June 13, 1961 L. E. RUSSELL 2,987,974

MACHINE FOR OPENING AND HANDLING CARTONS OF PACKAGING MACHINERY

Filed Nov. 19, 1957 8 Sheets-Sheet 1

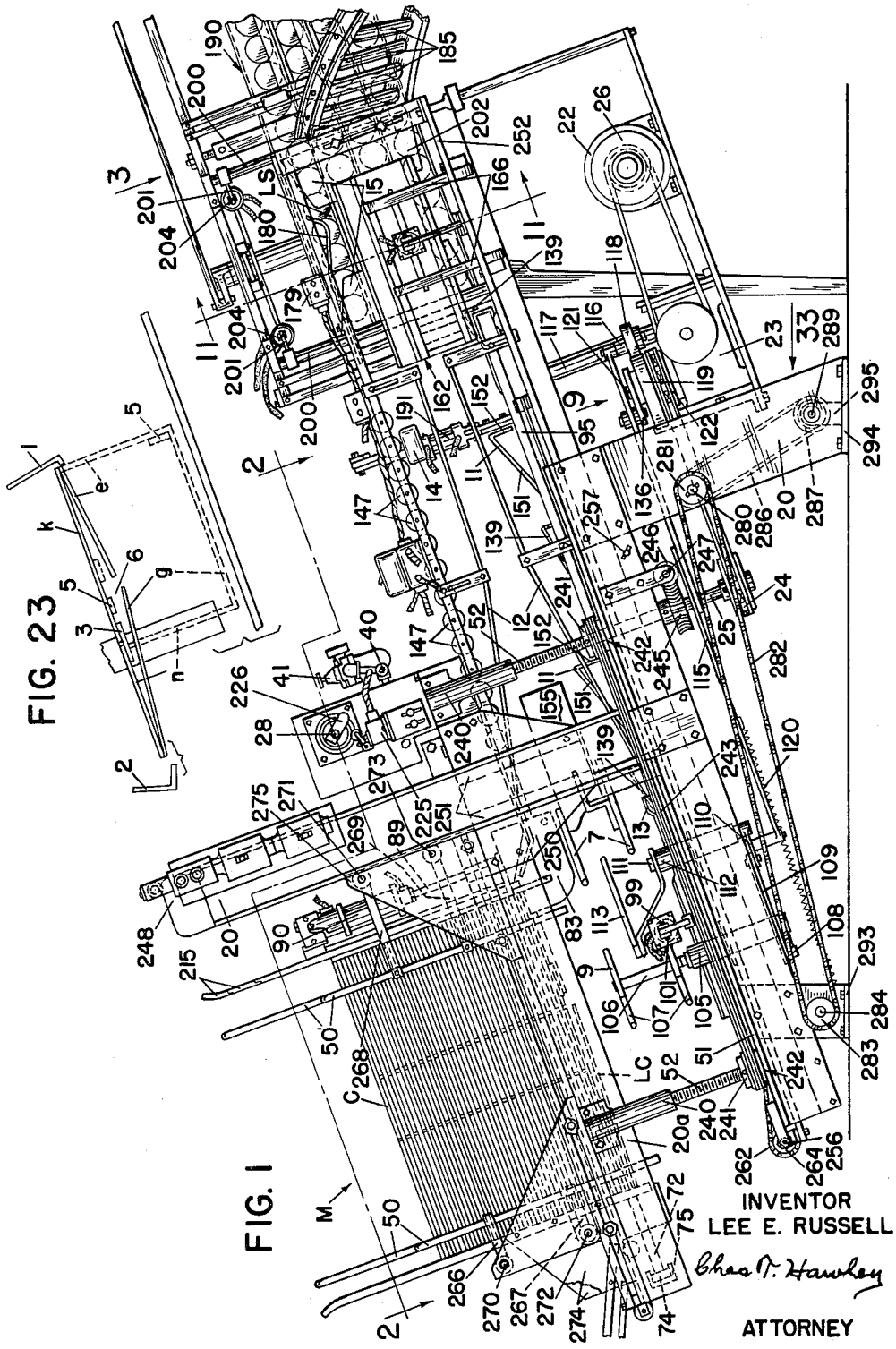

FIG. 23

FIG. 1

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MACHINE FOR OPENING AND HANDLING CARTONS OF PACKAGING MACHINERY

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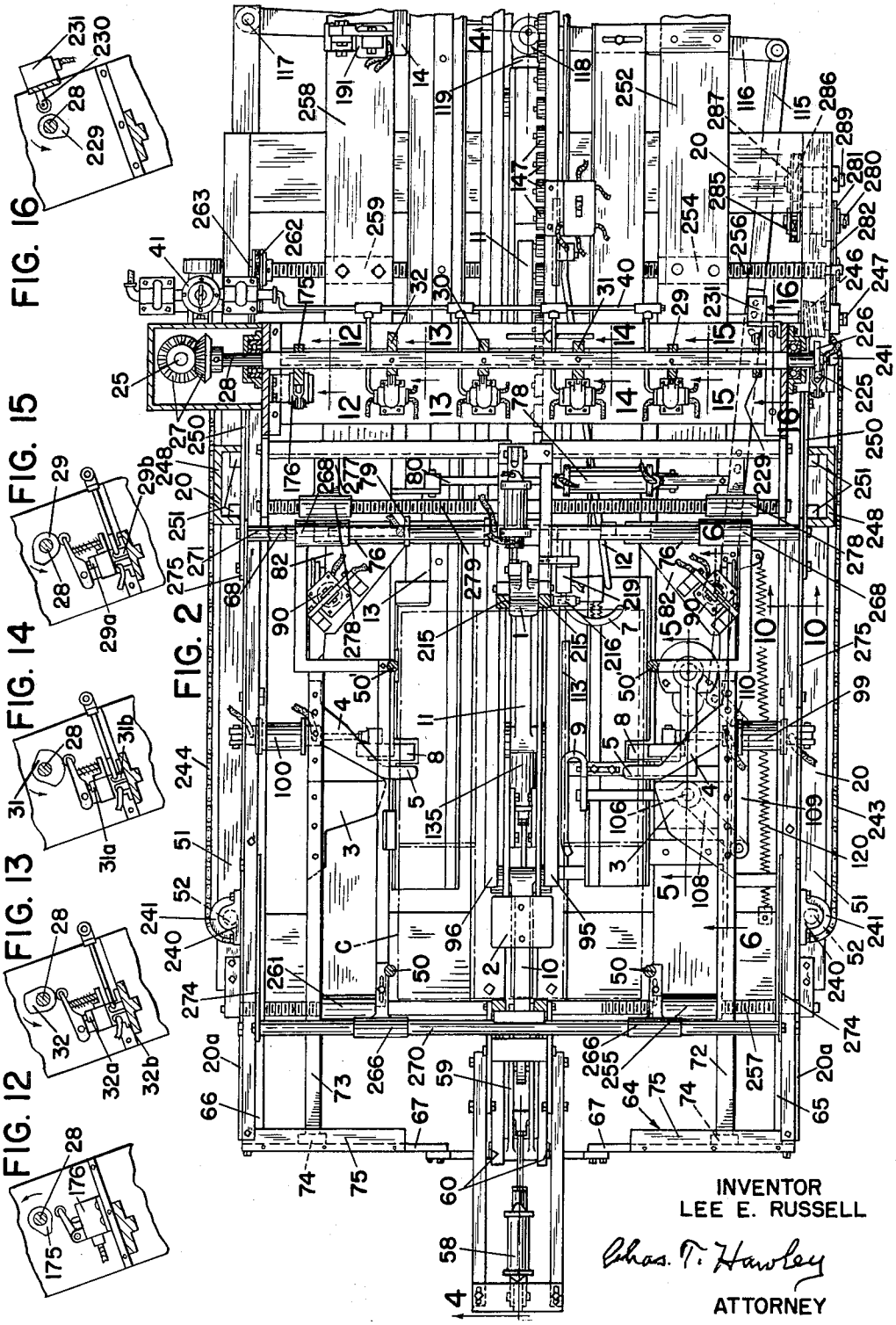

FIG. 16

FIG. 15

FIG. 14

FIG. 13

FIG. 12

FIG. 2

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MACHINE FOR OPENING AND HANDLING CARTONS OF PACKAGING MACHINERY

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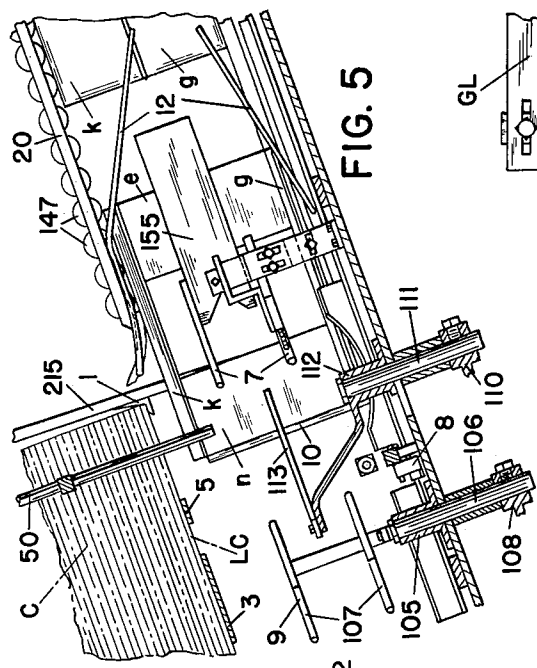

FIG. 5

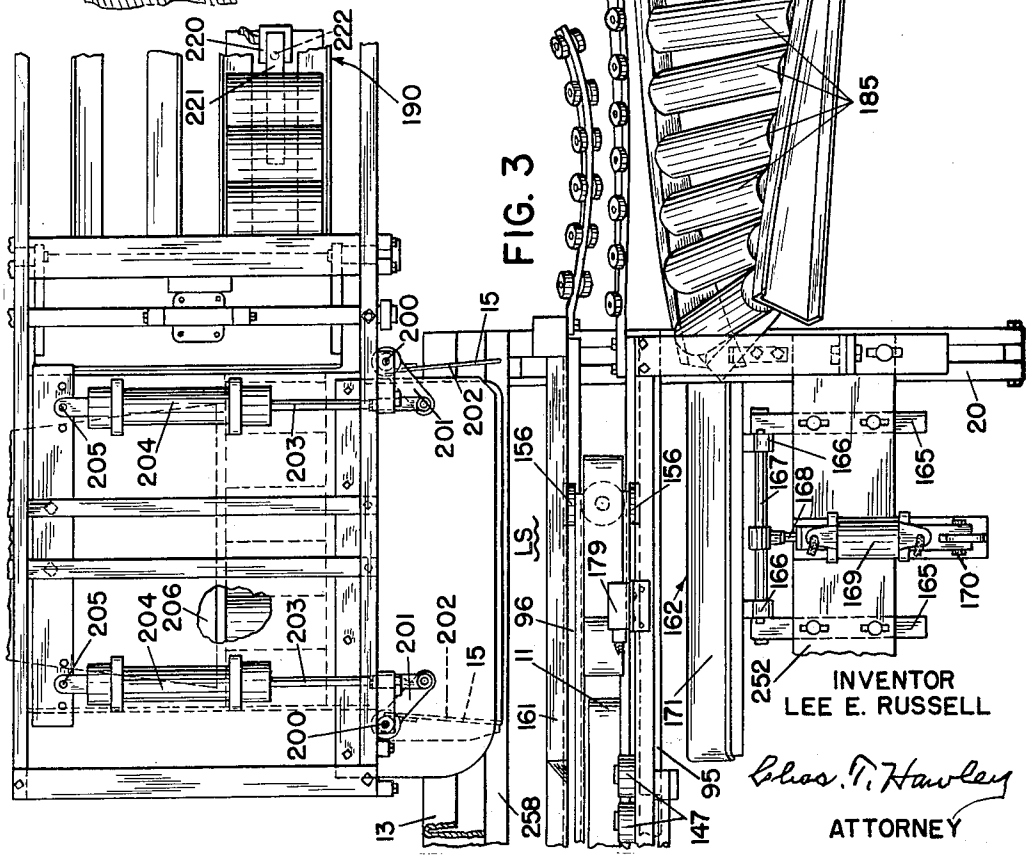

FIG. 3

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MACHINE FOR OPENING AND HANDLING CARTONS OF PACKAGING MACHINERY

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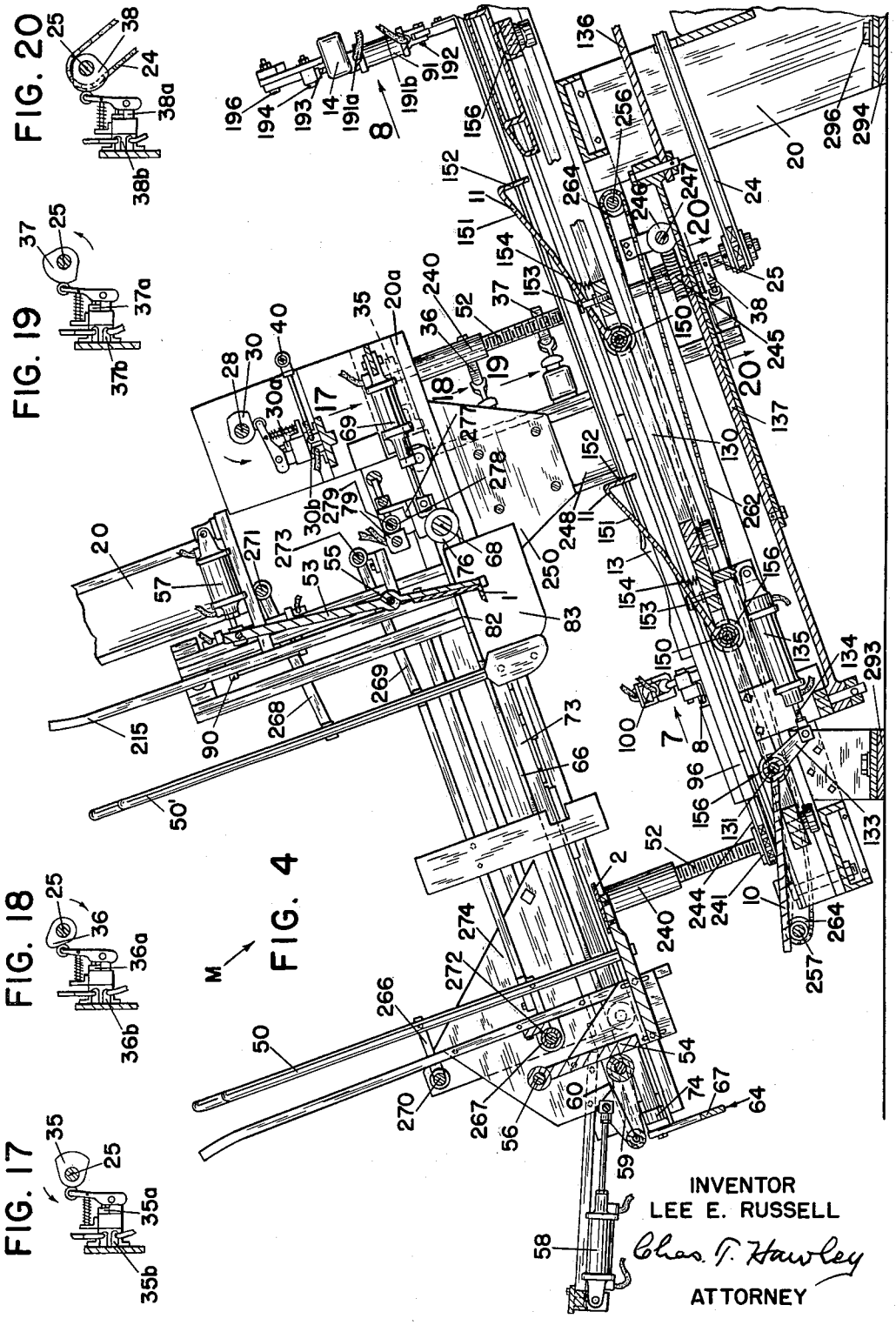

FIG. 20

FIG. 19

FIG. 18

FIG. 17

FIG. 4

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MACHINE FOR OPENING AND HANDLING CARTONS OF PACKAGING MACHINERY

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FIG. 6

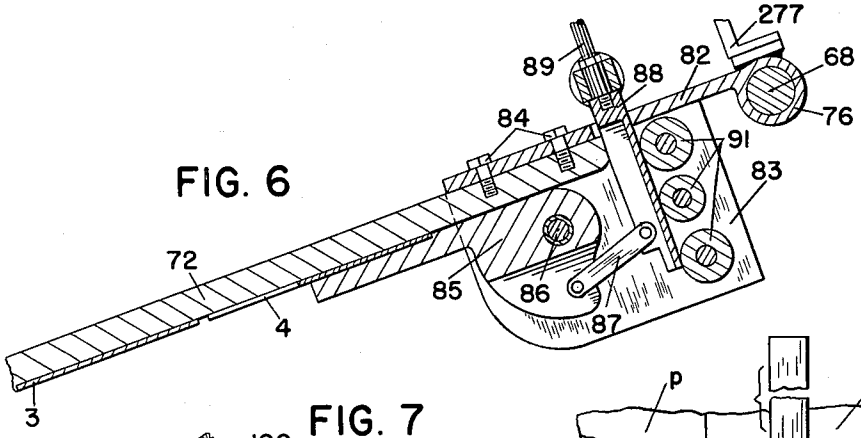


FIG. 7

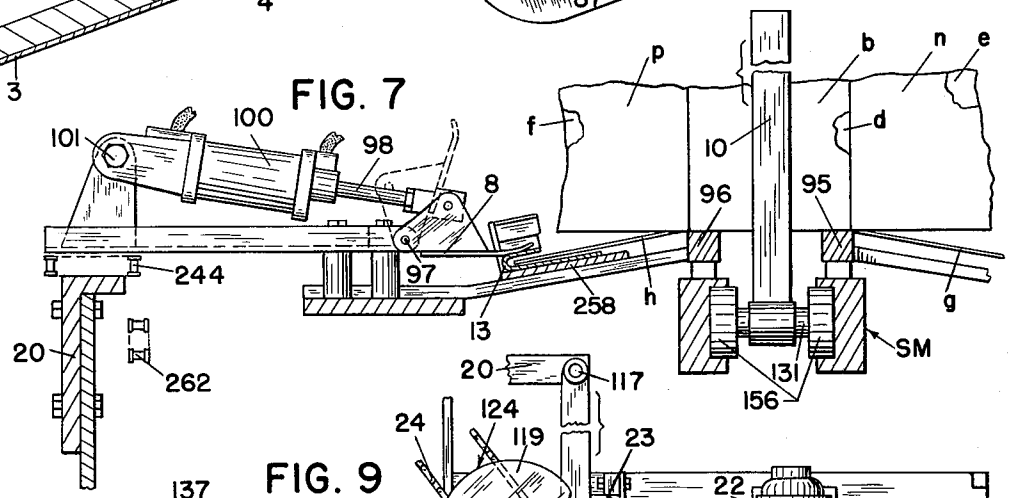


FIG. 9

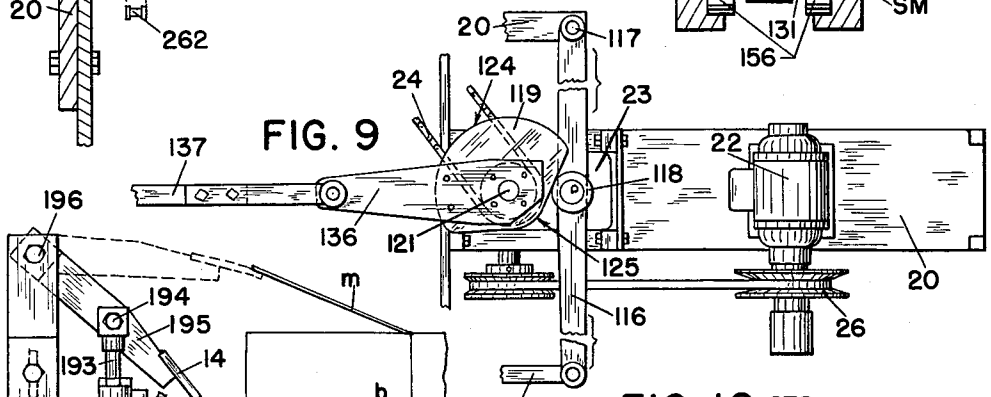
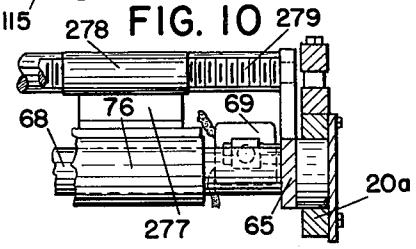


FIG. 10



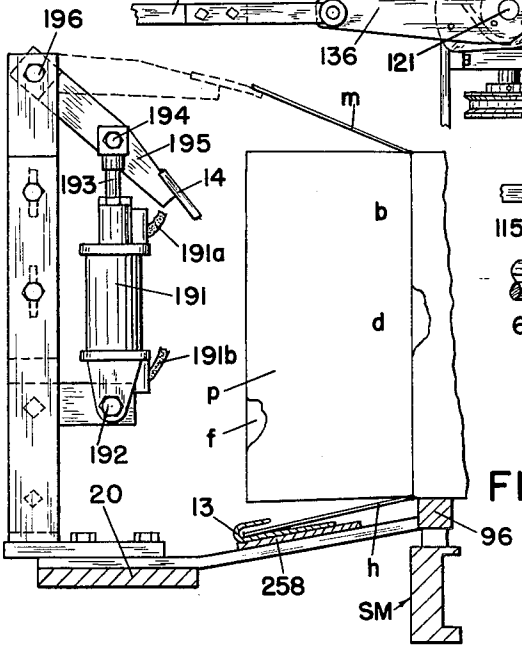


FIG. 8

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MACHINE FOR OPENING AND HANDLING CARTONS OF PACKAGING MACHINERY

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FIG. 11

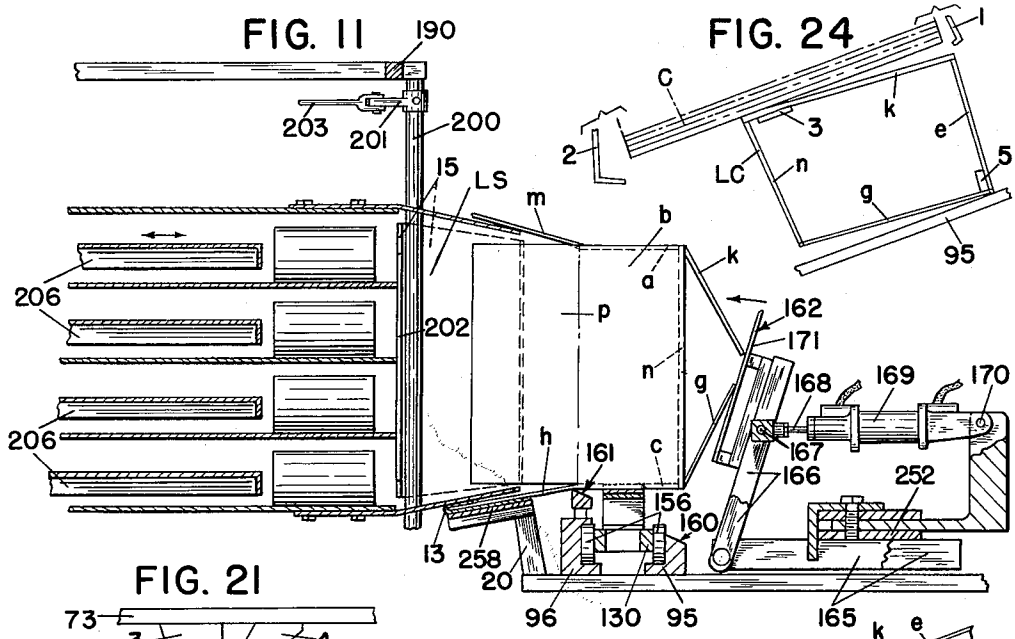


FIG. 24

FIG. 21

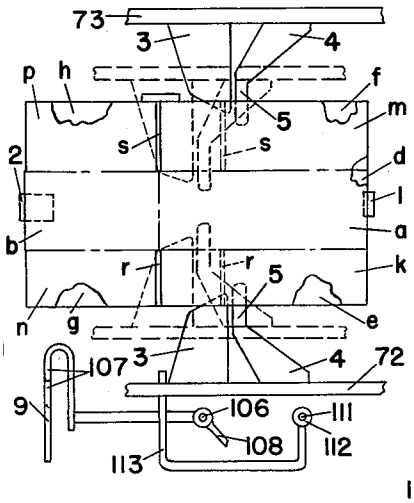


FIG. 27

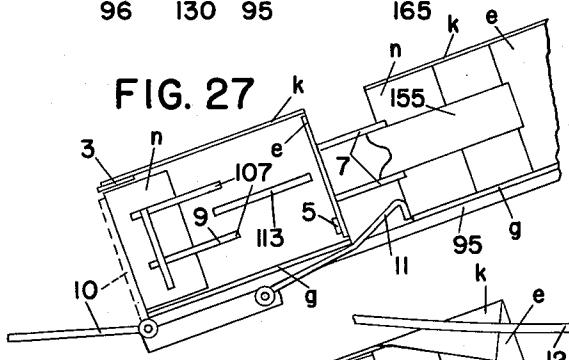


FIG. 28

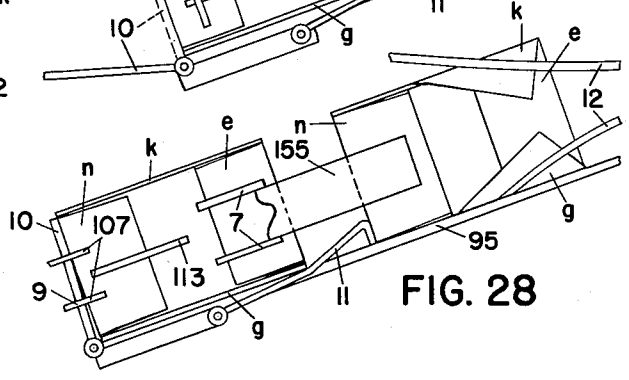
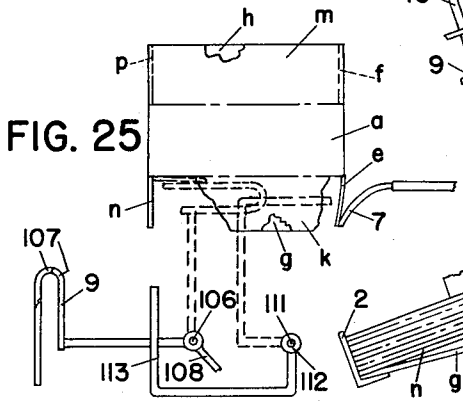


FIG. 25



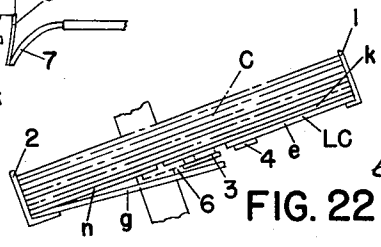


FIG. 22

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MACHINE FOR OPENING AND HANDLING CARTONS OF PACKAGING MACHINERY

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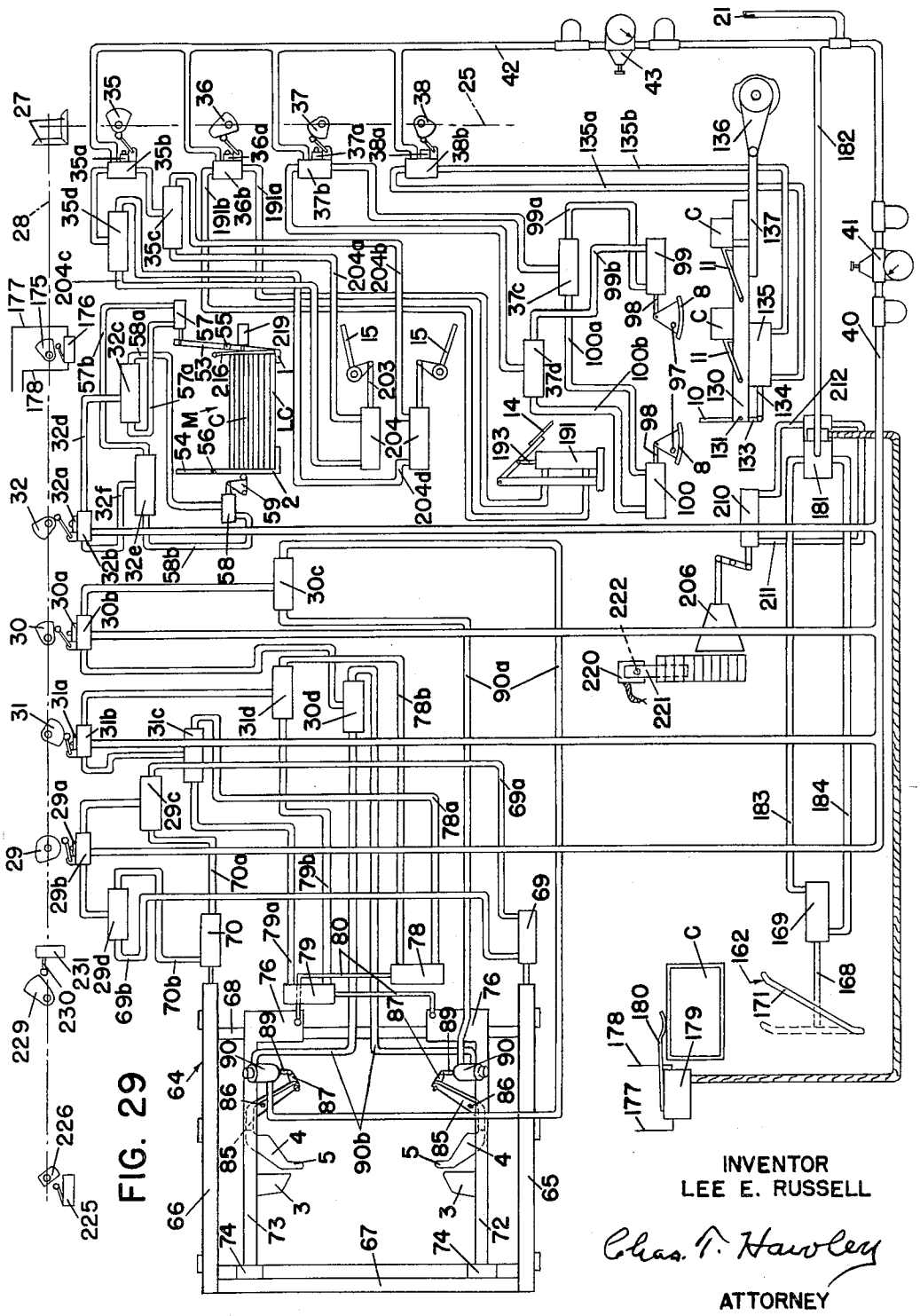

FIG. 29

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MACHINE FOR OPENING AND HANDLING CARTONS OF PACKAGING MACHINERY

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FIG. 26

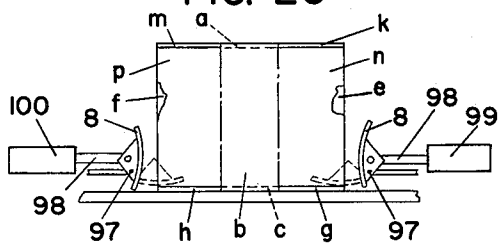

FIG. 30

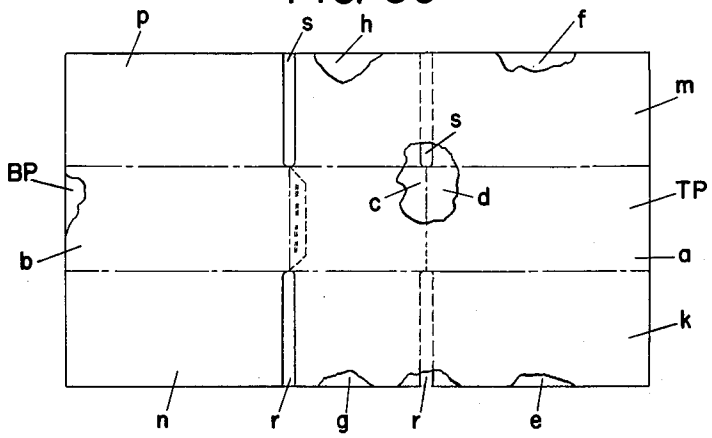

FIG. 31

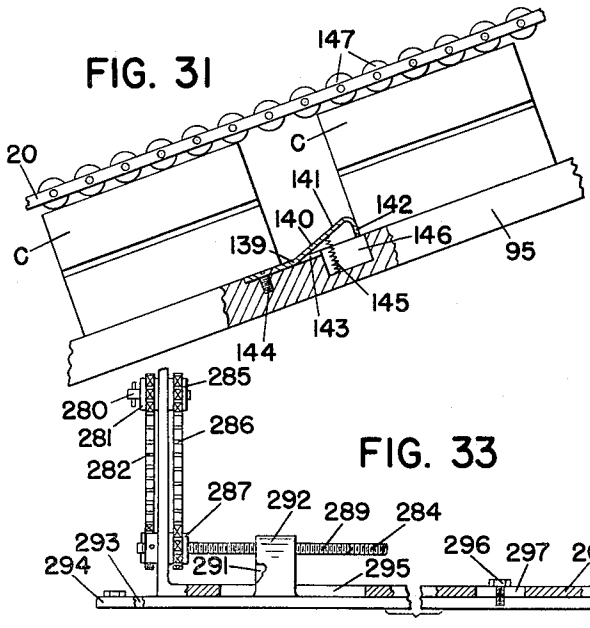

FIG. 32

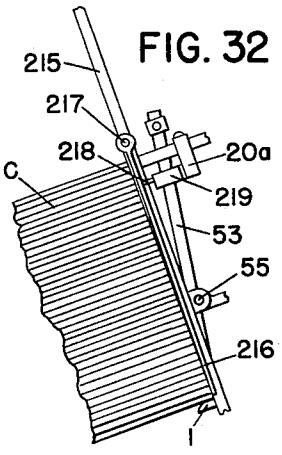

FIG. 33

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United States Patent Office 2,987,974 Patented June 13, 1961

2,987,974

MACHINE FOR OPENING AND HANDLING CARTONS OF PACKAGING MACHINERY

Lee E. Russell, Plant City, Fla., assignor to Crompton-Knowles Packaging Corporation, Holyoke, Mass., a corporation of Massachusetts

Filed Nov. 19, 1957, Ser. No. 697,473
30 Claims. (Cl. 93—53)

This invention relates to packaging machinery, more particularly to the opening and handling of cartons, and it is the general object of the invention to provide improved means for opening a carton automatically and thereafter controlling it for presentation to a loading station.

The invention relates more particularly to that type of machinery in which flat folded cartons are stacked one over the other and in which a carton is converted from the flat folded form to open form for reception of various articles, such for instance as cans. In machines of this general type as now used an attendant working at the loading station removes a carton from the top of a stack of folded cartons and manually opens it and then holds it in position at the loading station for reception of articles to be loaded. It is an important object of the present invention to provide a machine which will eliminate all of the manual operations now performed by the attendant and provide means which will fully open the bottom carton of a stack or group of cartons while it is still a part of the group.

It is a further object of the invention to provide means for temporarily supporting a group of superposed folded cartons and acting on the bottom ply of the lowermost carton of the stack in such manner as to move the lower ply downwardly while the lowest carton and those above it are supported by the temporary support.

It is another object of the invention to provide primary supporting means for supporting the group at opposite sides thereof, then inserting the aforesaid temporary support which may be considered a secondary support between the plies of the lowermost folded carton, then moving the bottom ply down and moving the primary supports to nonsupporting position so that at the completion of the opening operation the ends of the lowest carton will both be below the primary supports, after which the latter can be returned to their normal group supporting position.

The folded carton will ordinarily have side and end forming panels with flaps connected to them and it is a further object of the invention to provide opening means which first moves in one direction from a position under one flap to a position over the adjacent flap and then moves in the opposite direction to a position over the first flap, after which the operation for opening the carton can proceed, the secondary support moving in said directions with the opener and then moving inwardly under one of the side panels and the group to support the latter. The opener means has a corresponding inward motion between top and bottom plies enabling it to lie over part at least of a side forming panel of the bottom ply while the secondary support holds the top ply and the cartons above it. The opener means then acts to move the bottom ply and a portion of the top ply downwardly away from said group while the secondary support means remains stationary to support the group and another portion of the top ply.

After the bottom ply has been moved down to its lowest position it is desirable that at least one of the flaps be deflected to a position between opposite flaps to keep the carton in open position and it is a further object of the invention to effect deflection of a flap, such as that extending from an end-forming panel of the

bottom ply of the lowest carton of the group by cooperation between the opener and a stationary folding means or element as the carton approaches open position. This operation preferably takes place while the secondary support is still in supporting position so that it holds a top flap up and while the bottom flap is held down as by a shoe moved into position for the purpose.

It is a still further object of the invention to provide a flap folder for the flap opposite the previously-mentioned deflected flap to fold the flap between the top and bottom flaps and maintain it in that position as the carton is moved away from the opening station by advancing means, movement of the carton from the opening station completing the folding of the previously deflected flap. Thereafter continuing motion of the carton effects folding of the top and bottom flaps by cooperation with stationary inclined folding guides.

It is a further object of the invention to move the opened cartons by successive stages from the opener station to a loading station. In order that the carton may be loaded the flaps on the side thereof opposite the flaps already mentioned should be flared or spaced slightly to form a funnel, as it were, to receive the articles to be placed in the carton. It is a further object of the invention to cause the bottom flap on said opposite side of the carton to be deflected downwardly into a guide by another shoe element and to cause the top flap to ride up over a stationary guide inclined in such manner as to bend the top flap way from the bottom flap.

It is another object of the invention to provide guiding gates or the like to bend the end flaps intermediate the top and bottom flaps away from each other so that all of the flaps on the receiving side of the carton will in effect form a funnel to facilitate entry of articles into the carton. The gates act in such manner as to assist guiding the articles into the carton, after which they are returned to their normal position to permit the loaded carton to continue in its path toward a guiding station.

In order that the invention may be clearly understood reference is made to the accompanying drawings which illustrate by way of example the embodiments of the invention and in which:

FIG. 1 is a side elevation of that part of the machine showing the carton opener and the loading station, certain of the parts being broken away,

FIG. 2 is a slightly enlarged plan view partly in section on line 2—2 of the left-hand part of FIG. 1,

FIG. 3 is an enlarged plan view of the right-hand part of the mechanism shown in FIG. 1 looking in the direction of arrow 3 of that figure,

FIG. 4 is a vertical section on line 4—4 of FIG. 2,

FIG. 5 is a detailed vertical section on line 5—5, FIG. 2,

FIG. 6 is an enlarged section of the opener mechanism on line 6—6, FIG. 2,

FIG. 7 is an enlarged detailed view looking in the direction of arrow 7, FIG. 4, certain of the parts being in section,

FIG. 8 is an end elevation partly in section looking in the direction of arrow 8, FIG. 4,

FIG. 9 is a detailed plan view looking in the direction of arrow 9, FIG. 1, showing the mechanism for operating the advancers or pushers which move the opened carton along its path,

FIG. 10 is an enlarged detailed section on line 10—10, FIG. 2,

FIG. 11 is a detailed vertical transverse section on an enlarged scale, FIG. 1, certain of the parts being broken away,

FIGS. 12–13–14–15 and 16 are detailed vertical sec-

tions on lines 12—12, 13—13, 14—14, 15—15 and 16—16 respectively, FIG. 2.

FIGS. 17, 18 and 19 are detailed plan views partly in section looking in the direction of arrows 17, 18 and 19, FIG. 4,

FIG. 20 is a detailed horizontal section on line 20—20, FIG. 4,

FIG. 21 is a diagrammatic plan view illustrating the manner in which the opener and secondary supports operate,

FIG. 22 is a diagrammatic view showing the operation of the secondary support and opener in one of the movements which they have with respect to the lowest carton in the group.

FIG. 23 is a diagrammatic view showing the manner of movement of the secondary support and opener to effect opening of the lowest carton in the group,

FIG. 24 is a diagrammatic view showing the manner in which the secondary support holds up the top ply of the lowest carton and the cartons superposed above it when the opener moves down to push the bottom ply of the lowest carton to low position,

FIG. 25 is a diagrammatic view showing the manner of operation of the flap holder which acts on one of the end flaps at the rear of the trailing side of the carton,

FIG. 26 is a diagrammatic view showing the operation of the previously-mentioned shoes.

FIG. 27 is a diagrammatic side elevation showing the flap closer set forth in FIG. 25 and showing the primary pusher or advancer and secondary pushers or advancers for the opened carton,

FIG. 28 is a diagrammatic view showing the next stage of operation after that set forth in FIG. 27,

FIG. 29 is a diagrammatic view showing the relation between the various parts of the machine and how they are operated,

FIG. 30 is a plan view of the flat folded carton such as can be used with the invention,

FIG. 31 is a fragmentary elevation, partly in section, showing one of the stops to prevent retrograde movement of one of the cartons,

FIG. 32 is a fragmentary elevation, parts being broken away, showing control means to stop the machine in the event the magazine is depleted of cartons, and

FIG. 33 is an enlarged view looking in the direction of arrow 33, FIG. 1, showing the means whereby the machine can be moved laterally.

The following description will set forth first a carton such as may be used with the invention, then the operations which are performed on the carton, after which a description will be given of the various means and mechanisms for carrying out the operations which are performed on the carton.

In the carton shown in FIG. 30 it is presumed that the general movement would be to the right so that the leading or right-hand end would be the front and the bottom of the figure will be referred to as the right-hand side of the carton. The carton is of the type which generally opens to a rectangular form and has four panels which form the sides and ends of the finished carton and there is extended from opposite sides of each of these panels a flap each attached to its respective panels but all of the flaps being separate from each other. The carton has a top ply TP having a relatively long side forming panel *a* and a shorter end forming panel *b*. The bottom ply BP has a relatively long panel *c* to form a side of the finished carton and a shorter end forming panel *d*. The panels *a* and *c* are preferably the same length and panels *b* and *d* are also of the same length. All of these panels are connected to each other and have lines of scoring to permit them to be moved to open position.

The front end panel *d* of the bottom ply has a foldable right-hand end flap *e* and a left-hand end flap *f* extending from opposite sides thereof. The bottom side forming panel *c* is formed with a right-hand flap *g* and a left-hand flap *h*. On the top ply the panel *a* is provided with right and left-hand flaps *k* and *m* respectively and the panel *b* has right and left-hand flaps *n* and *p* respectively. Flaps on the right-hand side are separated by slots *r* and on the left-hand side by slots *s*.

The group or stack of folded cartons C as already described are normally supported by primary supports 1 and 2 at opposite sides of the group and the previously-mentioned secondary supports are designated at 3, there being a pair of each elements as shown in FIG. 2. Each opener 4 as shown in FIG. 2 extends rearwardly and has a toe 5. Each opener is a thin flat blade, as are the secondary supports 3, to facilitate entry thereof between top and bottom plies TP and BP as will be explained hereinafter.

Under normal conditions the lowest carton LC has the primary supports 1 and 2 extending under it in normal stationary position so that these supports hold up not only the lowest carton but all of the cartons resting on it. When the lowest carton is to be acted on the secondary supports 3, which are normally out of vertical alignment with the stack, and the openers 4, which are normally under the stack, move inwardly far enough so that the temporary supports can enter a space 6 the presence of which is due to the fact that the bottom ply BP tends to hang down slightly from the top ply TP. When in normal position the toe of the opener is under the flap *e* and does not extend under the end forming panel *d*. The secondary support and toe will then move to the left, FIG. 30, and inwardly so that both the secondary support and the toe engage the bottom side forming panel *c*. The parts 3 and 4 then move in the opposite direction to the right so that the opener, previously under flap *e*, can now pass over it but still have its toe 5 over the panel *c* and under panel *a*. By this time the secondary supports have taken over the weight of the top ply TP and of the superposed cartons and the primary supports 1 and 2 which are movable can be moved to non-supporting position as shown in FIG. 24. The openers then swing downwardly simultaneously to move the bottom ply away from the top ply and cause the side forming panel *c* to approach a lower horizontal position. The opener remains in contact with the panel *c* and is spaced slightly from the panel *d* and as the latter moves to its vertical position it is engaged by a deflecting means and folder 7, FIG. 25, which pushes the flap *e* rearwardly between the top and bottom side flaps *k* and *g*. This movement of flap *e* between the side forming flaps is possibly due to the fact that the top flap is held up by the secondary supports while the bottom flap *g* is depressed by the right-hand shoe 8, FIG. 26. It will be noted that the openers move in a direction away from the group to fully open the lowest carton while it is still part of the group of cartons.

By this time the side and end forming panels have opened to a generally rectangular form and a folder or finger 9, FIG. 25, then moves from the full to the dotted line position of that figure to move the rear right-hand flap *n* to the position indicated in dotted lines, FIG. 25. The carton is then advanced by a primary pusher bar or advancer 10 to the right, FIG. 4, the effect of which is to cause the folder 7 to complete folding of the flap *e* in a rearward direction and still further forward motion of the carton by a secondary advancer 11, see FIG. 28, causes side folding guides 12 to engage the top and bottom long flaps *k* and *g* to bend the former downwardly and the latter upwardly.

During the time the carton is being moved from its position under the stack the left-hand shoe 8, FIG. 26. will guide the flap *h* into a stationary rebent guide or holder 13, see FIG. 8, which holds said flap *h* inclined downwardly and prevents rearward motion of the opened carton.

As the opened carton nears the loading station LS a lifter 14, FIG. 8, engages the top side flap *m* and deflects

it upwardly to the position shown in FIG. 8. When the carton is in position at the loading station, gates **15**, FIG. 3, then move into action to deflect the flaps *f* and *p* away from each other so that these flaps together with the flaps *h* and *m* take the general form of the funnel to receive the articles which are to be inserted into the carton.

After the carton has been filled as with empty cans, the gates **15** then move back to their normal or closed position out of the path of the flaps *f* and *p* and the loaded carton moves onto a roll conveyor to move down to a gluing station GL, FIG. 3. When the carton reaches the station GL the right-hand flaps which were previously folded will be on the bottom of the carton while the flaps *f*, *h*, *m* and *p* will extend upwardly. The gluer folds and glues these latter flaps after which the carton moves along a conveyor to a discharge station where an attendant inverts the carton so that the glued flaps will be down and the unglued flaps will be up. The latter flaps will then be either taped or tied down for shipment.

In the particular form of the invention set forth herein the articles will be empty cans to be shipped to a customer who will then take the cans out of the cartons and proceed with them in usual manner and reinsert them into the carton at which time the previously unglued flaps will be glued. The invention, however, is not limited to the insertion of empty cans into the opened carton.

Referring more particularly to the means and mechanisms for carrying out the foregoing operation, the machine has a framework **20** on which the various mechanisms are mounted and has also a source of compressed air (not shown) connected through pipe **21** to various electrically controlled valves.

Supported on the framework is an electric motor **22** connected through a gear reducer **23** to a chain **24** which drives an upright shaft **25** journaled on the framework **20** and on a vertically adjustable frame **20***a*. By means of a variable pulley **26** the speed of shaft **25** can be varied, and one rotation of this shaft corresponds to a carton opening operation, a carton advancing operation and a loading operation. A speed of 26 r.p.m. may be mentioned as the rate of turning of shaft **25** but the machine is not limited to this speed. The machine will handle cartons at about twice the speed which is attainable by manual operation under previous practice.

Equal bevel gearing **27** connects shaft **25** to a horizontal shaft **28** journaled on the frame **20***a* to which are secured four cams **29**, **30**, **31** and **32** shown respectively in FIGS. 15, 4, 14 and 13. The vertical shaft **25** has secured thereto cams **35**, **36**, **37** and **38** shown respectively in FIGS. 17, 18, 19 and 20. The cams **29**, **30**, **31**, **32**, **35**, **36**, **37** and **38** effect opening and closing of electric switches **29***a*, **30***a*, **31***a*, **32***a*, **35***a*, **36***a*, **37***a* and **38***a* respectively, and these switches control air valves **29***b*, **30***b*, **31***b*, **32***b*, **36***b*, **37***b* and **38***b* respectively. Valves **29***b*, **30***b*, **31***b* and **32***b* are supplied with compressed air from pipe **40** connected through cut-off valve **41** to supply pipe **21**, and valves **35***b*, **36***b*, **37***b* and **38***b* are supplied with compressed air from pipe **42** connected through cut-off valve **43** to supply pipe **21**, see FIG. 29. The valves, except **41** and **43**, and their electric controls are all the same and are commercially available, the valves being preferably of the 4-way electro-pneumatic type, but it is to be understood that the invention is not limited to this type of valve.

The eight valves on shafts **25** and **28** pneumatically control various mechanisms which will now be described.

A magazine generally indicated at M confines the folded cartons. The group or stack of folded cartons C is guided by upright rods **50** and **50'** spaced to confine the cartons and guide them downwardly as they descend by gravity and permit them to extend downwardly. These guide rods are on frame **20***a* which is supported by a platform **51** the vertical position of said frame and rods being vertically adjustable by screws **52** on the platform **51** to adapt the machine for cartons of different sizes. Supported pivotally on the frame **20***a* is primary support **1** having a vertically extending arm **53** and which swings around pivot **55**, primary support **2** having an arm **54** which swings around pivot **56**, see FIG. 4, each support having their lower ends shaped to extend under opposite sides of the group to support the latter at the beginning of a carton opening operation. A pneumatic cylinder **57** is operatively connected to primary support arm **53** and a second cylinder **58** operates a lever **59** pivoted on the frame **20***a* at **60**. Both cylinders **57** and **58** are fixed with respect to the frame **20***a* and when air is introduced into cylinder **57** support arm **53** rocks counterclockwise, FIG. 4, to release the right-hand side of the group, and lever **59** rocks clockwise and allows support arm **54** to swing down around pivot **56** to release the left-hand side of the group.

Referring to the diagrammatic FIG. 29, cam **32** is in position to enable valve **32***b* to pass air under pressure to junction **32***c* via pipe **32***d*. Air under pressure in this junction corresponds to the normal stack holding position for the primary supports. Air via pipe **57***a* to cylinder **57** pushes the piston of the latter to the right, FIG. 29, and air via pipe **58***a* to cylinder **58** pushes its piston to the left, FIGS. 4 and 29, to lift lever **59** to hold primary support arm **54** in stack supporting position. When cam **32** has made a partial turn from the position shown in FIG. 19 it causes valve **32***b* to disconnect junction **32***c* from the air source and connects the source to junction **32***e* via pipe **32***f*. Air from this latter junction via pipe **57***b* moves the piston in cylinder **57** to the left, FIG. 29, to move primary support arm **53** to stack releasing position, and air via pipe **58***b* pushes the piston in cylinder **58** to the right, FIGS. 4 and 29, thus lowering lever **59** so that primary support arm **54** can swing down to stack releasing position.

The secondary supports **3** and openers **4** have movements lengthwise of the machine and also transverse movements, the openers in addition having angular movements in a direction away from the group of cartons. To provide for the longitudinal and transverse movements of the parts **3** and **4** which move together between the plies of the lowest carton, the machine has a rectangular open slidable frame designed generally at **64** including right and left-hand members **65** and **66** respectively joined at their rear ends by a cross member **67** and joined near their forward ends by a rod **68**. The members **65**, **66**, **67** and **68** forming the frame **64** are moved back and forth by air cylinders **69** and **70** mounted in fixed position on framework **20** and under control of the cam **29**. The pistons of these cylinders are connected to the members **65** and **66** and when frame **64** is to be moved rearwardly, to the left in FIG. 29, cam **29** will cause valve **29***b* to introduce compressed air into junction **29***c* and air pressure communicated via pipes **69***a* and **70***a* will push the pistons in cylinders **69** and **70** rearwardly. When the frame **64** is to be moved forwardly cam **29** causes compressed air to pass from valve **29***b* to junction **29***d* and air pressure communicated therefrom via pipes **69***b* and **70***b* to cylinders **69** and **70** cause the pistons of the latter and frame **64** to move forwardly.

The frame **64** has mounted thereon for transverse movement with respect thereto right and left-hand carriers **72** and **73** respectively. The rear end of each carrier has a roll **74** thereon movable along a guide track **75** on member **67**. The forward end of each carrier has a hub **76** slidable along rod **68**. Mounted on frame **64** are right and left-hand air cylinders **78** and **79** respectively each connected to one of the hubs by a piston rod **80**. These cylinders are controlled by cam **31** and when the latter causes valve **31***b* to be in one position compressed air is introduced into junction **31***c* and via flexible pipes **78***a* and **79***a* air is introduced into cylinders **78** and **79** to cause their pistons **80** to move the carriers away from

each other. When cam 31 moves to cause compressed air to pass from valve 31*b* to junction 31*d* air pressure is communicated from the latter via flexible pipes 78*b* and 79*b* to cylinders 78 and 79 respectively to cause the pistons 80 to move the carriers 72 and 73 toward each other.

Each of the openers 4 is mounted for pivotal movement on its carrier. FIG. 6 shows the mounting for the opener on carrier 72, which will be described, but it should be understood that a similar mounting is provided for the opener on carrier 73.

Hub 76 is formed with a horizontal plate 82 and a vertical plate 83. Plate 82 is secured to carrier 72 by screws 84 and plate 83 has a lever 85 pivoted thereto at 86. The opener 4 is fastened to lever 85 and the latter is connected by link 87 to a reciprocable actuator 88 passing through plate 82 and connected to piston rod 89 of a cylinder 90 secured to plate 82. Rolls 91 on plate 83 guide the actuator 88 and limits its movements to the right, FIG. 6.

The cylinders 90 are under the control of cam 30 which when in one position cause valve 30*b* to turn to introduce compressed air into junction 30*c* and from the latter via pipes 90*a* to the bottoms of cylinders 90 to raise the pistons in the latter and by means of links 87 swing the openers 4 down. When cam 30 moves valve 30*b* to its other position it introduces compressed air into junction 30*d* and via pipes 90*b* to the tops of the cylinders to depress the pistons and raise the openers 4.

When the carton has been opened as already described it will rest on support means generally indicated at SM which includes right and left-hand rails 95 and 96 respectively. At this time the previously mentioned shoes will be up as indicated in dotted lines FIG. 7 and full lines FIG. 26. These shoes move about fixed pivots 97 and are operatively connected to the piston rods 98 of air cylinders 99 and 100 at the right and left-hand sides respectively of the carton. These cylinders have the ends thereof opposite their pistons pivoted on fixed studs 101, see FIG. 7, and they are controlled by cam 37 on upright shaft 25.

When cam 37 is in one position it causes valve 37*b* to transmit compressed air to junction 37*c* and thence via pipes 99*a* and 100*a* to the piston rod ends of the cylinders 99 and 100 to hold the shoes up. When cam 37 moves to turn valve 37*b* compressed air will pass to junction 37*d* and thence to the opposite ends of the cylinders 99 and 100 via pipes 99*b* and 100*b* respectively to cause the latter to move their respective shoes down around their pivots 97. This down motion occurs about at the time the opened carton is on the support means. The left-hand shoe pushes flap *h* down so that it will align with guide 13, see FIG. 7, and the right-hand shoe pushes flap *g* down to make room for flap *n* when it is folded by 9.

Folder 9 is at the right-hand side of the machine, the lower part of FIG. 2, and is not duplicated on the other side. The folder includes a fixed upright tube 105, FIGS. 1, 2 and 25, in which an upright shaft 106 is rockable. The upper end of pin 106 has secured thereto two folding fingers 107 of U-shaped form the rounded parts of which engage the flap *n*. The bottom of shaft 106 has secured thereto an arm 108, FIGS. 1 and 2, pivoted to a link 109 which in turn is pivoted to arm 110. The latter is secured to a second upright shaft 111 rockable in a tube 112 held in fixed position on frame 20. This second shaft has secured to the upper end thereof a retainer 113 which overlaps the two fingers 107 when in the dotted line position shown in FIG. 25.

Arm 110 is pivoted to a link 115 which is also pivoted to a lever 116, FIG. 1. This lever is pivoted at 117 to frame 20 and has rotatable thereon a roll 118 held against a face cam 119 by a tension spring 120 one end of which is held by frame 20 and the other end of which is connected to link 115, see FIG. 2. Cam 119 is horizontal and is secured to upright shaft 121 extending from gear reducer 23. Shaft 121 has secured thereto a sprocket wheel 122 which by the chain 24 drives upright shaft 25. Cam 119 has a high dwell 124 and a low dwell 125. When roll 118 is on the high dwell link 115 is to the right, FIG. 2, and the folder 9 and retainer are in their nonworking position shown in full lines in FIG. 25. When roll 115 is on the low dwell the folder and retainer are in the working position shown in FIG. 25. Shafts 25 and 121 turn at the same rate.

After the folder 9 has folded flap *n* advancing mechanism comes into action to move the carton away from the opening station toward the loading station. This mechanism includes a carriage 130 slidable lengthwise of the machine on frame 20. This carriage has pivoted thereto at 131 the primary pusher 10 an arm 133 of which is connected to the piston rod 134 of an air cylinder 135 mounted on the carriage. The carriage is reciprocated by means of a crank arm 136 secured to shaft 121, see FIG. 9, and link 137.

Air to cylinder 135 is controlled by cam 38 and valve 38*b* and without a junction such as is used with other valves already described, since there is only one cylinder 135. As the carriage moves rearwardly, to the left in FIG. 29, valve 38*b* will be in position to introduce air under pressure via flexible hose or pipe 135*a* to hold piston rod 134 in its in position, thereby holding the primary pusher in the position shown in FIG. 4. After the folder 9 has operated to fold flap *n* between flaps *g* and *k*, valve 38*b* will have its position changed by cam 38 so that compressed air via pipe 135*b* will push the piston rod out to rock pusher 10 clockwise, FIG. 4, to engage the rear end of the carton. Thereupon crank 136 will move the carriage and carton to the right, FIG. 4, for a distance equal preferably to a little more than the length of the carton.

The carriage is at a level somewhat below that of the support means along which the primary pusher moves the carton so that on its return stroke the carriage will not drag on the carton and tend to move it rearwardly. It is desirable however to provide a stop to engage the rear end of the carton to positively prevent retrograde movement of it. This stop 139, shown in FIG. 31, comprises a thin sheet metal strip 140 having an inclined part 141 and a vertical turned down end 142 which engages the rear end of the carton. The other end of the strip extends into a recess 143 cut into the top surface of one of the support rails and held therein by a screw 144 tapped into the rail and permitting limited up and down motion of the stop under the action of a coiled spring 145 received in a pocket 146 in the rail and action of the carton. A series of rolls 147 rotatable on the frame 20 in position to engage the top of the carton, preferably the right-hand side of a side forming panel thereof, prevent upward displacement of the carton by spring 145. The machine as shown has three of the stops 139. A carton passing over a stop will depress it and the stop will rise to stopping position as the carton passes beyond it due to movement of the carriage.

The auxiliary pushers or advancers 11 are mounted on the carrier 130 and are pivoted thereto at 150. Each advancer 11 has a forwardly and upwardly inclined part 151 and a down bent end 152 for engagement with the rear part of a carton. A stop screw 153 is tapped into the carriage and passes through each advancer 11 to limit upward movement of the latter by action of a spring 154. The auxiliary advancers can be depressed readily when passing under a carton as the carriage has a return or nonadvancing stroke due to turning of crank 136.

When the primary advancer 10 is up and the crank pulls the carriage forwardly or to the right, FIGS. 1, 4 and 31, the carton will be moved until its trailing end is slightly beyond the first of the stops 139, whereupon the latter will spring up to hold the carton and the crank will then push the carriage rearwardly or to the left, FIGS. 1, 4, and 31, the first of the advancers 11 there-

upon being depressed and the rolls **147** preventing up motion of the carton. When the carriage has been moved rearwardly a sufficient distance the previously depressed advancer **11** will spring up behind the carton and will advance the carton to the next stop **139** on the next forward motion of the carriage. In this way the cartons are moved one at a time to the loading station. As the carton advances its top and bottom right-hand flaps are folded by the guides or folder rods **12**, and a stationary flat plate **155** held in fixed position holds the folded end flaps in folded position until the folders **12** begin to depress the top and bottom flaps.

The carriage **130** has rolls **156** which roll along the rails **95** and **96** as suggested in FIG. 11. At the loading station rail **95** has a relatively low inclined surface **160** and rail **96** has a relatively higher inclined surface **161**. At about the time the right-hand auxiliary advancer (FIG. 1) delivers the carton to the loading station a backing-up support generally indicated at **162** comes into action to prevent the front of the carton from descending to the inclined surface **160**. The support **162**, see FIGS. 1, 3 and 11, includes two bearings **165** held on the frame in transversely adjusted position and an upright arm **166** pivoted on each bearing. A cross rod **167** joining arms **166** is connected to the piston rod **168** of an air cylinder **169** mounted pivotally on the frame at **170**. A flap engaging flat plate **171** is secured to the arms **166** and is normally to the right, FIG. 11.

Cylinder **169** is under control of cam **175** on shaft **28**. This cam opens and closes on electric switch **176** from which two electric wires **177** and **178** lead to another switch **179** (FIG. 1) closed by an arm **180** when a carton arrives at the loading station. Switches **176** and **179** are in series and when both are closed an electrically operated air valve **181**, see FIG. 29, passes air under pressure from pipe **182** connected to supply pipe **21** to the right-hand end of cylinder **169** (FIGS. 11 and 29) via pipe **183** to move plate **171** against the previously folded flaps and move then into close folded position to support the carton against right-hand movement (FIG. 11) during the loading operation. After the loading operation cam **175** effects opening of switch **176** and valve **181** then automatically moves to introduce air via pipe **184** into the left end of cylinder **169** to return the piston rod and plate **171** to their normal nonsupporting position. When piston rod **168** is out the plate **171** holds the carton above rail **95** but allows the carton to rest on rail **96**. As plate **171** moves away from its supporting position after the loading operation the carton drops onto inclined surfaces **160** and **161** and is tilted forwardly as it is moved onto the angularly disposed rolls **185** (FIG. 3) by the next carton to reach the loading station.

Referring particularly to FIG. 8, frame **20** supports an air cylinder **191** pivotally at **192** and a piston rod **193** is pivoted at **194** to flap lifter **195** pivoted at **196** to frame **20**. The previously mentioned lifter plate **14** is part of the lifter for the flap *m*. Cylinder **191** is controlled by cam **36** and valve **36***b*. When cam **36** is in one position it causes valve **36***b* to introduce air under pressure to the top of cylinder **191** via pipe **191***a* to hold the piston rod **193** down in its normal position. When a carton arrives at a point adjacent the loading station, cam **36** then causes valve **36***b* to pass air through pipe **191***b* to the bottom of cylinder **191** to raise the lifter to elevate the flap *m* to the position shown in FIG. 8.

The prevoiusly mentioned gates **15** are shown in FIGS. 3 and 29. A frame generally indicated at **190** receives the articles to be loaded and has rockably mounted thereon two vertical shafts **200** each having secured thereto an arm **201** and a flat plate **202** which forms a flap engaging gate **15**. Each arm **201** is connected to a piston rod **203** of a cylinder **204** pivotally connected to frame **190** at **205**. The cylinders **204** are jointly controlled by cam **35** and its valve **35***b*. When the latter is in its normal position it introduces compressed air into junction **35***c* and air via pipes **204***a* and **204***b* pushes the piston rods in to keep the gates in closed position, that is, out of the path of flaps *f* and *p* as the carton moves to the loading station. When the carton reaches the loading station cam **35** moves the valve **35***b* to introduce compressed air into junction **35***d* to enable air via pipes **204***c* and **204***d* to push the piston rods **203** outwardly and cause the gates to push flaps *f* and *p* away from each other so that the flaps *f*, *h*, *m* and *p* are flared to form a funnel-like guide for the articles to be pushed into the carton. After the plungers **206** have pushed the articles into the carton cam **35** acts to return the gates to their normal position and the carton, having moved to its tilted position on surfaces **160** and **161** is moved toward the rolls **185** and by gravity moves on to the gluing station GL.

The plungers **206**, see FIGS. 11 and 29, are under control of the previously described air valve **181**, and when the latter operates to permit passage of air through pipe **183** to move plate **171** to supporting position, it also permits passage of air to cylinder **210** via pipe **211** to effect loading of a carton by plungers **206**. After the loading operation cam **175** effects opening of switch **176**, and valve **181** then moves automatically to let air into cylinder **210** via pipe **212** to return the plungers to non-operating position as plate **171** moves to nonsupporting position.

The magazine M has a pair of vertical bars **215**, see FIGS. 1, 2 and 32, at the front end thereof, one of which supports an actuator **216** pivoted as at **217**. The actuator is moved and held to the right, FIG. 32, by the flattened cartons C to actuate a button **218** to close a switch **219** supported by the bars **215**. If the magazine is depleted of cartons, actuator **216** will move to the left, FIG. 32, by gravity to open switch **219**. Switch **219** on frame **20***a* is in series with another switch **220**, see FIGS. 3 and 29, on the frame **190**. Switch **220** has a lever **221** which depresses a button **222** to close the switch. Closure of switch **220** is effected by the lowermost row of cans which hold lever **221** down as the cans progressively move down frame **190** toward the plungers **206**. When both switches **219** and **220** are closed, as above explained, the machine will continue to operate, but if either of the switches open due to depletion of the magazine or the absence of cans respectively, initiation of stoppage of the machine will occur. Both switches **219** and **220** are timed by a cycling switch **225** operated by a cam **226** on shaft **28**, see FIGS. 1, 2 and 29, such that stoppage will not occur until switch **225** is opened by its cam **226** and one or the other of switches **219** or **220** is also opened. By cycling or timing the switches **219**, **220** and **225**, as described above, stoppage of the machine will occur at the end of the rearward stroke of advancer **10** and before the plungers **206** can move to have a loading operation. As long as both switches **219** and **220** remain closed, opening of switch **225** will have no effect in stopping the machine.

Referring to FIGS. 2, 16 and 29, shaft **28** rotates a cam **229** thereon to depress a button **230** on a switch **231** to open the latter to effect stoppage of the machine when a carton fails to close switch **179** due to faulty stitching or taping of panels *a* and *b* which prevents proper opening of the carton necessary to close switch **179**, see FIG. 29. The circuitry for switches **176**, **179** and **231** is such that when switches **176** and **179** are closed by cam **175** and carton C, respectively, opening of switch **231** will be ineffective to cause stopping of the machine.

When it is desired to adapt the machine for cartons of different sizes, the screws **52**, described above, are turned on their axes in one direction or another to raise or lower frame **20***a* to provide the proper space underneath the magazine M for cartons of various sizes. It is to be understood, of course, that only one size of carton will be used at a time.

Referring to FIGS. 1, 2, and 4, the screws **52** have their

lower ends conventionally journaled in framework **20** and their upper ends threaded into bearings **240** fast on frame **20***a*. Intermediate the ends of each screw a sprocket wheel **241** is fastened such that the lower surface **242** of each wheel rests on platform **51** of framework **20**. A continuous chain **243** operatively connects a pair of screws **52** on the right-hand side of the machine and a chain **244** operatively connects a pair of screws **52** on the left-hand side of the machine, see FIG. 2. Each front screw at the bottom thereof, FIGS. 1 and 4, has fixedly mounted thereon a worm wheel **245** each of which abuts part of the framework **20** and meshes with a worm gear **246**. A shaft **247** etxends across the machine to connect both worm gears and when the shaft is turned the worms will rotate to revolve screws **52** via the worm gears and chains **243** and **244**. Frame **20***a* is guided between a pair of channels **248** which is part of the framework **20**. A pair of plates **250** on frame **20***a* has vertical guide bars **251** fast thereon and these plates and bars move up or down to guide the frame when the screws **52** are turned.

After frame **20***a* has been vertically adjusted to accommodate a selected carton size the various mechanisms above described, such as one of the shoes **8**, folders **7** and **9**, folding guides **12**, rolls **147** and backing-up support **162**, are adjusted toward or away from rails **95** and **96** to compensate for the selected carton size. These said various mechanisms are supported by a long plate **252**, see FIGS. 1–3, which have threaded hubs **254** and **255** through which screws **256** and **257** respectively pass. Another long plate **258** supports mechanisms above described, such as one of the shoes **8**, rebent guide **13**, and lifter **14**. Plate **258** has thereon hubs **259** and **261** which receive screws **256** and **257** respectively, the latter being journaled on the framework **20**. A continuous chain **262**, FIG. 4, meshes with sprocket wheels **263** and **264** on screws **256** and **257** respectively to operatively connect screws **256** and **257**, and when screw **256** is turned, the plates **252** and **258** and the mechanisms supported thereby will move toward or away from each other depending in which direction the screw is turned. The various mechanisms on plates **252** and **258** are mounted thereon for vertical adjustment by usual bolt and slot connections, as can be readily seen in the drawings.

Upright rods **50** of the machine M are supported by a pair of upper and lower left-hand hearings **266** and **267** respectively, while upright rods **50′** are supported by a pair of upper and lower right-hand bearings **268** and **269** respectively, see FIGS. 1, 2 and 4. Bearings **266** and **268** are slidably mounted on upper rods **270** and **271** respectively, and lower bearings **267** and **269** are threaded to receive screws **272** and **273** respectively. Rod **270** and screw **272** are supported by a pair of plates **274**, and rod **271** and screw **273** are supported by a pair of plates **275**. Turning of screws **272** and **273** will cause rods **50** and **50′** respectively to move toward or away from each other to accommodate various widths of cartons. Plates **274** and **275** are adjustably mounted on frame **20***a* but it is only necessary to move plates **274** to the left or right, FIG. 4, to compensate for various lengths of cartons.

Referring to FIGS. 2, 4, and 10, the hubs **76** of the carriers **72** and **73** are slidably mounted on rod **68** and each hub has fixed thereto a rigid member **277** connected to a threaded hub **278** which receives a screw **279** rotatably mounted on frame **20***a*. Turning of screw **279** will cause movement of carriers **72** and **73**, supports **3**, openers **4**, plates **82** and cylinders **90** thereon, and cylinders **79** and **78** toward or away from each others to allow for various widths of cartons. The supports **3** and openers **4** are adjustably held on the carrier and can be placed at various points along the carriers when different lengths of cartons are used.

After the component parts of the machine have been adjusted for a particular size carton, the machine itself must be adjusted laterally with respect to the loading station LS. Referring to FIGS. 2, 4, 23 and 33, a stub shaft **280** journaled on framework **20** has at one end thereof a sprocket wheel **281** meshing with a chain **282** trained around another sprocket wheel **283** fast on a screw **284** rotatably supported on frametwork **20**. A sprocket wheel **285** on the other end of stub shaft **280** mashes with a chain **286** trained around a sprocket wheel **287** fast on a screw **289** rotatably supported on framework **20**. Screws **284** and **289** are threaded through bearings **291** and **292** respectively, see FIG. 33. Bearings **291** and **292** are rigid with respect to floor plates **293** and **294** respectively, and pass through a slot **295** on framework **20**, the latter being fastened to the floor plates by screws **296**. These screws pass through slots **297**, FIG. 33, and when it is necessary to shift the machine laterally bolts **296** are loosened and stub shaft **280** is turned. Turning of shaft **280** causes chains **282** and **286** to effect rotation of screws **284** and **289** which thread themselves into or out of bearings **291** and **292**, depending upon which direction shaft **280** is turned, to cause lateral movement of the entire machine toward or away from the loading station. After the machine has been accurately placed in position the screws **296** are tightened and the machine is ready to operate.

From the foregoing it will be seen that the invention provides simple carton opening mechanism which effects opening of the carton while the latter is still a part of the stack of superposed folded cartons in the magazine. By this arrangement the carton can be opened directly under the magazine and thereby save space as distinguished from those openers in which the carton is first removed from the magazine and then opened. It will be seen that the invention includes opener blades at each end of the group of cartons and which enter between the top and bottom plies of the lowest carton and then by downward motion lowers the bottom ply while the top ply is still a part of the group of cartons. The primary supports engage the panels only and move away from carton-supporting position as the secondary supports move between the plies of the bottommost cartons, thereby facilitating downward motion of the bottom ply. The primary supports return to group supporting position before the secondary supports which are at each end of the group are removed from the group supporting position by withdrawing means. Furthermore, adjusting means are provided for varying the distance between the carriers **72** and **73** to adapt the opening mechanism to cartons of various widths. An initial folding operation of one of the forward flaps is effected by the opener means during the latter part of the down motion of the latter and this folding is completed when the opened carton is moved toward the loading station. The folding means for the trailing flap on one side of the opened carton swings into position to move this flap between top and bottom flaps which are temporarily spread apart slightly to receive the end flaps. Also, shoe means are provided for effecting control of the flaps. The majority of the operations are carried out pneumatically by means of cams and electrically operated air valves controlled by the cams, and the air cylinders which are required to move are connected by flexible hoses to their respective valves. At the loading station a support temporarily comes into operation to back up previously folded flaps and resist movement of the carton in the direction of loading. Also, gates at the loading station operate due to control means on certain of the flaps to deflect them to form a funnel-like entrance for the material to be loaded into the carton, after which means act to cause reversal of the control means to effect movement of the gates to closed or normal position to enable the loaded carton to move away from the loading station without interference by the gates with the end flaps.

Having now particularly described and ascertained the nature of the invention and in what manner the same is to be performed, what is claimed is:

1. In carton opener mechanism for a group of folded cartons arranged one over the other and each having top and bottom plies comprising scored connected end and

side forming panels, support means moving between said plies of the lowest carton to support said group, and opener means movable with said support means between said plies and effective while the lowest carton in the group is supported by said support means and is part of said group to move the bottom ply and a portion of the top ply of said lowest carton downwardly away from said group to fully open said lowest carton while said support means remains stationary to support said group and another portion of said top ply.

2. The carton opening mechanism set forth in claim 1 wherein folding means in cooperation with said opener means act on part of said lowest carton as the latter approaches open position to cause said part to move between parts of said plies to maintain the carton open independently of the opening means.

3. In carton opener mechanism for a group of folded cartons arranged one over the other and each having top and bottom plies comprising scored connected end and side forming panels, a pair of supporting elements entering between the plies of the lowest carton to support the group, and a pair of openers also entering between the plies of the lowest carton in the group effective to simultaneously exert a downward force on part at least of the bottom ply of said lowest carton to move the bottom ply away from the top ply to fully open said lowest carton.

4. In carton opener mechanism for a machine having a group of folded cartons arranged one over the other and each having top and bottom plies comprising scored connected end and side forming panels, support means moving between the plies of the lowest carton and beneath one of said side panels effective to support the top ply of said lowest carton and all the cartons thereabove, and opening means moving between the last named plies operative while the support means is supporting all of said cartons to engage the opposite said side to fully open said lowest carton by downward motion of part of the bottom ply thereof.

5. The carton opener mechanism set forth in claim 4 wherein the opening means includes a thin flat blade which enters between said plies of the lowest carton and exerts a downward force on one of the panels in said bottom ply by having a movement away from the group to fully open said carton while the lowest carton is still part of the group.

6. In carton opener mechanism for a machine having a group of folded cartons stacked one over the other and each having top and bottom plies comprising scored connected end and side forming panels, movable primary support means at opposite sides of the group normally in stationary position to engage the under sides of the panels in the bottom ply of the lowest carton to support said group, movable secondary support means moving into group supporting relation between the plies of said lowest folded carton while said primary support means is in normal stationary position, actuating means thereafter effective to move the primary support means away from said group while said secondary support means is held stationary to support said group, fully opener means effective thereafter to open said lowest carton while the top ply of the latter and the cartons thereabove are being supported by said secondary support means, the actuating means thereafter returning the primary support means to normal position to support the cartons above said lowest carton, and means thereafter to withdraw the secondary support means from group supporting position.

7. The opener mechanism set forth in claim 6 wherein the opener means is a blade which first enters between the plies of the lowest carton and then moves in a direction away from said group to exert a downward force on the bottom ply of the lowest carton to fully open the latter while it still is part of said group.

8. The opener mechanism set forth in claim 7 wherein a plurality of controllers act in such order as to cause a source of pneumatic power to move the secondary support means between the plies and move the blade between the plies, then operate the actuating means to move the primary support means to nonsupporting position relative to said group, then move the blade to open the carton, and then return the primary support means to normal position.

9. In carton opener mechanism for a machine having a group of folded cartons stacked one over the other and each having aligned end and side forming panels from which extend end and side lateral flaps separated from each other by slots, movable primary support means at opposite sides of the group normally in stationary supporting position to engage certain panels of the lowest carton to support all of the folded cartons, opener blade means at opposite ends of the group, operating means for the blade means acting to move the blade means simultaneously from a position under one of the flaps on the bottom of said lowest folded carton to a position over an adjacent flap and then over said one flap, other operating means then acting to move the blade means simultaneously downwardly to swing the first flap toward a vertical position to fully open said lowest carton, a movable secondary support at each end of and intermediate the sides of said lowest carton above said one and said adjacent flaps to support all of the cartons, means moving the primary support means away from said lowest carton while the secondary support is supporting all of said cartons and then return the primary support means to normal position to support the cartons of the group above said lowest carton, and advancing means thereafter effective to move the open carton from under the group whereupon egress of said secondary supports from the open carton is effected through certain of said slots while the carton is being moved by said advancing means.

10. The opener mechanism set forth in claim 9 wherein the primary support means engages certain of the panels only and is out of engagement with the flaps and the latter due to their weight sag intermediate the primary support means to open a space above said one and said adjacent flaps for entry of said blade means and said secondary supports.

11. In carton opener mechanism for a machine having a group of folded cartons stacked one over the other and each having top and bottom plies comprising scored connected aligned end and side forming panels each having a flap connected thereto, primary support means at opposite sides of the group normally in position to support the group, blade opener means at opposite ends of the group, operating mechanism acting to move the blade means between the plies of the lowest carton over the side forming panel of the bottom ply of said lowest carton and then move the blade means downwardly against the side forming panel of said bottom ply to move the adjacent end panel of the botom ply toward a vertical position to fully open the carton, secondary support means moving to a position within the lowest carton and supporting all of the cartons of the group while the blade means is moved downwardly, and actuating means moving the primary support means away from the group while the secondary support is supporting the group and thereafter returning the primary support means to normal position to support all of the cartons above said lowest carton.

12. The carton opener mechanism set forth in claim 11 wherein a shoe depresses the flap of said side forming panel of the bottom ply and means thereafter cooperating with the blade means deflect the flap of said end forming panel of the bottom ply over the depressed flap.

13. The carton opener mechanism set forth in claim 2 wherein the secondary support means holds the flap of the side forming panel of the top ply up to enable said flap of the end forming panel to pass thereunder as said flap is deflected.

14. The carton opener mechanism set forth in claim

13 wherein folding means folds the flap of the end forming panel of the top ply between the flaps of the side forming panels of the top and bottom plies.

15. In carton opener mechanism for a machine having a group of folded cartons stacked one over the other and each having top and bottom plies comprising scored connected aligned end and side forming panels from which extend lateral flaps separated from each other, primary support means capable of supporting the panels out of engagement with the flaps, the flaps on the bottom ply of the lowest carton hanging away from the top ply of the lowest carton to define a space between said plies, opener blade means, operating mechanism for the blade means effective to hold it against the under side of one of said flaps of the bottom ply to raise the latter with respect to an adjacent flap of the bottom ply to close part of said space, then move the blade means into the remaining space over said adjacent bottom ply flap and away from said one flap to enable the latter to assume its hanging position and then move the blade means into said space over said one flap, other operating mechanism thereafter effective to move the blade means downwardly to lower said bottom ply and move said one flap toward a vertical position to fully open said lowest carton, and support means engaging the under side of said top ply of said lowest carton to support the latter and the cartons thereabove while said other operating mechanism is moving said blade means downwardly.

16. In a carton opener mechanism for a machine having a group of folded cartons stacked one over the other and each having top and bottom plies comprising scored connected end and side forming panels from which extend corresponding lateral flaps separated from each other, primary support means at opposite sides of the group normally in position to engage said panels of the lowest carton but not the flaps to support all of the cartons, an opener blade for the lowest carton in the group normally in a position under one of the flaps of the bottom ply but spaced from the panels of the bottom ply, operating means for the blade effective to slide the blade from its normal position in one direction along the under side of one of the lateral flaps on the bottom ply of the lowest carton away from said one flap and over the adjacent flap and inwardly over the panel corresponding to said adjacent flap, a secondary support between said plies supporting all of said cartons, actuating means moving the primary support away from said group, other operating means moving the blade downwardly against said panel to open the carton and lower part of the carton previously under said primary support means, said actuating means thereupon returning the primary support means to normal position above the lowered part of said lowest carton to support the cartons above said lowest carton, said other operating means thereupon raising said opener blade, and the first operating means returning the blade to its normal position.

17. In carton opener mechanism for a machine having a group of folded cartons stacked one over the other and each having top and bottom plies comprising scored connected end and side forming panels from which extend corresponding lateral flaps separated from each other, primary support means at opposite sides of the group normally placed to extend under the lowest carton in the group, secondary support means between the plies of the lowest carton between said opposite sides of the group, opener means for said lowest carton, operating means causing the opener means to move downwardly against the bottom ply of the lowest carton to lower said bottom ply, actuating means moving the primary support means from under said lowest carton, the operating means thereafter causing the opener means due to downward force on said bottom ply to bend the top ply of said lowest carton downwardly, and the actuating means thereupon returning the primary support means under the folded carton next above said lowest carton and over the latter.

18. In carton opener mechanism for a machine having a group of folded cartons stacked one over the other and each having top and bottom plies comprising scored connected end and side forming panels from which extend corresponding lateral flaps separated from each other, support means between the plies of the lowest carton effective to support all the cartons, a flat opener blade between said plies, operating means moving the blade down against the bottom ply of the lowest carton to open the latter and then move the blade to a position substantially parallel to the top ply of said lowest carton, and advancing means moving the opened carton to cause said blade to pass between adjacent but separated flaps of the top ply.

19. In carton opener mechanism for a machine having a group of folded cartons stacked one over the other and each having top and bottom plies comprising scored connected end and side forming panels from which extend corresponding lateral flaps separated from each other, support means between the plies of the lowest carton effective to support all the cartons, a flat opener blade between said plies, operating means moving the blade down against the side forming panel of the bottom ply of the lowest carton to open the latter, folding means effective to move a flap corresponding to an end forming panel between the flaps corresponding to the side forming panels to enable said one flap to hold the carton open independently of the opener blade, and advancing means moving the open carton from under said group while said one flap holds the carton open, said operating means moving the opener blade away from said side forming panel and lifting the opener blade to a position enabling it to pass between certain flaps of the opened carton.

20. The carton opener mechanism set forth in claim 19 wherein said advancing means includes a reciprocating bar to engage one end of the carton to move the open carton in a direction from said opener blade toward said one flap when said bar moves in one direction.

21. The carton opener mechanism set forth in claim 19 wherein said advancing means includes a reciprocating carriage and a bar pivoted thereon to move the open carton in a direction from the opener blade toward the flap between said flaps corresponding to said side forming panels when said carriage moves in one direction.

22. The carton opener mechanism set forth in claim 19 wherein said folding means includes pivotally mounted fingers which act to fold said flap after the opener blade has completed opening of the carton and before the advancing means moves the open carton.

23. In carton opener mechanism for a machine having a group of folded cartons stacked one over the other and each having top and bottom plies comprising scored connected end and side forming panels from which extend corresponding lateral flaps separated from each other, support means between the plies of the lowest carton effective to support all the cartons, a flat opener blade between said plies, operating means moving the blade down against the bottom ply of the lowest carton to open the latter, a folding element cooperating with the opener blade as the latter moves down to initiate folding of a flap corresponding to an end panel and move it to a position between the flaps corresponding to the side panels to enable said flap to hold the carton open independently of the opener blade, and advancing means moving the open carton from under the group in a direction to enable the element to complete folding of said flap.

24. In a machine having a group of folded cartons and a loading station, rail support means under the group leading to the loading station, means having an operation to open the lowest carton in the group and deposit it on the rail support means, means partially folding certain flaps on one side of the carton incident to opening the carton, advancing means having an operation moving the open carton along the rail support means toward

the loading station, other means arranged along the rail support means partially folding the remainder of the flaps on said one side incident to movement of the carton by operation of the advancing means, loading means having an operation to load the carton from the open side thereof when it is at the loading station and on said support means, and bracing means at the loading station engaging the folded flaps prior to operation of the loading means to prevent displacement of the carton and opening of the flaps in the direction of loading during the loading operation and means synchronizing said operations to cause an operation of the advancing means and an operation of the loading means for each operation of the opening means.

25. In carton opener mechanism for a machine having a group of folded cartons arranged one over the other and each having top and bottom plies comprising scored connected end and side forming panels, support means at each side of the group moving between the plies of the lowest carton effective to support the top ply of said lowest carton and all the cartons thereabove, opening means at each side of the group operative while the support means is supporting all of said cartons to open said lowest carton by downward motion of part at least of the bottom ply thereof, a carrier at each side of the group for the corresponding support means and opening means, and means effective to cause relative movement of the carriers toward each other to cause the support means and opener means to move between said plies.

26. The opener mechanism set forth in claim 25 wherein the opening means at each side of the group is movably mounted on the corresponding carrier and the latter supports means to move the opening means to open the carton.

27. The opener mechanism set forth in claim 25 wherein the carriers are parallel and adjusting means to vary the distance between the carriers independently of the last-named means includes two screw means transverse of and operatively connected to the carriers, and means causing said screw means to rotate in unison to move the carriers toward or from each other.

28. The opener mechanism set forth in claim 25 wherein said panels have foldable flaps connected thereto and shoe means are provided to depress at least one of said flaps while the opening means is in opening position and adjusting means are provided to move the shoe means to different positions to accommodate the flaps of cartons of different widths.

29. The opener mechanism set forth in claim 25 wherein said panels have foldable flaps connected thereto and flap folders are provided to engage and fold certain of said flaps while the opening means is in opening position and means are provided to move said folders to different positions to cooperate with flaps of cartons of different widths.

30. In carton opener mechanism for a machine having a group of folded cartons arranged one over the other and each having top and bottom plies comprising scored connected end and side forming panels, a platform supporting said group determining the vertical position of the lowest carton in the group, rail support means below the platform, opening means mounted on the platform entering between the plies of the lowest carton effective to move part of the bottom ply of the lowest carton down to said rail support means and open said lowest carton, and adjusting means to vary the height of the platform above said rail support means to adapt the opening means for use with cartons having different open heights.

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