft carrrying the vacuum cups by a lost motion action, and providing the source of vacuum to the vacuum cups by coupling the cylinder by which the erected carton is moved to another hydraulic cylinder which is adapted to provide a source of vacuum as it is moved.

Terms such as "left," "right," "up," "down," "bottom," "top," "front," "back," "in," "out," "clockwise," "counterclockwise" and the like are applicable to the embodiment shown and described in conjunction with the drawings. These terms are merely for the purposes of description and do not necessarily apply to the position in which the folded cartons may be fed, stored and erected and in which the apparatus may be constructed or used.

While a particular embodiment of the mechanism for feeding and erecting has been shown and described it is to be understood the invention is not limited thereto since modifications may be made within the scope of the accompanying claims and protection is sought to the broadest extent the prior art allows.

What is claimed is:

1. A method for automatically feeding and erecting folded cartons, said method including the steps of: (a) initially supplying the folded cartons to a vertical supply chute where the lower edges of the cartons are supported on an endless belt; (b) transporting the folded cartons from the initial supply chute by the intermittent advancement of said belt to deliver the cartons to be deposited in a substantially horizontal condition in a horizontal chute, the advancement of the endless belt being in response to the rotative motion of a shaft which carries a plurality of suction cups; (c) engaging the bottom folded carton by the plurality of suction cups carried by and on said rotatable shaft; (d) causing a source of vacuum to be connected to the suction cups to cause the folded carton to be gripped by said cups; (e) pulling the carton from its horizontally stored position to and in way of guide means and by engagement with said guide means pushing the sides of the carton to an erected condition at an erecting station; (f) after bringing the carton to the erected condition causing the vacuum to the cups to be terminated to release the erected carton; (g) moving the erected carton from the erecting station, and (h) with the moving erected carton at a determined distance from the vacuum cups rotating the shaft and said carried cups to bring the cups in way of the next carton to be erected.

2. The method of automatically feeding and erecting folded cartons as in claim **1** in which the intermittent advancing of the endless belt includes a cam-actuated tightening pulley carried on a pivoted arm and with a cam disposed to move said pivoted arm, said cam being carried on and rotated with the shaft which carries the suction cups.

3. The method of automatically feeding and erecting folded cartons as in claim **1** which further includes the step of carrying the erected carton on a reciprocated frame moved by a hydraulic cylinder, the movement of said frame also causing a drive shaft to be rotated and there is provided a belt connecting said drive shaft to the shaft carrying the suction cups, the connecting of said belt being in a manner so to provide a determined lost motion to insure a delay in the movement of the suction cups to the lowermost folded carton in the stack and in the movement of the suction cups from the erected carton.

4. The method of automatically feeding and erecting folded cartons as in claim **3** which further includes connecting the hydraulic cylinder which moves the reciprocated frame to another hydraulic cylinder, said cylinder as it is moved developing the vacuum source connected to the vacuum cups.

5. The method of automatically feeding and erecting a folded carton as in claim **1** which further includes moving the erected carton in response to the reciprocated movement of a drive shaft which is connected by a belt to the shaft carrying the suction cups, said connecting belt being attached to each shaft so as to drive and rotate either of the shafts less than one revolution in either direction, said connecting belts having a determined slack to provide a determined lost motion action to insure delay in the movement of the suction cups to the lowermost folded carton in the stack and to a like extent in the movement of the cups from the erected carton.

* * * * *