United States Patent [19]

Sorensen et al.

[11] **3,741,082**

[45] **June 26, 1973**

[54] **CARTON INFEED AND ERECTING APPARATUS**

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[73] Assignee: **Anderson Bros. Mfg. Co.,** Rockford, Ill.

[22] Filed: **Oct. 22, 1971**

[21] Appl. No.: **191,724**

[52] **U.S. Cl.** ..... **93/53 R,** 93/53 SD

[51] **Int. Cl.** **B31b 1/78,** B31b 5/02

[58] **Field of Search** ..... 93/53 R, 53 SD, 53 BF; 53/186

[56] **References Cited**

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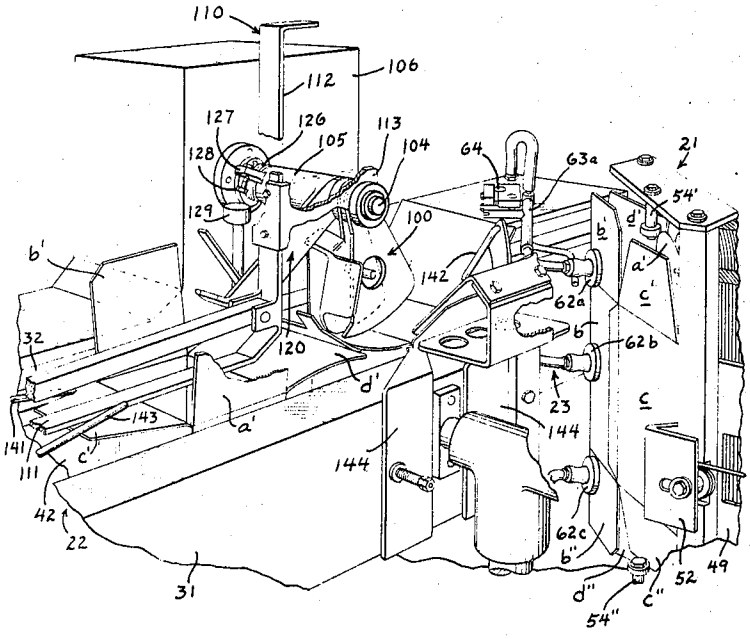
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Primary Examiner—Andrew R. Juhasz
Assistant Examiner—James F. Coan
Attorney—Robert Muir

[57] **ABSTRACT**

The apparatus feeds flattened carton blanks from a magazine, opens and erects the cartons, and advances the erected cartons along a conveyor for subsequent filling. Vaccum operated grippers withdraw the end carton from the magazine. An upper flap depressor depresses the forwardmost upper flap forwardly and a retractable hold-down thereafter holds the flap on its depressed position. The upper flap depressor includes first and second members which have a lost-motion connection. Means is provided for operating the grippers, the conveyor, and the upper flap depressor in timed relation.

31 Claims, 17 Drawing Figures



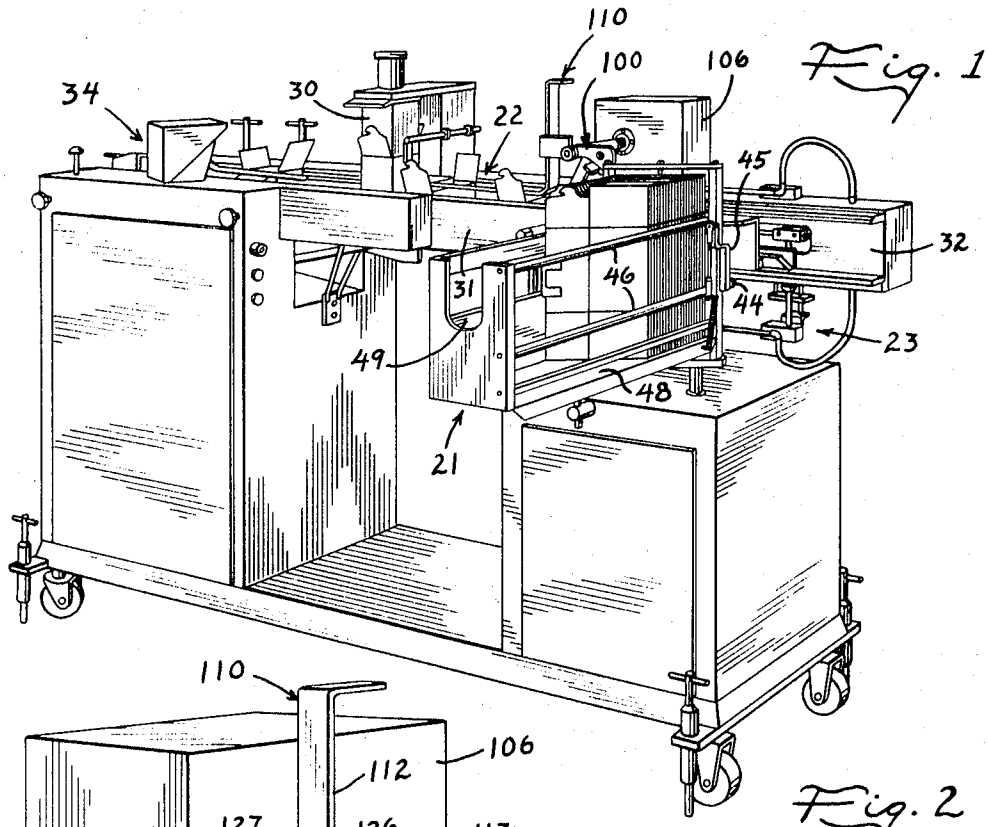

110
100
106
34
30
22
45
32
31
46
44
23
49
48
21

Fig. 1

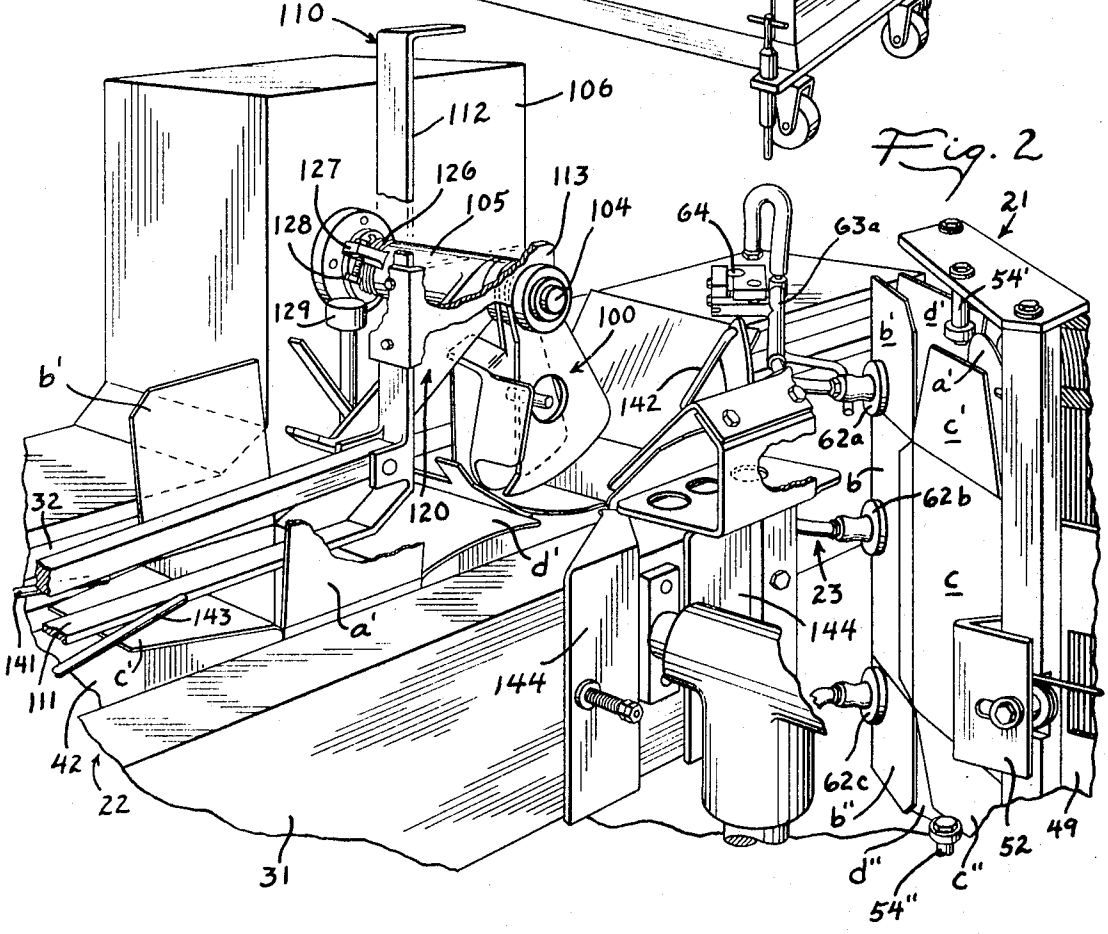
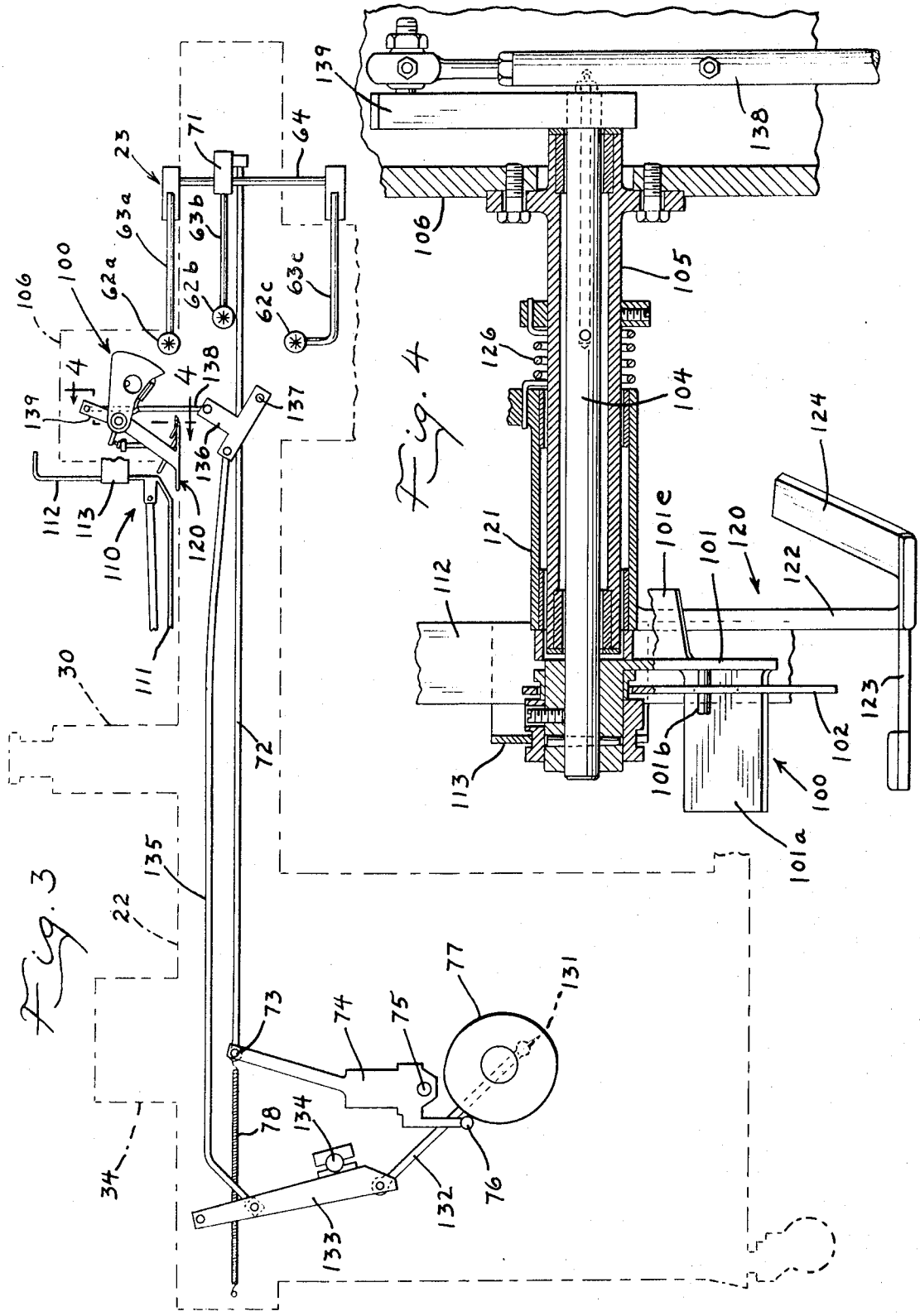

110
112
106
127
126
113
128
105
104
64
63a
21
54'
129
100
d'
b'
a'
c'
b'
142
62a
32
b
62b
120
d'
23
c
143
a'
144
141
c'
144
111
62c
42
b"
22
52
49
31
d"
c"
54"

Fig. 2


Fig. 3
Fig. 4
139
138
106
105
126
104
124
121
101e
101
120
122
112
123
102
113
101b
100
101a
23
71
64
63a
63b
62b
62a
62c
63c
100
106
4
4
138
139
137
136
112
113
110
120
111
30
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73
74
75
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132
76
133

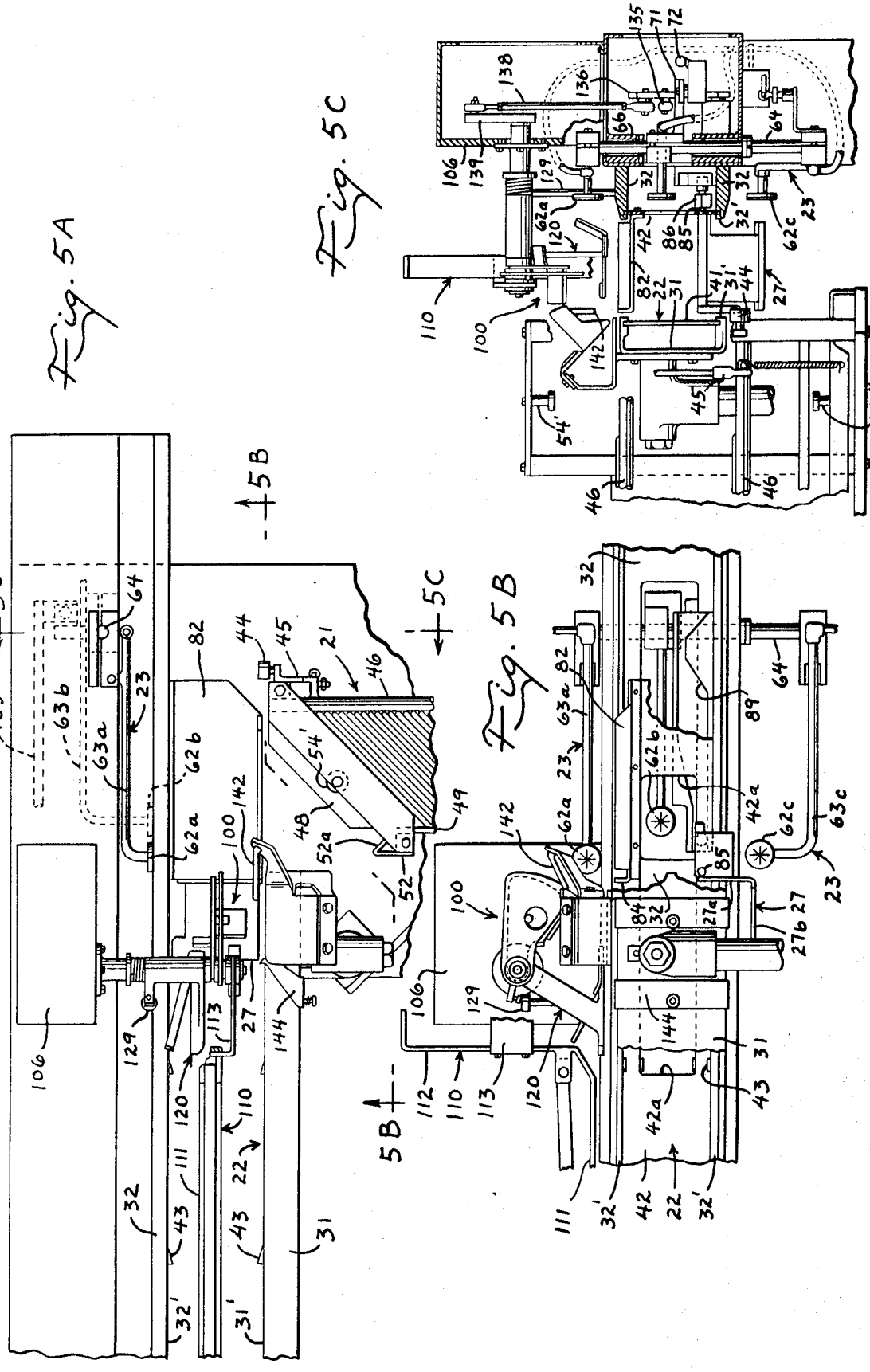

Fig. 5A
Fig. 5B
Fig. 5C
5B
5C
5B
5C

Fig. 5D

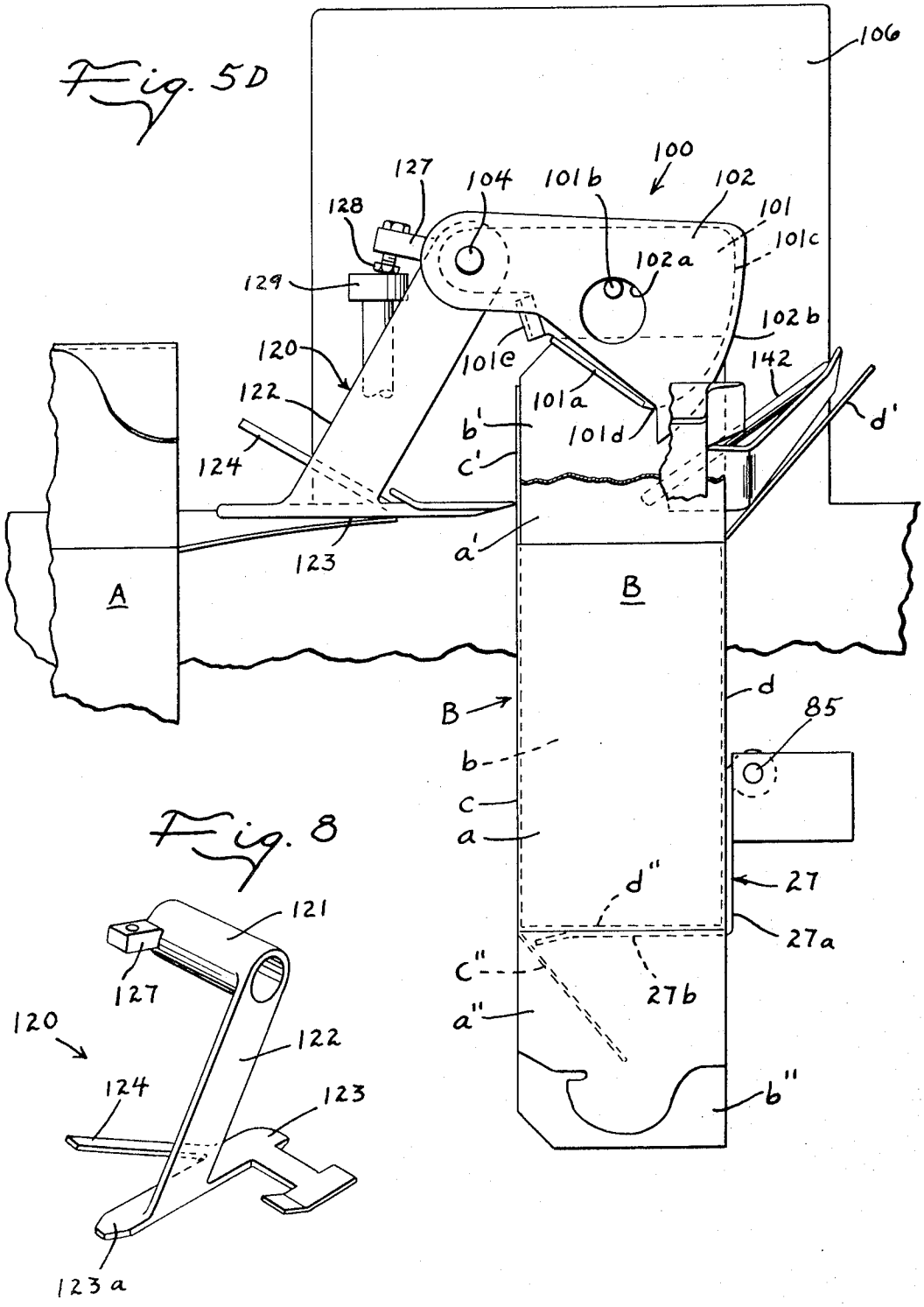

106
100
127
104
101b
102
101
128
101c
102a
129
102b
120
101e
142
122
101a
d'
b'
101d
124
c'
a'
123
A
B
B
d
85
b
c
a
d"
27
27a
C"
27b
a"
b"

Fig. 8

121
127
120
122
124
123
123a

Fig. 6A

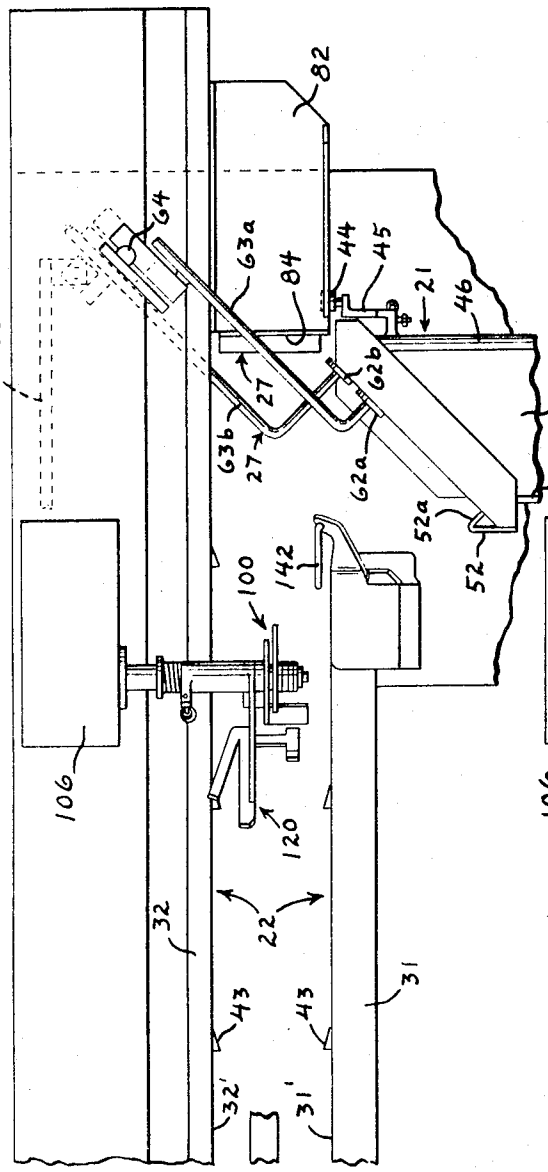


Fig. 6C

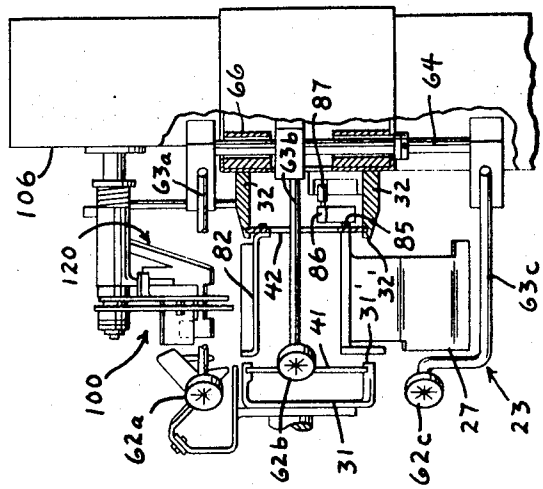


Fig. 6B

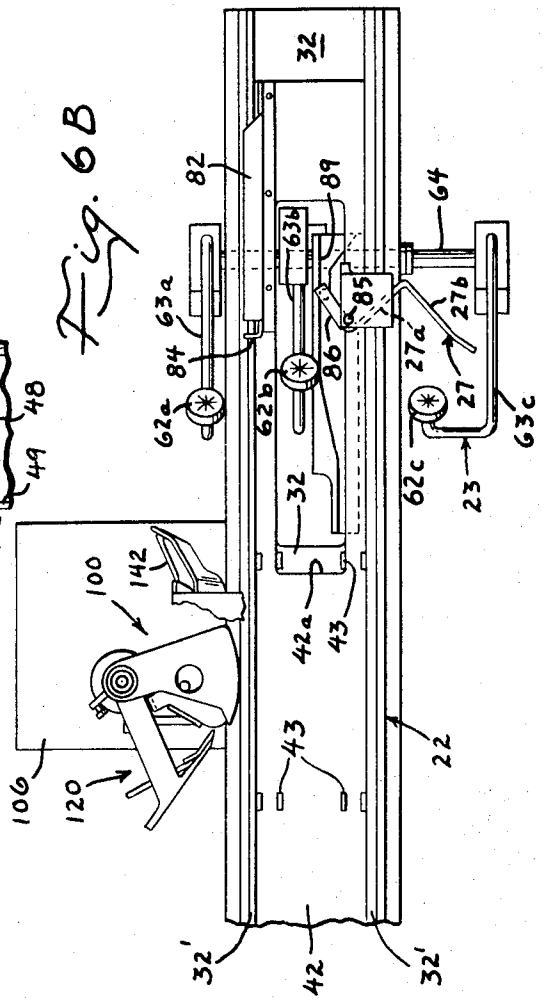


Fig. 6D

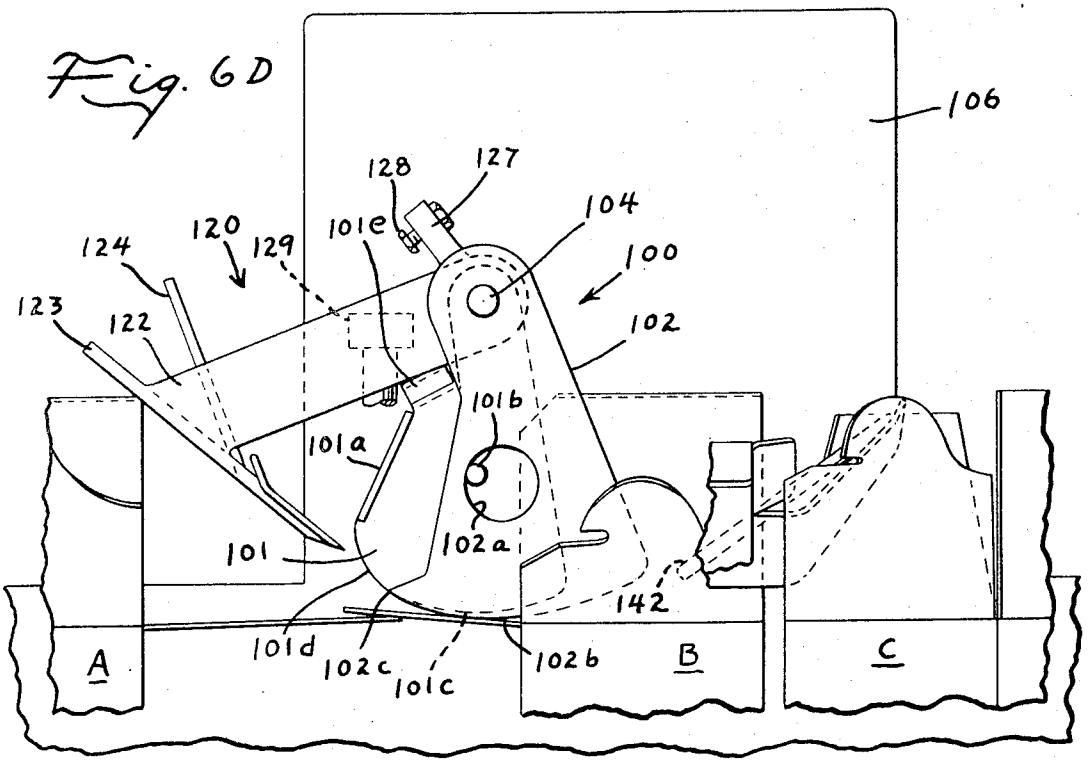

106
128
127
104
120
129
101e
100
124
123
122
102
101b
101a
101
102a
142
101d
102c
101c
102b
A
B
C

Fig. 7D

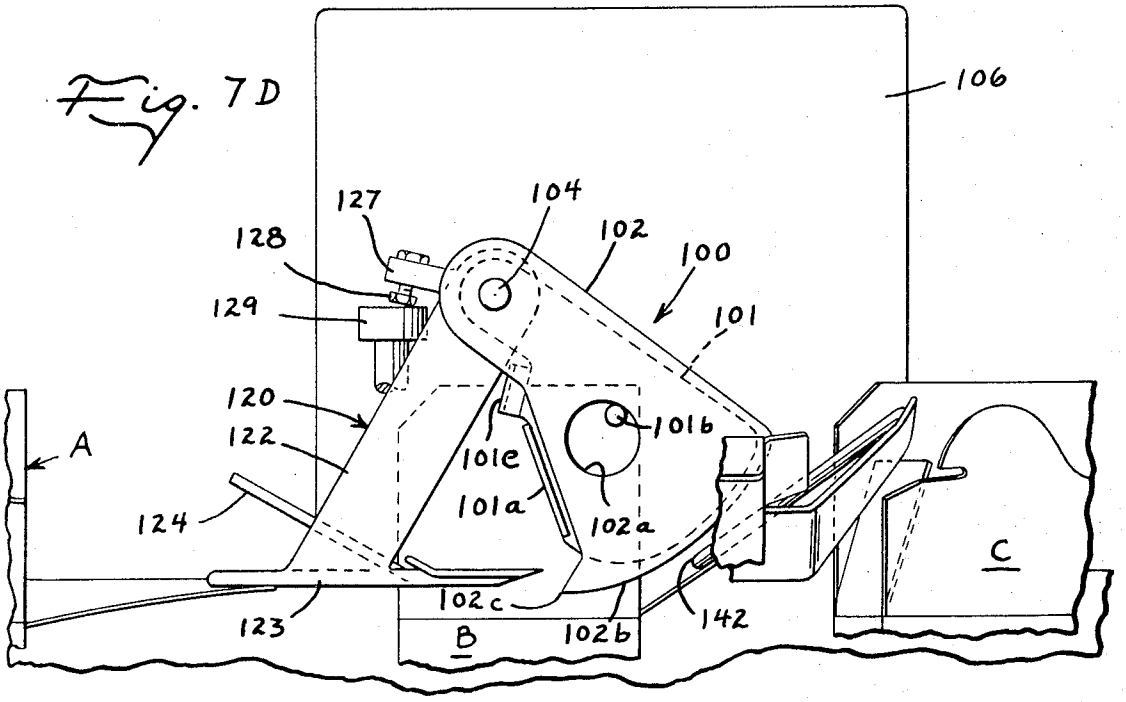

106
127
104
128
102
100
129
101
120
101b
A
122
101e
124
101a
102a
C
102c
123
B
102b
142

Fig. 7A

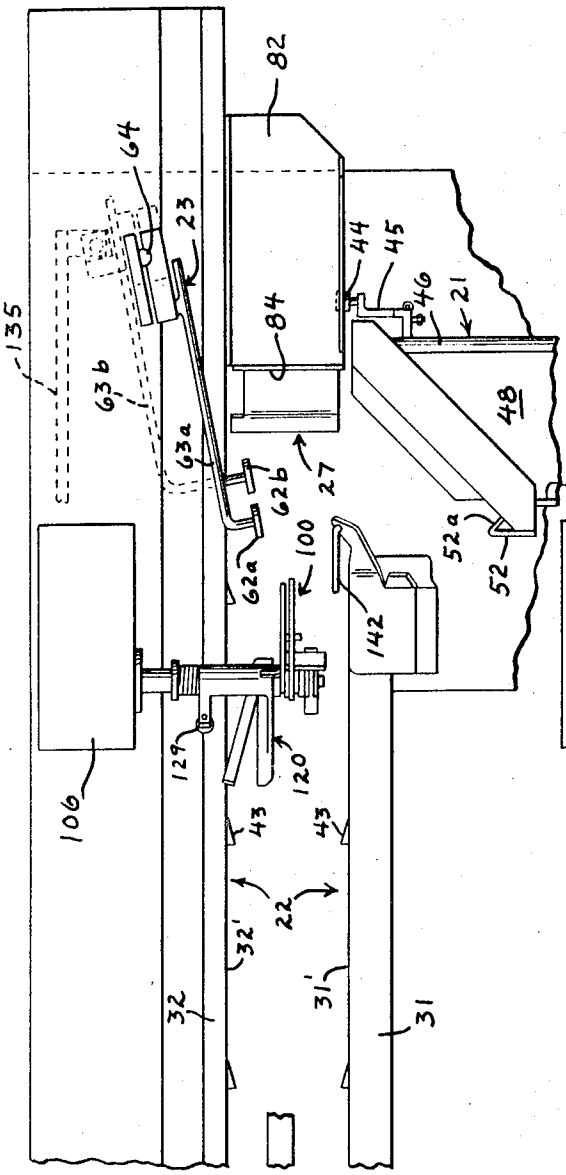


Fig. 7B

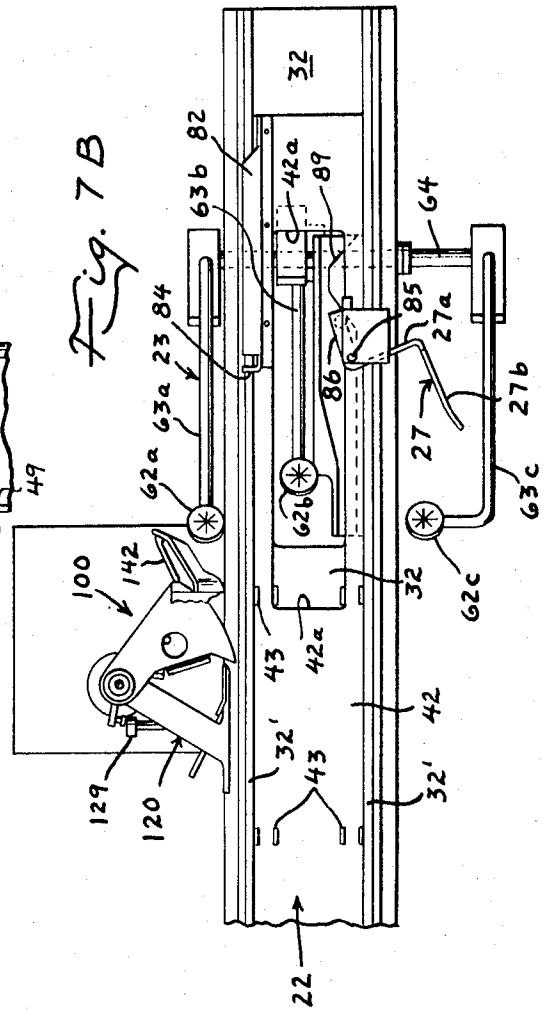
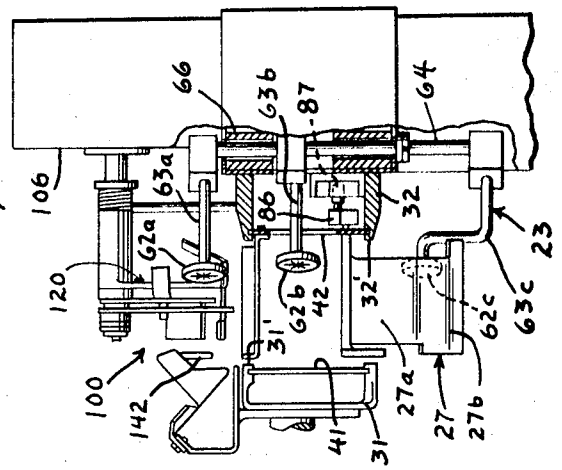


Fig. 7C



CARTON INFEED AND ERECTING APPARATUS

BACKGROUND

The present invention pertains generally to apparatus for feeding and erecting cartons.

The invention pertains to improvements in apparatus of the type disclosed in U.S. Pat. No. 3,298,288, issued Jan. 17, 1967 to Ralph F. Anderson and Leo Strombeck, and in U.S. Pat. No. 3,418,893, issued Dec. 31, 1968 to Roger H. Stohlquist and Leo Strombeck. While these prior machines were eminently successful, operational difficulties occasionally arose. For example some container jamming occurred at the erecting station. This resulted, at least in part, from an occasional failure to properly spread the upper flaps outwardly--especially the forwardmost upper flap. It is desirable to provide a machine which eliminates these difficulties, and also to provide a kit by which the prior machines could be improved.

SUMMARY

This invention relates to improvements in apparatus for feeding and erecting cartons.

an object of this invention is to provide a carton infeed and erecting apparatus which will feed flattened cartons one at a time from a stack to a conveyor, and reliably open and square the cartons and deflect or depress the upper flaps outwardly.

Another object is to provide an apparatus for erecting cartons having an improved mechanism for deflecting the forwardmost upper flap on the carton to open the carton.

Still another object of the present invention is to provide an apparatus for erecting cartons having an improved mechanism for preventing the adjacent fold line from bowing forwardly when the forwardmost upper flap is depressed, and/or for holding the depressed forwardmost upper flap in a generally horizontal position.

Another object is to provide an apparatus in accordance with any one of the foregoing objects in which there is improved relationship in timed movement of the various parts.

Yet another object is to provide a kit for constructing prior art apparatus with any of the foregoing objects.

These, and other objects and advantages of the present invention, will become apparent as the same becomes better understood from the following detailed description when taken in conjunction with the accompanying drawings.

DRAWINGS

FIG. 1 is a perspective view of a machine embodying the carton infeed and erecting apparatus of the present invention;

FIG. 2 is a perspective view of a portion of the machine shown in FIG. 1 and particularly illustrating the erecting station, there being portions broken away for a better illustration of the parts;

FIG. 3 is a view showing a portion of the operating mechanism of the machine and with the outline of the machine shown in phantom lines;

FIG. 4 is a cross-sectional view taken generally along line 4—4 of FIG. 3 and on a greatly enlarged scale;

FIG. 5A is a fragmentary top view of the apparatus of FIG. 1 illustrating the relationship of the parts of the carton infeed and erecting apparatus in the start position;

FIG. 5B is a front view as seen generally from line 5B—5B of FIG. 5A and having portions broken away for a better illustration of the relationship of the parts;

FIG. 5C is a cross-sectional view taken generally along line 5C—5C of FIG. 5A;

FIGS. 6A, 6B, and 6C correspond respectively to FIGS. 5A, 5B and 5C and illustrate the relationship of the parts in a moved position where the suction cups are adjacent the carton magazine;

FIGS. 7A, 7B and 7C correspond to FIGS. 5A, 5B and 5C, respectively, but in another moved position where the suction cups are returning to the start position;

FIG. 5D is a diagrammatic view illustrating the relationship of the parts in the position indicated in FIG. 5B and on a greatly enlarged scale;

FIGS. 6D and 7D are similar to FIG. 5D but showing the relationship of the parts corresponding to FIGS. 6B and 7B, respectively; and

FIG. 8, on sheet 6 of the drawings, is a perspective view of the retractable hold-down.

DESCRIPTION

The carton infeeding and erecting apparatus of the present invention is of general utility for use in feeding flattened cartons from a stack to a conveyor and for opening and squaring the carton as it is moved from the stack to the conveyor. In the form illustrated, the conveyor forms a part of a filling machine and the conveyor is arranged to advance the opened cartons (such as shown at A, B and C) past a flap folding apparatus which closes the lower end of the carton and then past the filling machine and to a further flap folding apparatus which closes the upper end of the carton.

The embodiment shown in the drawings includes a magazine **21** for storing a stack of flattened cartons, with the end carton in the stack laterally offset from a conveyor **22.** A vacuum operated gripper mechanism **23** is provided for engaging the face of an end carton in the stack and is movable from a position engaging one of the panels of the flattened carton in a stack to a position adjacent one side of the conveyor to move that panel laterally off the stack and into position at the conveyor. Means is prOvided for opening the carton in response to movement of the same laterally off the stack into engagement with the conveyor. The application of vacuum to the gripper means **23** is preferably continuous and the gripper means is moved in timed relation with reciprocation of the conveyor **22.** A combination lower flap folder and carton support **27** (see FIG. 5D) is preferably provided for folding the lower trailing flap on the carton and for supporting the carton when it is released by the gripper means.

The magazine **21** may be of any convenient construction and may be, for example, of the type described in the aforementioned U.S. Pat. No. 3,418,893 to which reference is made for a more complete description of the construction and operation thereof. The combination flap folder and carton support **27** is likewise of the type shown in that patent. The carton infeed and erecting apparatus is generally adapted for handling flattened cartons of the type having four panels hingedly articulated together along the corner fold lines. In the form of the carton illustrated in FIG. 5D, and designed generally by the letter B, the carton includes first and second side walls *a* and *b* and first and second end walls *c* and *d*. The end walls illustrated are wider than the

side walls, but this relationship could be reversed or they could be the same size if desired. Upper flaps designated *a'*, *b'*, *c'*, and *d'* are provided at the upper ends of the walls *a–d*, and lower flaps designated *a''–d''* are provided at the lower ends of the respective walls. When the carton is in its flattened condition, the side wall *b* and end wall *c* are disposed at one side of the carton and the side wall *a* and end wall *d* are disposed at the other side of the carton. As can be seen, the upper and lower flaps designated *d'* and *d''* are somewhat larger than the corresponding flaps *c'* and *c''* and project outwardly therefrom. As is conventional, the flaps are connected to the respective walls along fold lines.

The carton infeed and erecting apparatus is shown in FIG. 1 applied to a filling machine of the general type disclosed in U.S. Pat. No. 2,612,016, issued Sept. 30, 1952 to Swan F. Anderson and reference is made to that patent for a more complete description of the construction and operation of the filling and closing mechanism. In general, the filling machine includes a lower flap folding mechanism (not shown) arranged to complete the closing of the lower flaps on the carton, a filling apparatus including a nozzle **30** and an elevator (not shown) for elevating the container into telescoping relationship with the nozzle; and an outlet flap folding mechanism **34** for closing the flaps on the upper end of the carton after it has been filled.

The lower flap folding mechanism (not shown) may be of any suitable construction for infolding the lower flaps *a''*, *b''* and *c''* in proper sequence as the carton moves therepast to the nozzle **30.** The upper flap folding mechanism **34** similarly may be of any construction suitable for folding the upper flaps in proper sequence. The particular flap folding structure used will vary dependent upon the type and shape of the carton and flap. They may, for example, be of the type disclosed in the aforementioned U.S. Pat. No. 2,612,016.

The aforementioned conveyor **22** is preferably arranged to advance the opened or erected cartons in step fashion through the filling machine. The conveyor includes spaced lateral guide rails at opposite sides and, in the form shown, the guide rails comprise first and second channel-shaped members **31** and **32** mounted in opposed relation to each other. Members **31** and **32** define lateral guide edges **31'** and **32'** on the ends of the upper and lower legs of the respective channel members to laterally guide the containers. The containers are transferred along the members **31** and **32** in step fashion by a transfer apparatus which may be of any suitable design. One preferred design is described in U.S. Pat. No. 3,364,651 issued Jan. 23, 1968 to Roger H. Stohlquist and reference is made thereto for a more complete description. In the transfer apparatus herein shown, spaced slide plates **41** and **42** are mounted on the rails **31** and **32** respectively for reciprocation lengthwise of the rails. A plurality of pusher fingers such as indicated at **43** are provided at spaced points along each of the slides to advance the containers along the rails. The pusher fingers **43** are arranged to engage a carton between the rails and advance the same with the slides when the slides are moved forwardly or extended, and the fingers are laterally yieldable to pass around or bypass the containers when the slides are moved rearwardly or retracted. The drive mechanism (not shown) is adapted to sequentially move the slides forwardly to a fully extended position and then back to a fully retracted position.

As best shown in FIGS. **5A**, **6A** and **7A**, the rail **32** is somewhat longer than rail **31**, and extends a substantial distance beyond the inlet end of the rail **31.** The magazine **21** is positioned to support a stack of flattened cartons with the end carton spaced laterally from the guide rail **32.** While the carton magazine **21** can have various different constructions, it is herein shown as of the type described in the aforementioned U.S. Pat. No. 3,418,893 and reference is made thereto for a more complete description. In one variation best seen in FIGS. **1** and **5A**, the magazine **21** is provided with a cam **44** mounted on linkage **45** connected to side bars **46** having an oblate cross-section. The cam **44** is positioned for engagement by retraction of the transfer mechanism and this rotates the bars **46** and jogs the cartons on each cycle of the machine. The carton magazine generally includes a bottom support **48** herein shown in the form of a flat sheet metal panel, to underlie the lower edges of the cartons in the stack and support the same. Opposite rails **46** is a carton guide **49** in the form of a flat upright panel conveniently joined to the bottom panel **55.** Guide **49** and rails **46** are shown generally perpendicular to the guide rails **41** and **42.** Under such circumstances, rods **46** are spaced from guide **49** a distance less than the flattened width of the carton so that the cartons are positioned at an angle to the rails **41** or **42.**

A member **52** is provided on the guide **49** at the forward end thereof, that is at the end adjacent the conveyor **22.** Member **52** is provided with a carton engaging face **52***a* to define a magazine mouth.

Means is provided for retarding movement of the side wall *a* and end wall *d* of the end carton, as the walls *b* and *c* of that carton are pulled off the stack. In the embodiment shown, two stop fingers designated **54'** and **54''** are provided on the carton magazine and positioned to engage the upper and lower flaps *d'* and *d''* at the rear side of the front carton in the stack, as best shown in FIG. **2.** The stop fingers aid in retaining the flattened carton in the magazine and, in addition, function to retard movement of the side panel *a* and end panel *d* as the opposite panels are moved laterally away from the stack, to thereby at least partially open the end carton in the stack during its removal.

The gripper means **23** operates to remove the end cartons one at a time from the stack and to open and square the cartons as they are moved into position on the conveyor means **22.** This operation, illustrated in the drawings in FIGS. **5–7,** is sometimes referred to as erecting the carton and the location where this occurs is sometimes hereafter referred to as the erection station. The gripper means includes a plurality of suction cups, here shown three in number and designated **62***a–62c*, which are mounted on tubular arms **63***a–63c*, respectively, for swinging movement about the axis of a shaft **64.** The vacuum cups are supported on laterally extending end portions of the respective arms so that the face of each cup is disposed in a plane generally paralleling the lengthwise axis of the arms. As best seen in FIG. **2,** the cups **62***a* and **62***c* are disposed at a level to engage the flaps *b'* and *b''* on the upper and lower ends of the side wall or panel *b*, and the vacuum cup **62***b* is positioned to engage the side wall *b*. The cups **62***a–62c* are arranged so that they are not in vertical alignment but are staggered somewhat.

The shaft **64** is conveniently mounted for rotation about an upright axis in a bracket **66** adjacent the rail

32 (see FIG. 7C). The axis of the shaft 64 is spaced longitudinally a distance from the end of the guide rail 31 and is so located that the vacuum cups are swingable about the axis of the shaft 64 from a first position (FIGS. 5A–5C) in which the cups are adjacent and generally parallel to the rail 32, and a second position (FIGS. 6A–6C) in which the cups engage the front face of the end panel of the carton in a substantially parallel relation thereto. The gripper means is operative to grip the second side panel *b* on the end carton and swing the end panel therewith off the stack and toward the conveyor 22. As the carton is moved off the stack, for example toward the position shown in FIGS. 7A–7C, the carton is partially opened in the manner described above and best shown in FIG. 2.

Preferably, the vacuum cups 62*a*–62*c* are moved between the position shown in FIGS. 5 and 6 in timed relation with the movement of the transfer mechanism on the conveyor 22. As best shown in FIGS. 3 and 5C, shaft 64 is affixed to a rearwardly extending arm 71 which is pivotally connected to a pitman 72. At the opposite end of the pitman 72, there is a pivotal connection 73 to a pivotally mounted member 74. Member 74 is pivotally mounted on axis 75 and carries a cam follower 76 for engaging the periphery of a cam 77. A spring 78 is arranged to keep the cam follower 76 in contact with the cam 77. Cam 77 is driven by a motor (not shown) and the above-described arrangement changes the rotary motion to reciprocating swinging motion of the suction cups 62*a*–62*c*.

As best seen in FIGS. 5B, 6B and 7B, slide plate 42 has an opening 42*a* through which suction cup 62*b* and its arm 63*b* swing. In the present embodiment, vacuum is continuously applied to the suction cups 62*a*–62*c* and they are stripped off the carton as the cups move back past the guide 42. The carton, at the time it is stripped off the suction cups, has the side panel *b* disposed alongside the guide 42. Affixed to the guide 42 is a laterally extending member 82 which has a forward edge 84 generally perpendicular to the guide 42. Edge 84 is arranged to engage the back end wall *d* of the carton and, being perpendicular to the guide 42, aids in squaring the carton.

The combination flap folder and carton support mechanism 27 is similarly carried by the guide 42 for folding the lower trailing flap on the carton and for underlying and supporting the carton as it is advanced to a position between the rails 31 and 32. In the embodiment shown, the flap folder and carton support 27 is a generally L-shaped member which is pivotally mounted on a pin 85 on the guide 42 (see FIG. 5B). Support member 27 is movable with the guide and is also swingable relative to it between a retracted position as shown in FIG. 6B and a carton support position as shown in FIGS. 5B and 5D. A rearwardly extending arm 86 carries a roller 87 arranged to engage a stationary cam track 89. The cam track has a ramp portion intermediate its ends which forces the roller downwardly and moves the support member 27 to its support position. The support member 27 has a depending portion 27*a* arranged to engage the trailing side wall of the carton and a forwardly extending, flap-tucking portion 27*b*. Preferably, when in its support position (see FIG. 5B), the depending portion 27*a* is directly beneath the edge 84 and cooperates with it to square the carton.

In order to avoid interference with the upper flaps during filling, it is desirable to spread the upper flaps on the carton. An improved upper flap depressing mechanism 100 is provided for folding the upper lead flap on the carton forwardly as the carton enters the space between the guide rails. Conveniently, this same mechanism also depresses the trial flap. As best shown in FIG. 4, this upper flap depressing apparatus 100 includes a first member 101 which is attached to a shaft 104 that extends crosswise of the conveyor at a level above the tops of the cartons and adjacent the erecting station. Shaft 104 is rotatably mounted in a tubular member 105 affixed to an upwardly extending housing 106 on the machine. The upper flap depressing apparatus 100 also includes a second member 102 swingably mounted on the first member for limited movement relative thereto in a manner hereafter explained. The first and second members are movable between an elevated position (see FIG. 5D) and a lowered position (see FIG. 6D) in which it engages the forwardmost upper flap *c'* of a carton at the erecting station and depresses it forward. To aid in this function, first member 101 has laterally extending portion 101 *a* for contacting the flap *c'*.

As best seen in FIGS. 5D, 6D or 7D, second member 102 has an opening 102*a* therethrough and a laterally extending pin 101*b* on the first member 101 extends into the opening. This permits a limited amount of lost motion between the first and second members. With this lost motion connection, the second member 102 will remain in the lowered position after the first member has started to return to the elevated position as it is doing in FIG. 7D. Second member 102 has an arcuate lower face 102*b* and a nose portion 102*c*. The first member 101 has an arcuate lower portion 101*c* and a forward portion 101*d* at a greater amount of curvature. When the portion 101*d* engages a flap, the greater degree of curvature allows the flap to be more readily depressed. The lower arcuate portion 102*b* of the second member and its nose portion 102*c*, permit the second member to hold the flap depressed while the first member starts to its elevated position.

In prior apparatus of this type, a stationary hold-down has been provided for holding the depressed flaps in their depressed position. In the embodiment illustrated, there is a similar hold-down, generally designated 110. This stationary hold-down is foreshortened for a reason explained below. In the embodiment illustrated, the stationary hold-down 110 includes a lower member 111, an upwardly extending member 112 and an arm 113 which supports the hold-down conveniently adjacent the outer end of the shaft 104, as best seen in FIGS. 2 and 3.

The stationary hold-down 110 is foreshortened to allow room for a retractable support or hold-down generally designated 120. Referring to FIGS. 4 and 8, the retractable support or hold-down 120 includes a sleeve portion 121 circumjacent the tube 105, a downwardly extending arm 122, and a generally I-shaped holding portion 123. One leg 123*a* of portion 123 is elongated and affixed to arm 122. An upwardly and outwardly extending finger 124 is mounted on portion 123 and outwardly deflects the upper side flap *b'* of the container as it passes this retractable support or hold-down.

Retractable support or hold-down 120 serves to contact and support the forward side of the forwardmost upper flap *c'* (see FIG. 5D) and thereby supports the adjacent fold line to prevent the fold line from bowing forward as the flap is engaged by the upper flap de-

pressing apparatus **100.** The retractable support **120** does not move from the position shown in FIG. 5D until the portion **101***a* of the first member has started to bend the upper flap *c'* forwardly. If the fold line is allowed to bow, there ia a danger of a jam-up of the machine. The retractable support **120** preferably contacts upper flap *c'* above, but closely adjacent the fold line. For example, about three-sixteenths inch above the fold line for a half-gallon container. Retractable support or hold-down **120** is then retracted (FIG. **6D**) and then serves to hold the depressed forwardmost flap in its depressed position (FIG. 7D) until it goes under the stationary hold-down **110.** The apparatus for accomplishing retraction is described below.

Referring to FIG. **4,** first member **101** of the flap depressor has a laterally extending portion **101***e* which engages the arm **122** of the retractable hold-down **120** as the upper flap depressor approaches its lowered position. In this manner, the retractable hold-down **120** is moved to its retracted position by the upper flap depressor **100.** A spring **126** is mounted circumjacent the tube **105** and is engaged with the tubular portion **121** to resiliently urge the retractable hold-down to its lowered position. An adjustable stop is provided for locating the retractable hold-down at its lowered position, in which portion **123** lies in a generally horizontal plane. As shown, a projection **127** is provided on sleeve **121** and receives a bolt **128.** The bolt contacts a stop member **129** mounted on the frame of the machine.

As explained above, the upper flap depressor **100** includes first and second members which have a lost motion connection therebetween. Thus, only first member **101** is fixed to shaft **104.** Member **101** serves as a pusher to move the retractable hold-down **120** to its retracted position. Thus by mechanical interconnection, the movements of the second member **102** and the retractable hold-down **120** are related to the movement of the first member **101.**

Referring to FIG. **3,** there can be seen the mechanism by which first member **101** is reciprocated. Cam **77** carries an eccentric **131** to which is connected a link **132.** A second link **133** is rotatably mounted on shaft **134** and is connected to a pitman **135.** Pitman **135** is connected to a T-shaped member **136** which is pivotal about axis **137.** Attached to one leg of the T-shaped member **136** is an upwardly extending pitman **138** which operates on shaft **104** through link **139** (see FIG. **4**). In this manner, the movement of the upper flap depressor **100** and the retractable hold-down **120** is controlled by the cam **77.** Since this is the origin of the movement for the suction cups **62***a*–**62***c*, movement of these items is interrelated or timed.

From the foregoing it is thought that the construction and operation of the carton infeed and erecting apparatus will be readily undersoood. The transfer mechanism operates the guides **41** and **42** in a reciprocating manner to intermittently advance the opened cartons from the erecting station to the filler **32.** Cartons are withdrawn from the magazine **21** by the suction cups in timed relation with the operation of the transfer mechanism. The forwardmost upper flap is depressed by a new upper flap depressor which cooperates with a retractable hold-down to assure that the forwardmost upper flap is opened. As the transfer mechanism moves the carton past the flap depressor, the rearwardmost flap is also depressed downwardly (see FIG. 7D). A finger **124** on the hold-down operates to deflect the upper side flap *b'* outwardly where it is engaged by a guide rod **141.** A finger **142** adjacent the erecting station holds the opposite or near side flap *a'* and deflects it outwardly for engagement by a second guide rod **143,** all as best seen in FIG. **2.** In this manner the upper flaps are spread open for the filling operation.

It is possible to embody the present invention in a kit for converting prior art devices to a machine having improved carton breaking and/or improved carton infeed and erecting. For example, the following described kit may be utilized on devices shown and described in the aforementioned U.S. Pat. Nos. 3,298,288 and 3,418,893.

The kit preferably includes the tubular member **105,** the pivot shaft **104,** the first flap depressor **101,** the second flap depressor **102,** the retractable hold-down **120,** and the foreshortened hold-down **110** (see FIGS. **3** and **4**). Also the cam **77** which may also include a cam track for the transfer apparatus, links **132** and **133,** pitman **135,** T-shaped member **136,** upwardly extending pitman **138,** and link **139** to transfer motion from the cam **77** to the shaft **104.** The kit also includes the spring **126** (see FIG. **4**) for urging the retractable hold-down **120** downwardly, and the stop member **129** (see FIG. **2**) for limiting the movement. The kit also includes cam follower **76** on member **74,** spring **78** for holding the cam follower against the cam, the pitman **72,** and shaft **64** on which is mounted the vacuum cups and which reciprocates them by transfer of motion from the cam **77.** Shaft **64** is preferably hollow to serve as a vacuum tube.

The kit conveniently includes cam **44** and linkage **45** for jogging the magazine (see FIG. **5C**). Also guide rods **141** and **143** (see FIG. **2**) for spreading the flaps, and the assembly which includes finger **142** and serves as a flap guide. The kit may also include additional pushers **43,** a new cam track **89,** and a spring-urged gate **144** which holds the cartons when the transfer mechanism is retracted.

While a preferred embodiment of the invention has herein been illustrated and described, this has been done by way of illustration and not limitation, and the invention should not be limited except as required by the scope of the appended claims.

What is claimed is:

1. In an apparatus for erecting flattened cartons of the type having a first end panel and a first side panel at one side of the flattened carton joined along edge fold lines to a second side panel and a second end panel at the other side of the flattened carton, said panels including wall portions and end flaps on the ends of at least some of the wall portions; the apparatus having conveyor means for advancing cartons in a forward direction along a path, means for holding a stack of flattened cartons adjacent said path, and means for moving the end carton of the stack to an erecting station at the conveyor means where the carton is generally squared; the combination therewith of: an upper flap depressor mounted for swinging movement abOut an axis crosswise of the conveyor means at a level above the cartons and adjacent said erecting station, means for moving the upper flap depressor between an elevated position and a lowered position in which it engages the forwardmost upper flap of a carton at the erecting station and depresses it forward to a generally horizontal position, a retractable support located immediately forward of the upper flap depressor, means mounting the retractable support for movement between a retracted posi-

tion and a support position where it engages the forwardmost upper flap and holds it from bowing forwardly, means for retracting the retractable support correlative with the movement of the upper flap depressor to its lowered position so that the upper flap may be depressed without interference by the retractable support, and an abutment on the apparatus for stopping the support at the supporting position.

2. The combination of claim **1** in which the retractable support is swingably mounted about the same axis as the upper flap depressor.

3. The combination of claim **2** in which the means for retracting the support is a pusher mounted on the upper flap depressor for engaging the support and moving it to its retracted position.

4. The combinaton of claim **1** including means for adjusting the position where the abutment is engaged.

5. The combination of claim **1** including means for resiliently urging the support toward the supporting position.

6. In an apparatus for erecting flattened cartons of the type having a first end panel and a first side panel at one side of the flattened carton joined along edge fold lines to a second side panel and a second end panel at the other side of the flattened carton, said panels including wall portions and end flaps on the ends of at least some of the wall portions; the apparatus having conveyor means for advancing cartons in a forward direction along a path, means for holding a stack of flattened cartons adjacent said path, and means for moving the end carton of the stack to an erecting station at the conveyor means where the carton is generally squared; the combination therewith of: an upper flap depressor mounted for swinging movement about an axis crosswise of the conveyor means at a level above the cartons and adjacent said erecting station, means for moving the upper flap depressor between an elevated position and a lowered position in which it engages the forwardmost upper flap of a carton at the erecting station and depresses it forward to a generally horizontal position, a retractable support located immediately forward of the upper flap depressor, means mounting the retractable support for movement between a retracted position and a support position where it engages the forwardmost upper flap and holds it from bowing forwardly, means for retracting the retractable support correlative with the movement of the upper flap depressor to its lowered position so that the upper flap may be depressed without interference by the retractable support, the upper flap depressor including first and second members both mounted for swinging movement about said axis, the means for moving the upper flap depressor including means for moving the first member between the elevated and lowered position in timed relation with the movement of the conveyor means, and means providing a lost-motion connection between the first and second members so that the second member remains at the lowered position temporarily after the first member has started to move to the elevated position and until the support is substantially at the supporting position.

7. The combination of claim **6** wherein the first member has an arcuate surface for engaging the forwardmost upper flap, said arcuate surface having a forward portion at a higher curvature than the remainder, and wherein the second member has an arcuate surface with a forward portion at a lower curvature than the forward portion of the first member.

8. The combination of claim **6** wherein the means providing a lost-motion connection between the first and second members includes: means providing a surface on one of the members, and a laterally extending pin engageable with said surface when the first member is moved toward the elevated position.

9. The combination of claim **6** wherein the conveyor means is operative to advance the containers in step fashion; and wherein the means for moving the end carton to an erecting station includes vacuum operated gripper means for gripping the end carton, and means for oscillating the gripper means between a first position at the stack of flattened cartons and a second position at the erecting station; and including means responsive to movement of the end carton for opening the same, and means on the conveyor means engageable with the opened carton for advancing the same and including a laterally extending member which extends generally entirely across the trailing end panel of the erected carton to help square the carton.

10. In an apparatus for erecting flattened cartons of the type having end panels and side panels, at least some of the panels including end flaps at the upper end thereof; the apparatus having an erecting station, a conveyor for advancing cartons from the erecting station in a forward direction; and an upper flap depressor at the erecting station and movable for depressing the forwardmost upper flap to a generally horizontal position; the improvement comprising: a retractable hold-down swingably mounted immediately forward of the upper flap depressor, the retractable hold-down including an arm and a contacting surface on the arm, the contacting surface operative in a holding position to hold the depressed upper flap in the horizontal position, means mounting the arm for swinging movement so that the contacting surface is movable between the holding position and a retracted position removed therefrom, means for moving the hold-down to its retracted position as the upper flap is depressed and to its holding position after the upper flap is depressed, and deflecting means on the retractable hold-down for deflecting outwardly one upper flap at the lateral side of the carton disposed 90° to said forwardmost upper flap.

11. Apparatus as set forth in claim **10** wherein the upper flap depressor and the retractable hold-down are both mounted for swinging movement about the same axis, and the means for moving the hold-down comprises a laterally extending member on the upper flap depressor and arranged to engage the mounting arm of the hold-down as the upper flap depressor moves to engage the forwardmost upper flap of the carton.

12. Apparatus as set forth in claim **11** including a spring mounted circumjacent said axis for urging the hold-down toward the holding position, and including a stop engaged by the hold-down to stop the same at the holding position.

13. Apparatus as set forth in claim **10** wherein the deflecting means includes a finger extending from the contacting surface in a forward direction and at an angle extending upwardly and outwardly to a point beyond the lateral side of the carton.

14. Apparatus as set forth in claim **13** wherein the carton has four flaps at the top; the upper flap depressor and the retractable hold-down are both mounted for swinging movement about the same axis; and the

means for moving the hold-down comprises a pushing surface on the upper flap depressor for engaging the mounting arm as the upper flap depressor moves to engage the forwardmost upper flap of the carton; and including means for moving the upper flap depressor between an elevated position and a lowered position, and for maintaining the upper flap depressor in said lowered position until said conveyor has advanced the carton at least part way past the upper flap depressor so that it operates to deflect the rearmost upper flap rearwardly; and means for deflecting outwardly the other upper flap at the lateral side of the carton whereby all four upper flaps are deflected outwardly of the carton.

15. Apparatus as set forth in claim **14** wherein the upper flap depressor includes first and second members mounted for swinging movement about said axis, and means providing a lost-motion connection between the two members so that one member remains at the lowered position temporarily after the other member has started to move to the elevated position.

16. In an apparatus for erecting flattened cartons of the type having a first end panel and a first side panel at one side of the flattened carton joined along edge fold lines to a second side panel and a second end panel at the other side of the flattened carton, said panels including wall portions and end flaps on the ends of at least some wall portions, the apparatus having conveyor means for advancing cartons in a forward direction along a path, a carton magazine laterally offset from said path for holding a stack of flattened cartons, gripper means engageable with a face of the carton at the end of the stack, means for moving the gripper means from a first position adjacent the end carton in the magazine to a second position at the conveyor means where the carton is erected and generally squared, and upper flap depressor means mounted for swinging movement about an axis extending crosswise of the conveyor means at a level above the cartons and adjacent said second position; characterized in that the upper flap depressor means includes first and second members mounted for swinging movement about said axis between an elevated position and a lowered position, means for moving the first member between said positions in timed relation with the movement of the conveyor means and the gripper means, means providing a lost-motion connection between the first and second members so that the second member remains at the lowered position temporarily after the first member has started to move to the elevated position, the first member having an arcuate surface for engaging the forwardmost upper flap of a carton and depressing it forward to a generally horizontal position as the first member is moved to the lowered position, and the second member having a surface for engaging the depressed upper flap and holding it in its depressed position while the first member starts to move to the elevated position.

17. The combination of claim **16** wherein the means for moving the first member is arranged to temporarily maintain the second member generally at the lowered position so that the members operate to deflect the rearmost upper flap rearwardly.

18. The combination of claim **16** including hold-down means for holding the forwardmost flap in its horizontal position.

19. The combination of claim **18** wherein at least a portion of the hold-down means is retractable in response to movement of the upper flap depressor to its lowered position.

20. The combination of claim **18** wherein the hold-down means includes an arm swingably mounted about the same axis as the upper flap depressor means, and wherein the upper flap depressor means includes means for engaging the arm when the members are moved to lowered position to push the hold-down means to a retracted position.

21. The combination of claim **20** wherein the means for engaging the arm is carried by the first member, and said surface of the second member holds the upper flap depressed until the hold-down means is moved to a holding position engaged with the depressed flap.

22. In an apparatus for erecting flattened cartons of the type having end panels and side panels, at least some of the panels including end flaps at the upper end thereof; the apparatus having an erecting station, a conveyor for advancing cartons from the erecting station in a forward direction, and an upper flap depressor at the erecting station and movable for depressing the forwardmost upper flap to a generally horizontal position; characterized in that the upper flap depressor includes first and second members mounted for swinging movement about an axis extending crosswise of the conveyor at a level above the cartons, means for moving the first member from an elevated position to a lowered position in timed relation with the movement of the conveyor to depress the forwardmost upper flap forwardly, and lost-motion means connecting the first and second members to move the second member when the first member is moved but to provide a dwell of the second member at the lowered position.

23. Apparatus for erecting flattened cartons as set forth in claim **22** wherein the lost-motion means includes a surface on one of the members, and a laterally-extending projection on the other member and arranged to engage said surface when the first member is moved toward the elevated position.

24. Apparatus for erecting flattened cartons as set forth in claim **23** wherein the first member has an arcuate surface at the bottom and front for engaging the forwardmost upper flap, said arcuate surface having a forward portion at a higher degree of curvature than the remainder, and wherein the second member has an arcuate surface with a forward portion at a lower degree of curvature than the forward portion of the first member.

25. Apparatus for erecting flattened cartons as set forth in claim **24** including a retractable hold-down movable between a retracted position and a holding position for engaging and holding the forwardmost flap in its horizontal position.

26. Apparatus as set forth in claim **25** wherein the retractable hold-down is mounted for swinging movement about said axis, and including means on the first member for engaging the hold-down as the first member moves to its lowered position to move the hold-down to its retracted position.

27. Apparatus as set forth in claim **26** including a spring for urging the hold-down toward its holding position.

28. A kit for improving carton breaking in a machine for erecting flattened cartons of the type having a first end panel and a first side panel at one side of a flattened carton joined along edge fold lines to a second side panel and a second end panel at the other side of

the flattened carton, said panels including wall portions and end flaps on the upper ends of at least some of the wall portions; the machine having a motor, conveyor means driven by the motor for advancing cartons in a forward direction, a magazine for supporting a stack of flattened cartons adjacent the conveyor means, and vacuum operated gripper means for gripping the face of a panel on the end carton in the magazine and moving the carton to an erecting station at the conveyor means; the kit comprising: a support tube for mounting crosswise of the conveyor means at a level above the cartons and adjacent said erecting station and defining an axis thereat, a first flap depressor rotatably mounted on the axis for movement between an elevated position and a lowered position in which it engages the forwardmost upper flap of a carton at the erecting station and depresses it forward, a second flap depressor rotatably mounted on the axis and having a lost-motion connection to the first flap depressor, means including an eccentric and a pitman driven by the motor for reciprocating the first flap depressor between said positions, a retractable hold-down rotatably mounted on the support tube for movement between a retracted position and a holding position where it engages the depressed forwardmost upper flap and holds it in the depressed position, a spring circumjacent the support tube for urging the retractable hold-down toward the holding position, a stop on the machine and positioned for engaging and stopping the retractable hold-down at the holdinG position, means on the first flap depressor for engaging the retractable hold-down and moving it to its retracted position as the first flap depressor moves to its lowered position, and means including a cam, cam follower and pitman for moving the vacuum operated gripper means in timed relation with the first flap depressor and the conveyor means.

29. In an apparatus for erecting flattened cartons of the type having a first end panel and a first side panel at one side of the flattened carton joined along edge fold lines to a second side panel and a second end panel at the other side of the flattened carton, said panels including wall portions and end flaps on the ends of at least some of the wall portions; the apparatus having conveyor means for advancing cartons in a forward direction along a path, means for holding a stack of flattened cartons adjacent said path, and means for moving the end carton of the stack to an erecting station at the conveyor means where the carton is generally squared; the combination therewith of: an upper flap depressor mounted for swinging movement about an axis crosswise of the conveyor means at a level above the cartons and adjacent said erecting station, means for moving the upper flap depressor between an elevated position and a lowered position in which it engages the forwardmost upper flap of a carton at the erecting station and depresses it forward to a generally horizontal position, a retractable support located immediately forward of the upper flap depressor and swingably mounted about the same axis as the upper flap depressor, means mounting the retractable support for movement between a retracted position and a support position where it engages the forwardmost upper flap and holds it from bowing forwardly, and a pusher mounted on the upper flap depressor for engaging the retractable support and moving it to its retracted position correlative with the movement of the upper flap depressor to its lowered position so that the upper flap may be depressed without interference by the retractable support.

30. In an apparatus for erecting flattened cartons of the type having end panels and side panels, at least some of the panels including end flaps at the upper end thereof; the apparatus having an erecting station, a conveyor for advancing cartons from the erecting station in a forward direction; and an upper flap depressor at the erecting station and mounted for swinging movement about an axis for depressing the forwardmost upper flap to a generally horizontal position; the improvement comprising: a retractable hold-down mounted immediately forward of the upper flap depressor, the retractable hold-down including an arm and a contacting surface on the arm, the contacting surface operative in a holding position to hold the depressed upper flap in the horizontal position, means mounting the arm for swinging movement about the same axis as the upper flap deflector so that the contacting surface is movable between the holding position and a retracted position removed therefrom, means for moving the hold-down to its retracted position as the upper flap is depressed and to its holding position after the upper flap is depressed, and the last-mentioned means including a laterally extending member on the upper flap depressor and arranged to engage the mounting arm of the hold-down as the upper flap depressor moves to engage the forwardmost upper flap of the carton.

31. Apparatus as set forth in claim **30** including a spring mounted circumjacent said axis for urging the hold-down toward the holding position, and including a stop engaged by the hold-down to stop the same at the holding position.

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