

[54] MACHINE FOR ERECTING A CARTON  
BLANK TO A CARTON

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[51] Int. Cl. .... **B31b 1/46**

[58] Field of Search ..... **93/51 HW, 51 R, 47, 39 R,  
93/55.1 R, 36 R, 36 B, 49 M, 51 M**

[56] **References Cited**

**UNITED STATES PATENTS**

2,189,105	2/1940	Evans et al.	93/51 R
2,643,592	6/1953	Geffroy	93/51 R
2,841,058	7/1958	Bickford	93/51 R X

2,937,578 5/1960 Dorfmann..... 93/51 R X

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Soffen

[57]

**ABSTRACT**

Method and apparatus for erecting carbon blanks having preformed fold lines in which flat carton blanks are pressed into a pair of cavities, whose stationery bases are offset in height relative to one another for forming the lid and tray portions, by a descending male die member of complementary configuration, which is urged into the two cavities. After the side panels of the lid and tray portions are erected, two pairs of fingers undergo rotational and reciprocating motion to fold glue bearing edge flaps into their assembled position to maintain associated side panels in their erected position.

The carton blank is provided with biasing tabs to urge the triangular folds of the carton blank into the proper position in readiness for folding of both the tray and lid edge flaps.

**14 Claims, 14 Drawing Figures**

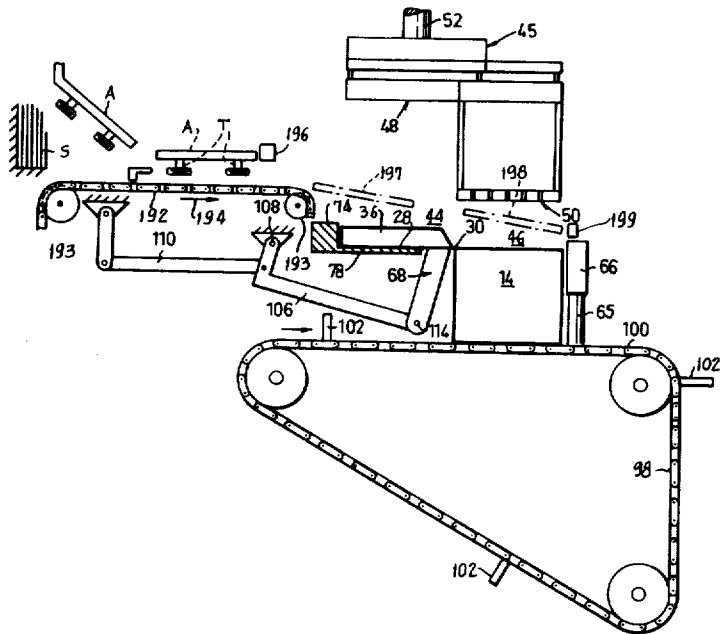


FIG. 1

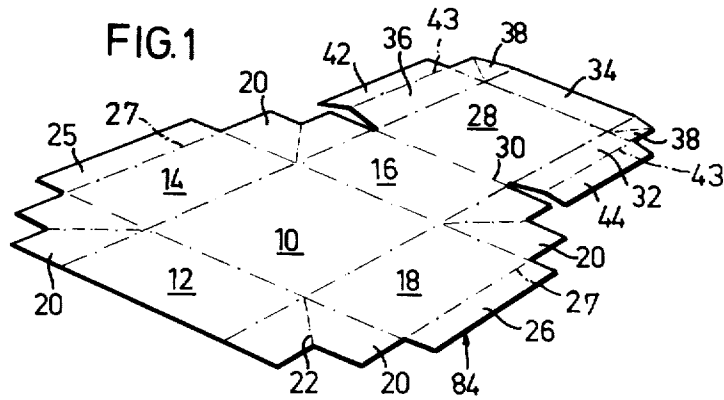


FIG. 2

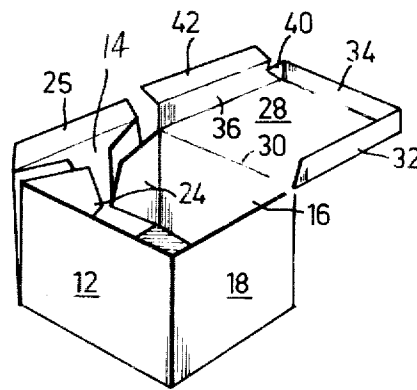


FIG. 3

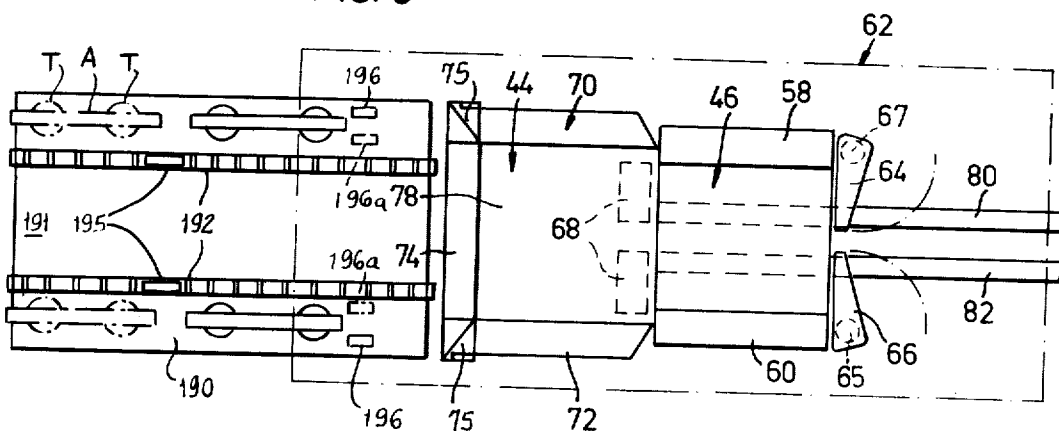
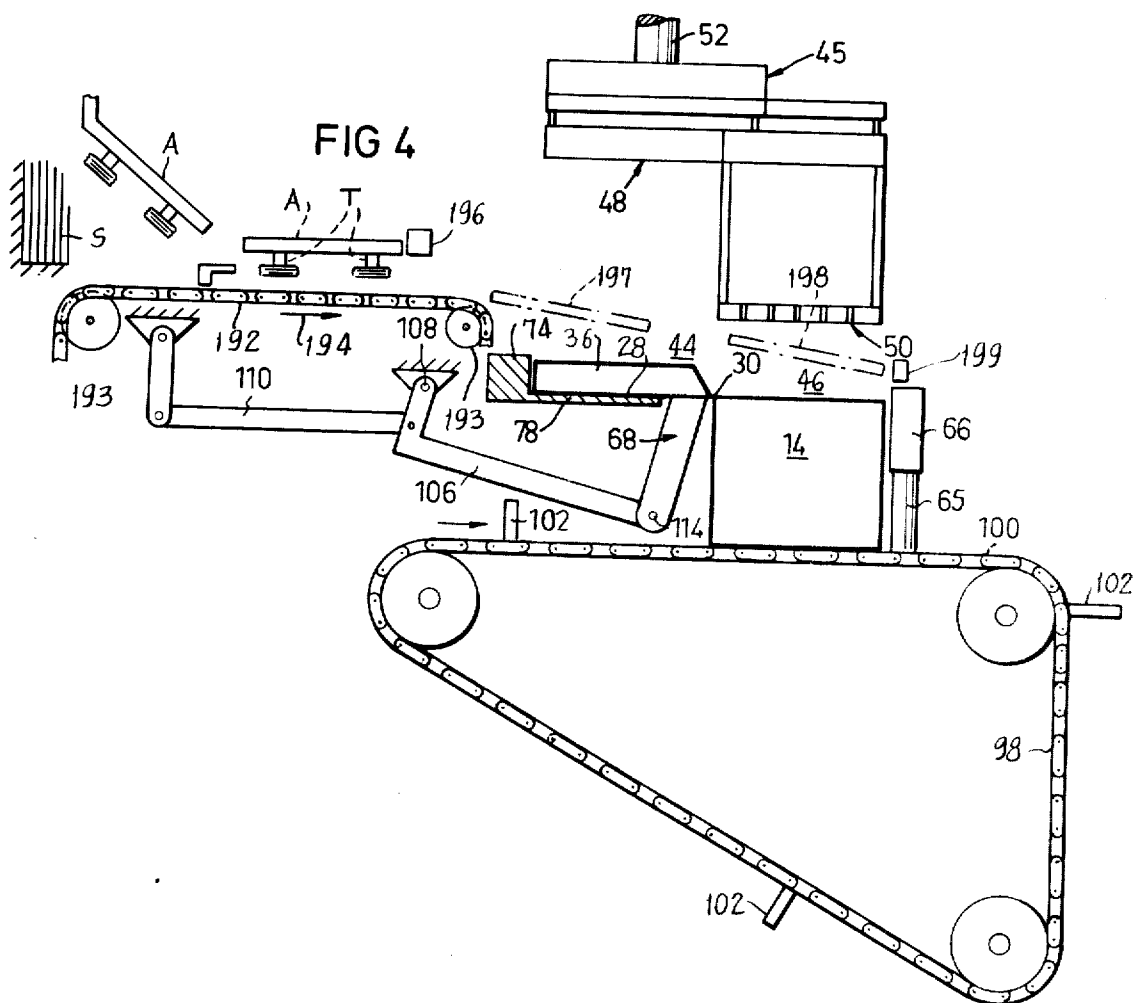
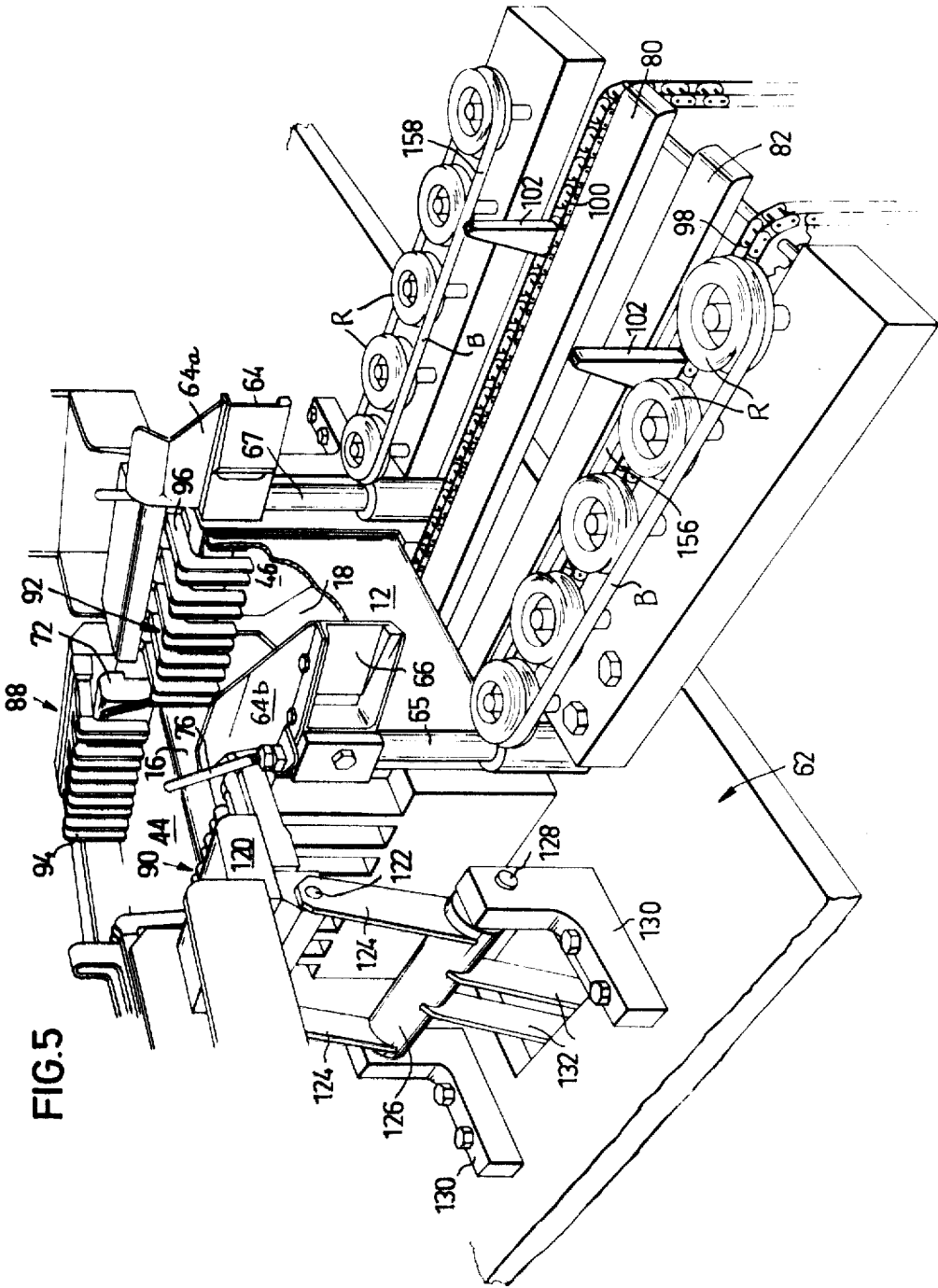


FIG 4





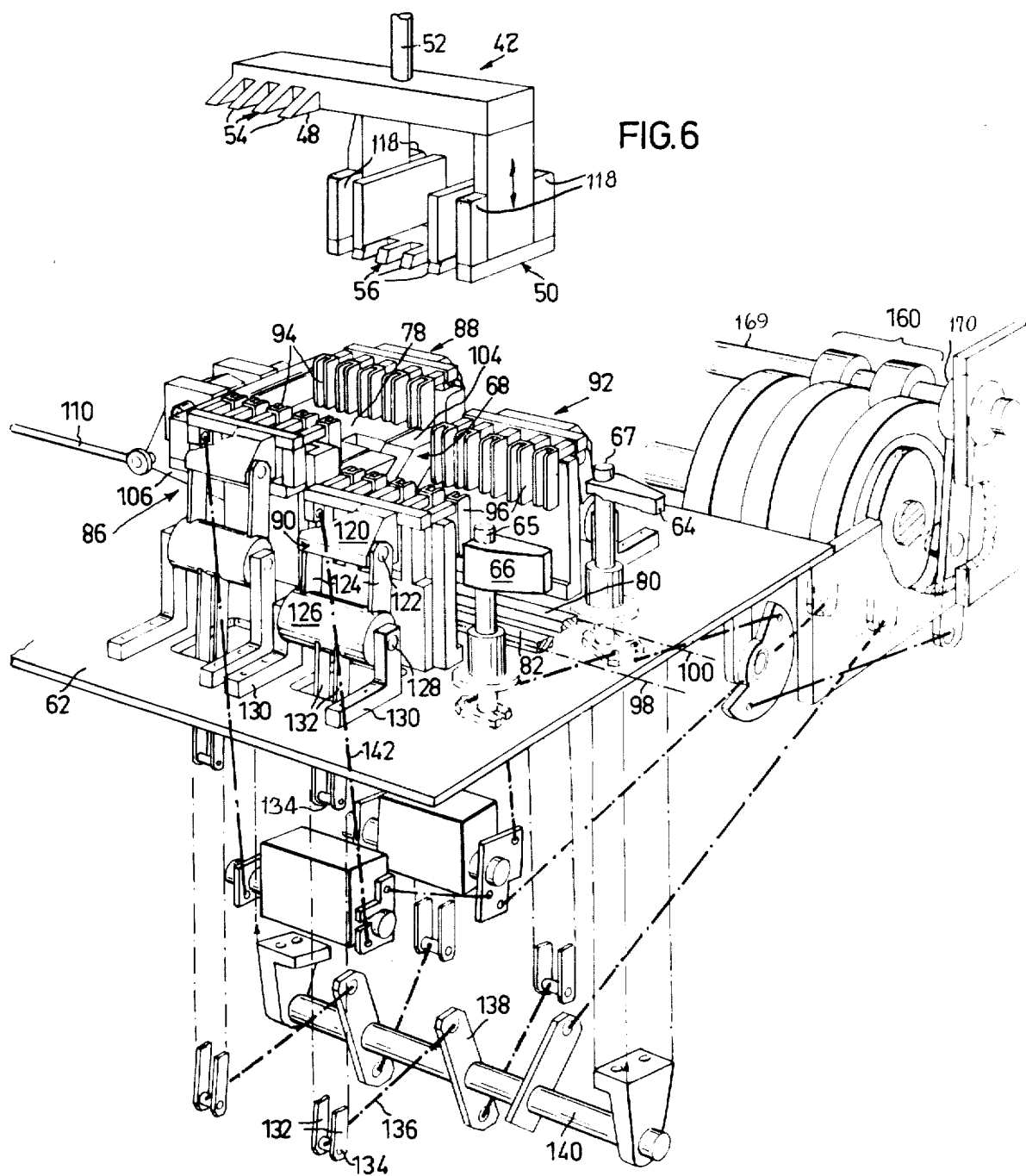


FIG.7

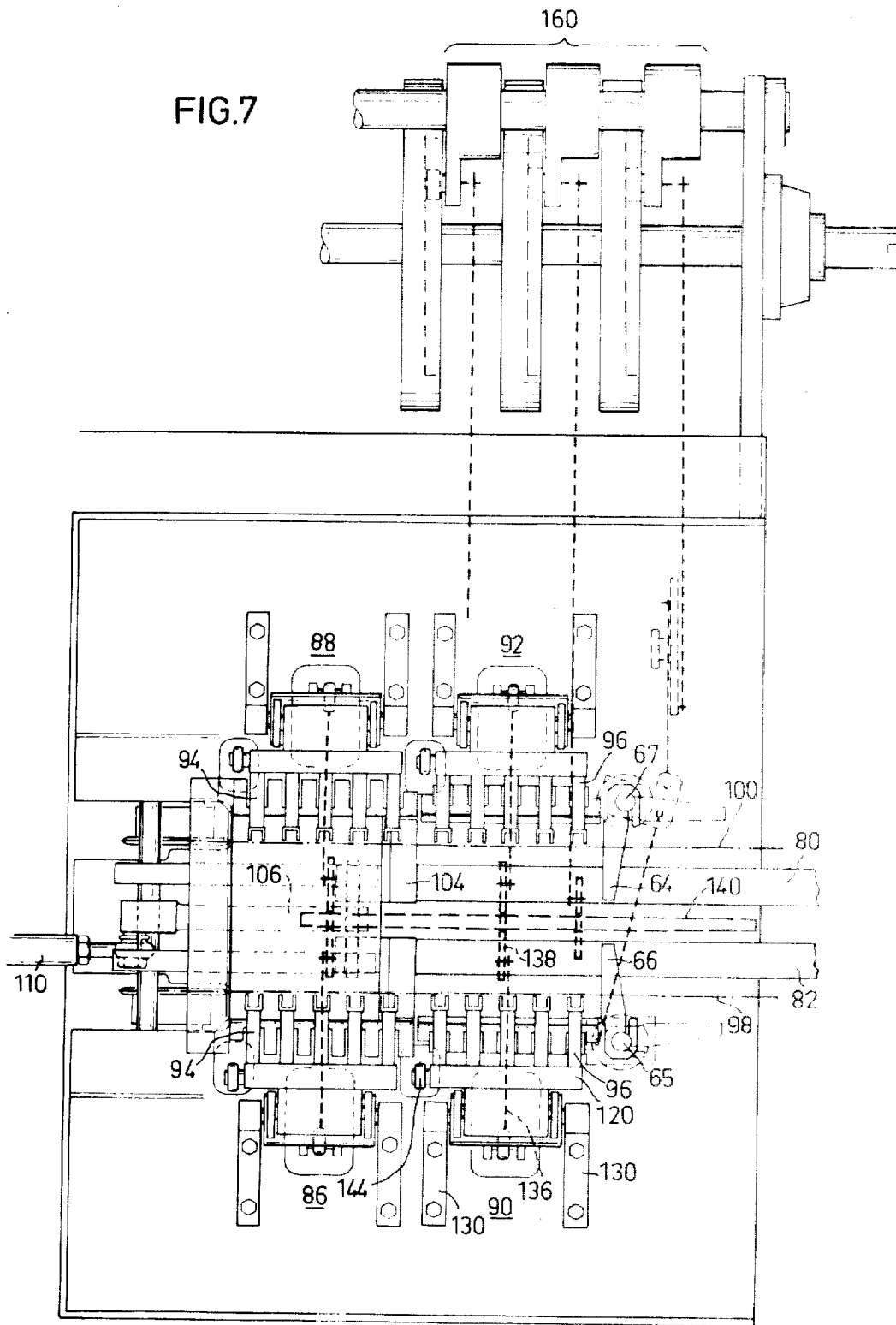


FIG. 8

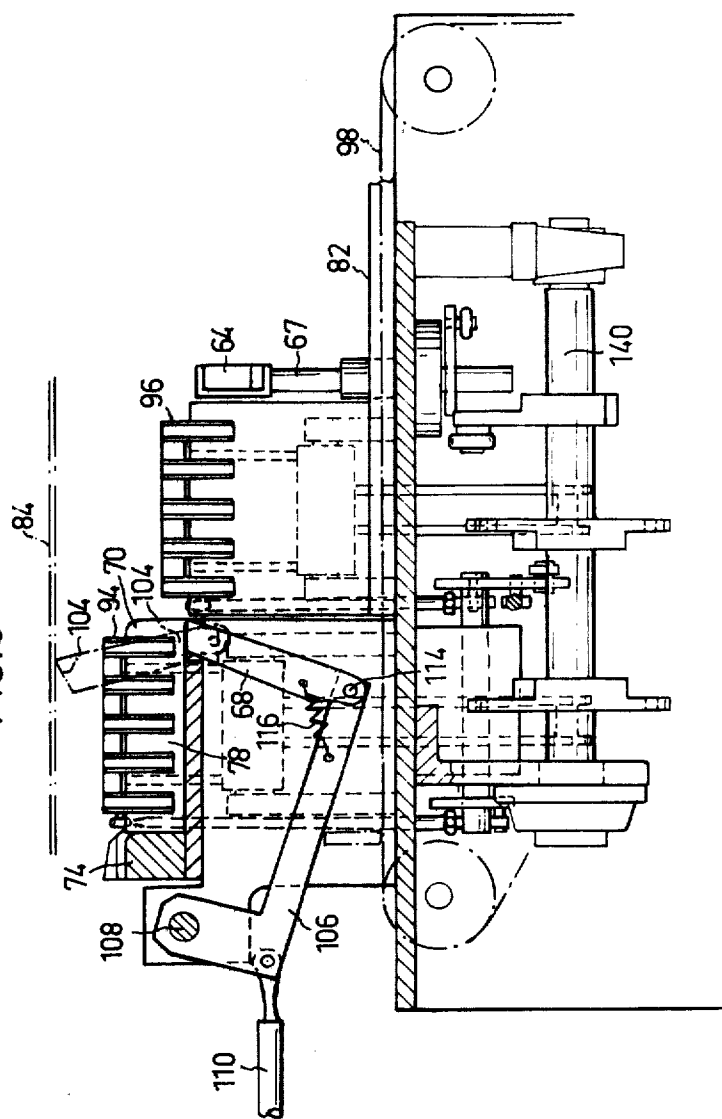


FIG.9

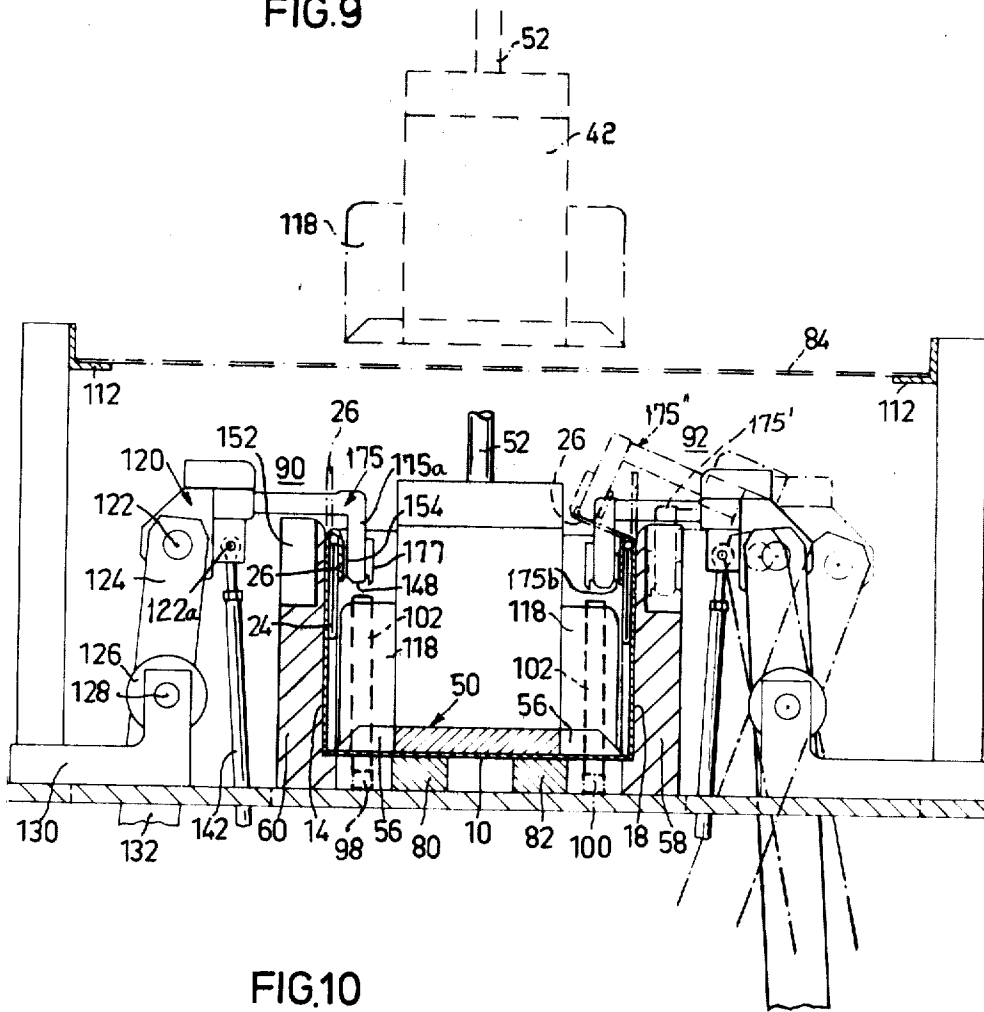
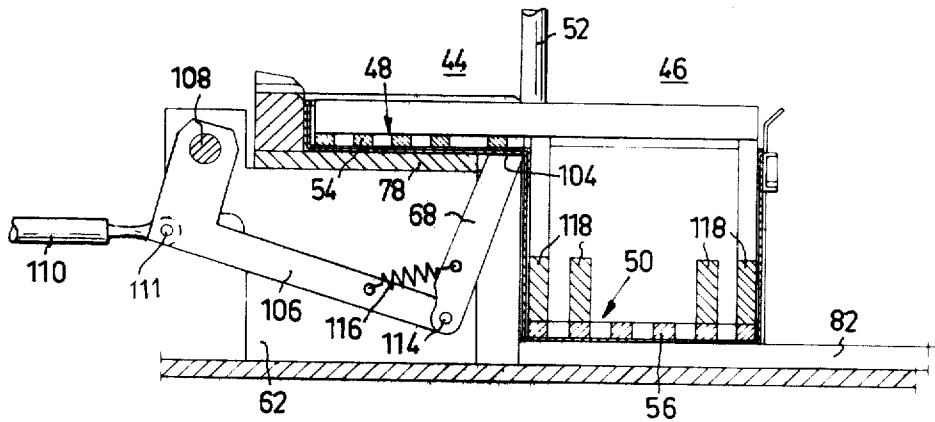


FIG.10





**FIG.11**

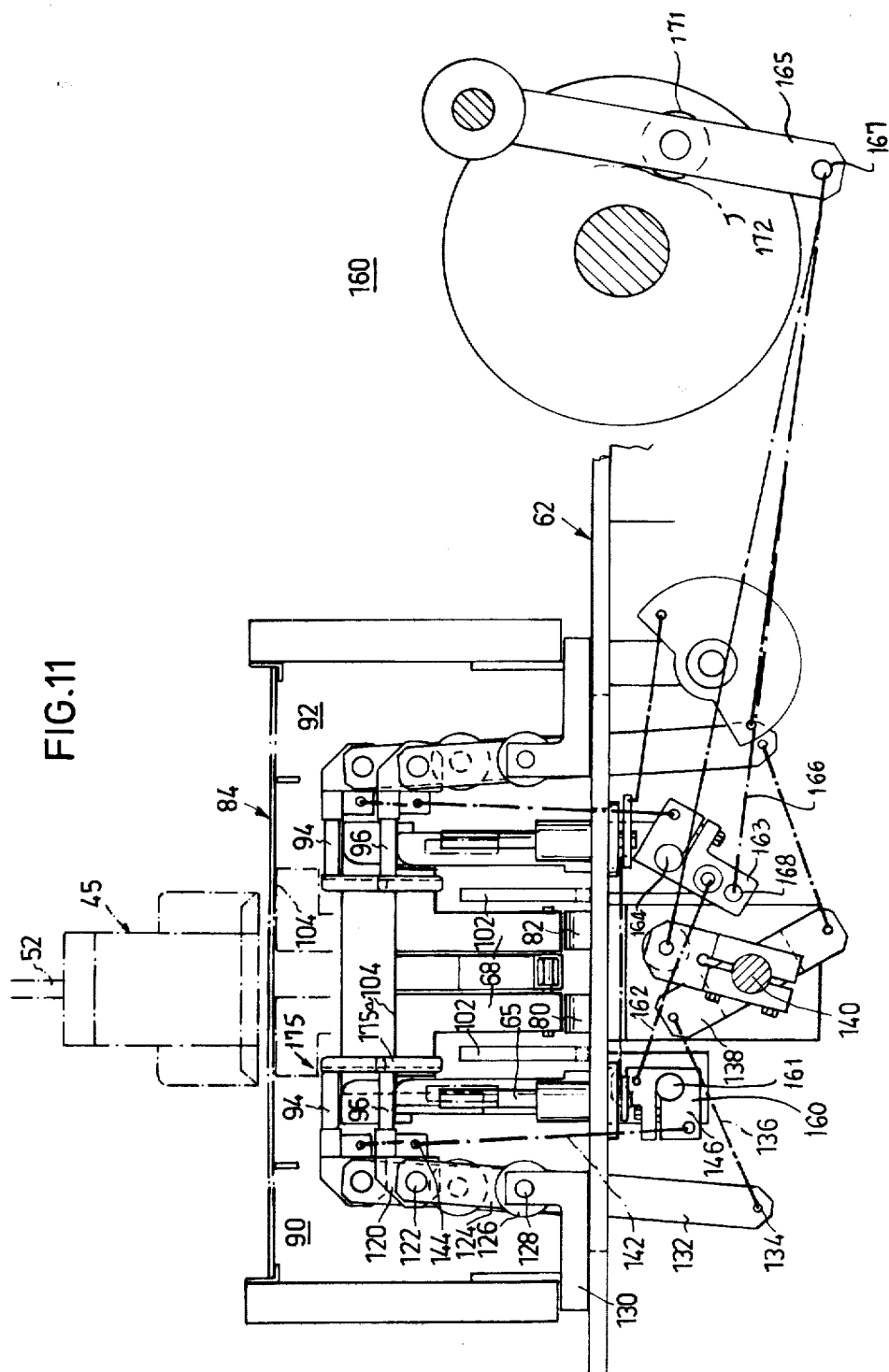


FIG.12

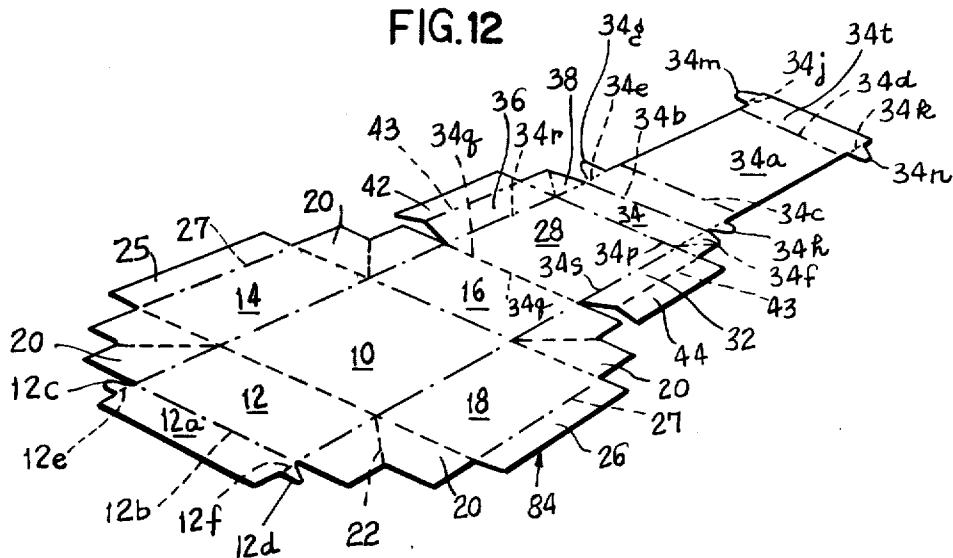


FIG.13

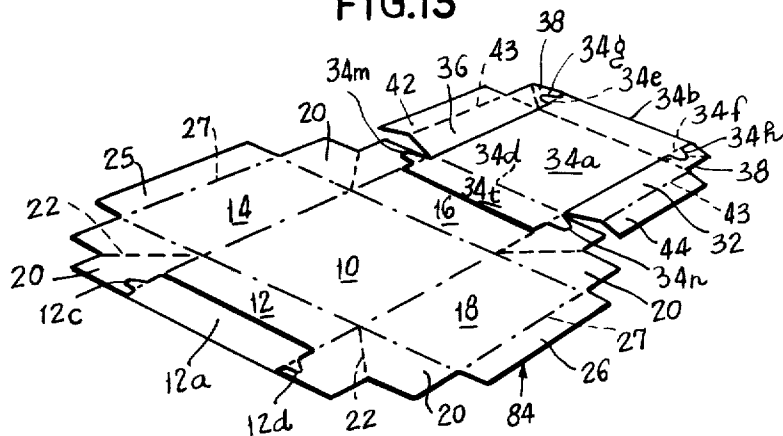
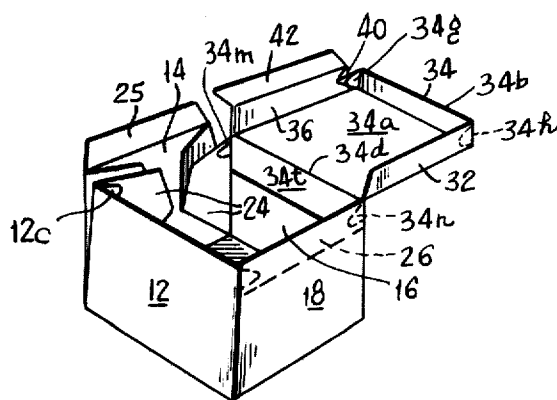


FIG.14



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## MACHINE FOR ERECTING A CARTON BLANK TO A CARTON

This invention relates to methods and machines for erecting a carton blank to a carton. Primarily the invention relates to the erection of cartons which are comprised of a bottom portion in the form of a tray and a lid portion in the form of a further tray which is hingedly connected to the bottom portion and fits outside its side walls when closing the carton. More particularly the invention relates to the erection of such bottom trays and lid trays which at two opposite side panels are extended with edge flaps which are to be folded down against the insides of the side panels and are to be secured to these by means of gluing.

It is previously known to erect the blanks under consideration by pressing them down into two adjacent shafts or openings by means of a plunger. At the upper ends of the shafts are provided means for folding the side panels of the trays to their erected position and which folds the corner portions between the ends of the side panels. In a certain position within the shafts the carton has been erected and its parts have been secured to each other by means of a glue or other bonding medium. The bonding medium may be comprised of a heat sealable layer on the blank or it may consist of blue bead lines which are applied to the blank before it is pressed down into the shafts. When in the shaft the carton in its erected position will be subjected to the action of pressure members which during a predetermined interval will act against those parts of the carton which shall be connected with each other through gluing. According to the known methods and machines the carton is thereafter subjected to a continued downward vertical displacement to the open bottom end of the shaft where the carton is delivered to a conveyor device.

In the known machines the carton is merely guided by the plunger and the walls of the shaft. This means that the bottom of the carton is free to move when the pressure members act on the carton at the portions of the carton to be glued. However, in practice it has been found that the parts of the carton may be displaced relative to one another in a manner not desired so that these parts in the ready-made carton will not be maintained in their correct positions in relation to each other. Displacement of the parts in relation to each other is obtained due to the fact that the parts of the cartons will not be kept safely in correct positions when they are acted on by means of the pressure members at the places to be glued.

One object of the invention is to provide a method and a machine for maintaining the parts of the carton in their correct positions in relation to one another when the carton is acted on by pressure members at the portions to be glued.

Another object of the invention is to provide a method and a machine which in relation to known machines will enable the plunger to be moved through a shorter travel during both its vertical up and down movement in order to enable an increased working capacity for reciprocating cycle of the plunger.

These and other objects of the invention will appear from the following description of two embodiments of the machine according to the invention shown by way of example in the accompanying drawings.

In the drawings:

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FIG. 1 is a perspective view of a blank intended to be erected to a carton having a bottom tray and a lid tray which is hingedly connected with one edge of the bottom tray.

FIG. 2 is a diagrammatic perspective view of the carton as nearly fully erected.

FIG. 3 is a diagrammatic plan view of a portion of the erecting apparatus and a carton being erected in position in two juxtapositioned shafts of the apparatus.

FIG. 4 is a diagrammatic longitudinal section through the two shafts in FIG. 3 showing the reciprocal plunger in its upper end position and a movable supporting member in contact with the underside of the lid at the hinged connection between the lid and one side edge of the bottom tray.

FIG. 5 is a diagrammatic perspective view of the machine with certain details omitted for the sake of clarity.

FIG. 6 is another diagrammatic perspective view of the machine with certain details in FIG. 5 omitted and other details being shown in order to disclose the driving connections to certain movable parts of the machine.

FIG. 7 is a top plan view of the main parts of the machine with certain details omitted for the sake of clarity.

FIG. 8 is a longitudinal section through the two shafts corresponding to FIG. 4 but with still more details shown in order to explain the functions of the details.

FIG. 9 is a diagrammatic cross-section through the machine at the deeper one of the two shafts.

FIG. 10 is a diagrammatic longitudinal section through the two shafts and through the plunger located therein, the plunger having its bottom plates in their bottom position in order to hold the bottoms of the lid tray and the bottom tray against stationary bottom supports.

FIG. 11 is a diagrammatic front view of the machine for disclosing the connections between certain movable details in the machine.

FIG. 12 is a perspective view of an alternative carton blank which may be erected in the machine of the present invention.

FIG. 13 is a perspective view of the carton blank of FIG. 12 showing the manner in which certain portions thereof are folded preparatory to erection of the carton blank.

FIG. 14 is a perspective view of a nearly erected carton erected from the blank of FIG. 13.

The blank in FIG. 1 is comprised of a bottom portion and a lid portion. The bottom portion has a bottom panel 10, four side panels 12, 14, 16, 18 and corner gusset portions 20 which in a known manner connect the ends of the side panels and are arranged to be folded double along their diagonal fold lines 22 upon erecting the blank. The double folded corner portions form flaps 24 (see FIG. 2) which are intended to be secured by gluing to the inside of the adjacent side panels (for example, see side panel 14 of FIG. 2) or to be kept in the folded position through some other technique. In the example shown they are adapted to be secured by means of edge flaps 25, 26 which form extensions of the two opposite side panels 14, 18 and are arranged to be folded down over the corner flaps and secured by gluing to the inside of the adjacent side panel.

The opposing side panels 12, 16 of the bottom portion have no edge flaps which require folding. One side

panel 16 is hingedly connected along its upper edge with the bottom 28 of the lid portion, fold line 30, constituting the hinge connection.

The lid portion has three side panels 32, 34, 36 which at their adjacent ends are connected by means of corner portions 38, 38 which are adapted to be double-folded in the manner of portions 20, 20. In the erected lid portion these corner portions 38 form triangular flaps 40 intended to be secured in a position along the adjacent side panel. In the example shown the two opposite side panels 32, 36 are extended, each with an edge flap 42, 44 which is folded down over the triangular corner flaps 40 and secured by gluing to the adjacent side panel. FIG. 2 shows flap 42 before being folded against side panel 36 and corner flap 40.

FIG. 6 shows diagrammatically a plunger 45 for pressing the blank of FIG. 1 downwardly into two adjacent shafts 44, 46 (FIG. 3) of unequal height (see FIG. 4) in order to erect the side panels of the lid portion and the bottom portion as the blank is pushed into the shafts.

The plunger 45 is provided with two bottom plates 48, 50 (see also FIG. 4) located in this example at different levels which correspond to the levels of shafts 44, 46 respectively. The lower bottom plate 50 is adapted to press against the bottom panel 10 of the carton blank bottom portion and has substantially the same size as bottom panel 10. The upper plate 48 is adapted to press against the bottom 28 of the lid portion and has substantially the same size as this bottom. The two bottom plates are rigidly connected with each other in this embodiment of the machine and are carried by a common vertical shaft 52 which is actuated by a driving mechanism not shown in detail to be moved (i.e., reciprocated) between an upper end position and a lower end position. The upper end position of the plunger is shown in FIG. 4 and in FIG. 9 in dotted lines and its lower end position is shown in FIGS. 9 and 10. The driving mechanism for moving the plunger is synchronized along with the movement of the other movable parts of the machine. At its opposite side edges the two bottom plates are each provided with a plurality of fingers 54, 56 (FIG. 6) along opposite parallel sides of the bottom plates as will be explained in greater detail below.

As will be seen from FIGS. 4 and 10, the one shaft 46 is deeper for receiving the bottom portion of the carton, whereas the other shaft 44 is elevated above shaft 46, has a smaller depth and is intended to receive the lid portion of the carton.

The shaft 46 for the bottom portion is defined by two opposite stationary side pieces 58, 60 (FIG. 3) which are secured to the frame of the machine, the frame being denoted generally by reference numeral 62. Some of the details of the frame are not shown in the drawings. However, a number of frame members are shown which carry certain of the movable or stationary parts of the machine which are necessary for the performance of certain important functions in connection with the present invention. The intent of omitting certain details in the illustration is to facilitate the understanding of the drawings.

The two other opposite sides of the shaft for receiving the bottom portion of the carton are comprised at one side by the pivotally mounted doors 64, 66 which are selectively rotated about vertical shafts 65, 67 (FIGS. 3, 5) from a closed position where they form the

downstream side of the shaft 46 to an open position which is indicated in FIG. 5. At the other side of the shaft 46 is a vertically movable support member 68 (FIG. 4) which is adapted to rest against the underside of the bottom 28 of the carton lid adjacent the fold line 30 between the lid portion and the bottom portion as indicated in FIGS. 4, 8, and 10.

The shaft 44 for receiving the lid portion (FIG. 3) is defined by two opposite stationary side pieces 70, 72 and a transverse side piece 74 which is stationary. The side pieces are intended to cooperate with the side panels 32, 34, 36 of the lid portion for erecting the same.

At the upper ends of the two shafts are members 75 (FIG. 3) and 76 (FIG. 5) which in a known manner per se is intended to cooperate with the corner (gusset) portions between the side panels for folding these corner portions to form corner flaps 24, 40 (FIG. 2) which are urged to lie against their associated side panels in the carton when erected.

In the shaft 44 of the lid receiving portion is a stationary bottom support 78 which forms part of side piece 74 and extends forwardly toward vertically movable support member 68 as will be understood from FIGS. 3, 4, 8 and 10.

In the shaft 46 at the bottom portion is a stationary bottom support in the form of two parallel longitudinally extending stationary rails 80, 82 (FIGS. 3, 5). These rails extend beyond the downstream end of shaft 46 for the bottom carton portion as is shown in FIGS. 3, 5 so as to form a conveyor for the carton when erected in a manner to be described below.

The carton blank 84 (see FIGS. 1, 3, 4, 9) is picked up from a supply S of such blanks arranged in a vertical fashion (FIG. 4) by means of a pair of arms A—A (FIGS. 3, 4) each having a plurality of suction teats. The arms A, A "grab" the right-hand-most blank from blank from Supply S and rotate the blank to a horizontal position above a table 190 having an elongated slot 191 for receiving linearly movable closed loop chains 192, 192 guided by suitable sprockets and driven by a motor (not shown) to move the chains in the downstream direction shown by arrow 194 (FIG. 4). The vacuum in arms A, A is released causing the carton blank to drop onto table 190. The chains 192 are provided with upwardly extending "pushers" which abut the upstream or left-hand edge of the carton blank (FIG. 4) and move the blank toward the erecting position.

As the blank is moved in the direction of arrow 194 a pair of glue applicators 196 are moved vertically downward by means not shown for purposes of simplicity so that their glue dispensing ends are above the carton blank. An elongated bead or strip of glue is first simultaneously deposited along edge flaps 25, 26 (see FIG. 1). Thereafter, a second pair of glue applications 196a, 196a are moved vertically downward as edge flaps 42, 44 pass beneath the glue applicators 196a, 196a to simultaneously lay down a stripe or bead of glue along each of these edge flaps. As the rearward edges of flaps 25, 26 pass the applicators 196, 196 they are deactivated and moved upward. Similarly, as the rearward edges of flaps 42, 44 pass applicators 196a, 196a, they are deactivated and moved upwardly. Alternatively, the second pair of applicators 196a, 196a may be dispensed with and replaced by a mechanism (not shown) for moving applicators 196, 196 outwardly immediately after laying down beads on edge flaps 42, 44,

so as to lay down beads on edge flaps 25, 26 when the flaps receiving these beads pass beneath applicators 196, 196.

The "pushers" 195, 195 continue to move the carton blank downstream so as to move above shafts 44, 46. The marginal edges of the blank move upon a pair of horizontally aligned guides 197 (FIGS. 4, 9) as the blank continues to move along its forward marginal edges engaging a pair of diagonally aligned guides 198 forcing the forward edges to move diagonally (i.e., downward and to the right) until the forward edges engage a pair of stationary stops 199 which halt any further movement of the carton blank in the downstream direction.

Thereafter, the plunger 45 is moved downwardly to press the blank downwardly into the two cavities or shafts 44, 46 to such an extent that the bottom of lid portion 28 rests upon the stationary bottom support 68 (FIG. 4) and the bottom 10 of the bottom portion will rest against the stationary bottom rails 80, 82 (FIGS. 5, 6). The two bottom panels 28, 10 are pressed against the stationary bottom supports by means of the bottom plates 48, 50 of the plunger. The two bottoms of the carton and its side panels will thus be secured in a very accurate and fixed position. The corner portion 20, 20 engage upwardly projecting members 64a, 64b as the blank is moved downwardly by plunger to bend the corners along their fold lines. The corner portions 38, 38 are similarly bent along their fold lines by upwardly extending projection 76 (see FIG. 5).

The edge flaps 25, 26, 42, 44 at the opposite side panels are then folded inwardly and downwardly to engage the adjacent side panels. This fold operation is performed by means of devices in the form of four pivotally journaled and vertically movable members 86, 88, 90, 92 (see FIG. 6) each having a number of L-shaped fingers 94, 96. These members are provided at each of the two opposite sides in the two shafts 44, 46 (FIG. 6). When the edge flaps 25, 26, 42, 44 are secured by gluing over the corner flaps 24, 40 the movable fingers 94, 96 will return from their pressing position (FIGS. 5, 6, 7, 8) to their resting position which is indicated by dotted lines in FIG. 9. The plunger 45 will then have been moved from its lower end position (solid lines in FIG. 9) to its upper end position (dotted lines in FIG. 9). The carton is now erected and is moved out from the shafts. The doors 64, 66 are opened so that the downstream side of the shaft 46 will be opened. Parallel with the stationary bottom rails 80, 82 are two endless chains 98, 100 (see FIG. 5) which carry upwardly extending vertical rods 102 spaced from each other along the length of the chains. The chains are moved a predetermined distance so that the rods 102 next behind the bottom tray as erected will be brought to engagement with the bottom tray and feed the carton along the rails 80, 82 and out through that side of the shaft which has been opened. The erected cartons are then fed between B—B entrained about rollers R which may be power driven or free-wheeling.

Following the above general description of the main parts of the machine and their functions, the various devices will now be described more in detail.

As will be seen from FIGS. 7, 8, 10 and 11, the support member 68 is comprised of a T-shaped plate which in the example shown is comprised of two L-shaped parts (FIG. 11). The upper edge of the plate forms a support surface or edge 104 which is intended to sup-

port the underside of the bottom panel 28 of the lid portion adjacent the hinge line 30 (FIG. 10) when the side panels of the bottom tray are erected in the shaft 46 due to the downward movement of plunger 42. In FIGS. 8 and 11, support member 68 is shown in its upper-most position in dotted line fashion and in its lower-most position in solid line fashion. The support member 68 is carried by an arm 106 which is pivotally journaled on a stationary shaft 108.

A link 110 is pivotally connected to arm 106 by pin 111 (FIG. 10) and is subjected to a to-and-fro movement of a rotating cam which is synchronously driven with the movable parts of the machine. When the blank 84 is fed into a position on side supports 112 in the starting position indicated by dotted lines in FIG. 9 beneath the plunger 45 in its upper end position, the support member 68 is in an upper position where its support edge 104 will be located at a predetermined height above the stationary bottom support 78 in the shaft 44 for the lid portion. The support edge 104 of the support member has its upper end positioned at a level located higher than the upper side of the side pieces 70, 72 (see FIG. 3) and forms a vertically movable side piece for the shaft 46 to support side panel 16. When the blank is driven downwardly off the supports 112 by plunger 45 so as to rest on the support edge 104 of the support member, the plunger 42 will then start to fold the bottom portion of the carton over the support edge 104 and down into the shaft 46 for erecting the side panels 12, 14, 16, 18 of the bottom portion. At the same time the support member will be successively lower. Thereafter the bottom plate 48 will start to press down the lid portion into the shaft 44 for erecting the side panels 32, 34, 36 of the lid portion. Lowering the support member 68 is then provided to follow this downward movement of the plunger in order to form a support against the bottom of the lid portion adjacent the fold line 30 when erecting the side panel 16. The support member 68 controls the erection of the side panel 16 of the bottom portion and moves panel 16 to a vertical position upon maintaining a satisfactory guide of the carton portions which will result in the carton portions being erected and moved to an exact position in relation to each other.

The support member 68 is pivotally mounted to arm 106 by shaft 114 and is actuated by a spring 116 which is provided to bias the support member 68 to make sliding contact with the front edge of the stationary bottom support 78 or other stationary guides in such a way that the support edge 104 of the support member will assume the different positions shown in FIG. 8 as it moves along a path extending from the uppermost position of the support member shown as 68 in dotted fashion (FIG. 8) to a lowermost position shown in solid line fashion in order to be in contact with the bottom 28 of the lid portion adjacent the fold line 30 between the bottom 28 of the lid and the adjacent side panel 16 of the bottom tray as the blank is moved downwardly by plunger 42. Spring 116 acts to normally urge arm 68 counterclockwise about its pivot 114 and allows edge 104 to properly rest itself against the carton blank in the region of fold line 30 (FIG. 2).

As referred to above the two bottom plates 48, and 50 of the plunger are provided with a number of straight fingers 54 and 56 at the side edges of the plate. These fingers are spaced with such a distance from each other and are located in such positions relatively

to the movable fingers that the fingers of the plunger may pass between the movable fingers when these are in their position for pressing against the edge flaps 25, 26, 42 and 44 upon gluing the same to the inside of the side panels and the plunger 45 is moved from its lower end position to its upper end position.

As will be seen from FIG. 9 the bottom plate 50 is provided with a number of vertically aligned plates 118 (see FIG. 6) extending upwardly and having their outer vertical edges positioned adjacent the inside of the side pieces 58, 60 (see FIG. 3) of shaft 46 in order to form supports against the side panels when their edge flaps 25 and 26 are being folded inwardly and downwardly in the manner described below.

Since all four members 86, 88, 90 and 92 for folding the edge flaps are designed in the same manner, merely one member 90 of these four members will be described in detail with reference to FIGS. 5-11.

A block 120 (FIG. 6) is pivotally journaled on a horizontal shaft 122 carried by a pair of arms 124 which are secured to a hub 126 rotatably journaled on a stationary shaft 128 which is carried by a pair of brackets 130 on the frame of the machine. At the lower side of this hub is secured a pair of arms 132 which at their lower ends are connected with a link 136 shown in dotted fashion (FIG. 11), in turn, is subjected to a reciprocating movement from a crank lever 138 secured to a shaft 140 which is rotatable between two end positions.

The pivotal movement of the block about the shaft 122 is controlled by a substantially vertically aligned link rod 142 (FIG. 9) whose upper end 104 is hingedly connected to the block 120 by pin 122a whose lower end is connected with a cam-controlled crank arm 160 to carry out a predetermined movement up and down. Crank arm 160 pivots about stationary shaft 161. A linking arm 162 (shown in phantom line fashion) links arm 160 to a similar crank arm 163 pivoted about shaft 164. Crank arm 163 is linked to an arm 165 by link 166 (shown in phantom) and pivot pins 167, 168. Arm 165 (FIGS. 6, 11) is mounted to pivot about shaft 169 by collar 170. Arm 165 has a rotatable cam follower roller 171 which follows the periphery of cam 172.

On the block 120 are secured the L-shaped fingers 175 which have a free downwardly directed outer arm 175a provided with an end surface which is intended to rest against the adjacent edge flap when starting the folding of the edge flap.

At least some of the fingers may be provided with a nail shaped projection 177 (FIG. 9) at the end of the finger. The nail extends beyond the end of the finger 175a in order to be able to engage the free edge of the flap at the beginning of its folding movement and so that the finger may maintain its engagement with the edge flap.

In the starting position shown in dotted line fashion 175' in FIG. 9, all fingers are located in pockets 152 on the back side of the side piece 60, the front side of which is smooth. This starting position is shown by dotted lines for the right-hand set of fingers in FIG. 9.

In the right-hand position of FIG. 9 is shown the folding member 92 with its parts in three different positions, namely, in the resting position in dotted line, where the arms 146 are positioned in the recesses 152 and the edge flap 26 is shown in an upright position in dotted lines, in the pressing position where the arm 146 engages the edge flap 26 when folded down and presses this flap against the side panel 18 for gluing to the

same, and in an intermediate position in dotted lines where the arm 96 with the end of its arm 146 has folded the edge flap 26 to a position where the flap is directed inwardly. These positions and intermediate positions are obtained in the following manner.

From the resting position the fingers are raised by rotating the block about its shaft by means of the link rod 142 until the ends of the fingers have been positioned at a higher level than the upper side of the side piece shown in dotted line fashion as position 175''. Thereafter, the arm is turned inwardly by rotating hub 126 about shaft 128 so that the fingers will be moved to contact with the adjacent vertically upstanding edge flap (see edge flap 26 in FIG. 9). The fingers will engage the free edge of the edge flap so that the nail 177 will engage closely above the edge of the edge flap. Thereafter, the arms will be substantially standing still and the continued movement of the fingers will be effected by pivoting the block 120 about its shaft 122 by downward movement of the link rod 142.

The ends of the fingers will then follow a substantially circular arc-shaped path having its center adjacent the fold line of flap 25 (and 26). When the edge flap reaches a position substantially at right angles to the adjacent side panel, the end surfaces of the fingers will release their contact with the edge flap and then the inside surfaces of the fingers will make this contact. On the inside of the fingers are elastic pressure members 175b which now rest against the edge flap. When the edge flap is positioned substantially parallel along to its side panel, the arms are pivoted somewhat outwardly which results in the pressure members elastically pressing against the edge flap in order to subject the same to a pressure during a predetermined interval so that the glue between the edge flap and the side panel will have time to harden. During this interval the plunger will be redrawn to its upper end position and the next blank is fed to its position beneath the plunger. This is permissible due to the fact that the gaps between fingers 175 permit the fingers 56 of bottom plate 50 to freely pass therethrough.

The movement of the movable fingers, the doors, the plunger and the support member are synchronized by means of members known per se and controlled for predetermined mutual movements by means of cam discs as indicated diagrammatically in the Figures where a number of links are merely indicated by dotted lines. The intermittent drive of the chains is also synchronized in relation to the movements of said parts by means of devices known per se.

When the gluing is ready, the fingers are returned to their resting position. Meanwhile the doors 64, 66 (FIG. 3) have been opened and when the chains are being driven, the ready erected carton is moved downstream by pushers 102 on chains 98, 100 (FIG. 4) to be fed out on the rail between two endless conveyor belts B, B which feed the carton to any desired place.

FIG. 12 shows an alternative embodiment 84 of the carton blank of FIGS. 1 and 2 wherein the carton blank 84' differs from blank 84 in that it is provided with a short edge flap 12a joined to side panel 12 by a fold line 12b and having outwardly extending tabs 12c and 12d joined to flap 12a by fold lines 12e and 12f, and an elongated panel section 34a integrally joined to side panel 34 and having additional fold lines 34b, 34c and 34d, a pair of fold lines 34e and 34f which hingedly join tabs 34g and 34h thereto, and a pair of fold lines 34j

and 34k which hingedly join tabs 34m and 34n thereto.

In a pre-folding and pre-gluing operation performed prior to the erecting operation of the carton flap 12a is folded along line 12b against side panel 12 (FIG. 13) and glued. However, tabs 12c and 12d are not glued to corners 22, 22. Also, panel section 34a is folded inwardly and glued so that fold line 34c is aligned with fold line 34p (FIG. 12), fold line 34d is aligned with 34q, fold lines 34e and 34j are aligned with fold line 34r, and fold lines 34f and 34k are aligned with fold line 34s. Outer-most flap 34t is folded against the upper part of sidewall 16 as shown best in FIG. 14. However, tabs 34g, 34h, 34m and 34n are not glued to the corners 38, 38, 20 and 20, respectively.

The carton blanks 84' shown as folded and glued in FIG. 8b constitute the blanks used in the erection operation described hereinabove. The erection operation performed on blanks 84' is identical to that described hereinabove except that the tabs 12d-12d, 34g-34h and 34m-34n perform the following function (since all of the aforementioned pairs of tabs function in substantially the same manner, only one such set of tabs will be described herein for purposes of simplicity).

As the blank is moved downwardly into the cavities 44, 46 the side panels 12, 14, 18, 32, 34 and 36 are moved to their upward vertical positions. Simultaneously therewith, the triangular corners are folded inwardly as shown in FIG. 14. The tabs 12c and 12d are bent inwardly against the triangular corners 22, 22 and act to urge the folded triangular corners toward side panels 14 and 18 so that the folded corners will lie beneath the edge panels 25, 26 when they are folded downwardly and inwardly in the same manner as previously described for the carton blanks 84.

Tabs 34m-34n similarly urge folded corners 20, 20 against side panels 14 and 18 so that they will be beneath edge flaps 25 and 26; and tabs 34g-34h urge folded corners 38, 38 against side flaps 36, 32 so that these folded corners will lie beneath edge flaps 42 and 44 when these edge flaps are folded downwardly and inwardly in the manner previously described.

We claim:

1. Apparatus for erecting cartons from a substantially flat carton blank having tray and lid portions, side panels forming the sides of said tray portion and side panels forming the sides of said lid portion wherein said lid portion is hingedly coupled to one of said tray portion side panels along a fold line, said apparatus comprising:

blank receiving means having first and second cavities positioned adjacent one another and each having a stationary floor and a common pair of sidewalls;

said floors being positioned adjacent one another;

reciprocating plunger means having first and second bottom surfaces respectively cooperating with the floors of said first and second cavities;

said first and second surfaces being adapted to respectively enter said first and second cavities when said plunger is moved in a carton erecting direction to press the lid and tray portions of a carton blank respectively against said first and second floors and cause said lid and tray side panels to be moved to the erected position;

means for moving the erected carton out of said cavities when said plunger moves in a reset direction.

2. The apparatus of claim 1 wherein the cavity having the lower floor is provided with a stationary interior

wall extending toward the floor of said remaining cavity for engaging and erecting the side panel of said blank hingedly connected to said lid portion.

3. The apparatus of claim 1 further comprising a movable wall positioned above said lower floor and arranged in a spaced parallel manner relative to said stationary interior wall when in a closed position and movable to an open position when said plunger moves toward its reset position for enabling the erected carton to be removed from said cavities.

4. The apparatus of claim 3 further comprising swingable means positioned beneath the upper floor and having a free edge movable through an opening in said upper floor adjacent said intermediate wall to a position above the upper floor whereby said upper edge engages the fold line between the tray portion side panel and the lid portion to initiate bending of the carton along said fold line as said plunger moves in the erecting direction;

said swingable means being movable downwardly when the carton blank is urged against said upper edge by said plunger whereby said upper edge is moved to a position substantially flush with the upper floor.

5. The apparatus of claim 1 further comprising pusher means movable across said lower floor and toward said movable wall when said movable wall is in the open position to push the erected carton out of said cavities.

6. The apparatus of claim 1 wherein said carton blank is provided with triangular corner flaps which form gussets in the corners of the lid and tray portion side panels;

means positioned adjacent the tops of said cavities and cooperating with said plunger for folding the corner flaps inwardly when the plunger moves into the cavities in the erecting direction.

7. The apparatus of claim 1 wherein the marginal edges of the tray and lid portion side panels arranged transversely to said hinged connection are each provided with edge flaps bendable along fold lines spaced inwardly and parallel to the free edges of the edge flaps; folding means for folding the edge flaps inwardly and downwardly against the interior sides of the side panels to which they are joined.

8. The apparatus of claim 7 wherein the gussets in the corners of said tray and lid portions are positioned to lie against the transversely aligned side panels to be positioned between said transversely aligned side panels and their associated edge flaps when the edge flaps are in their final folded position.

9. The apparatus of claim 8 further comprising means for applying an adhesive material to all of said edge flaps;

said edge flap folding means including means for pressing the edge flaps outwardly after being folded to seal the edge flaps to their associated side panels and gussets.

10. The apparatus of claim 8 wherein said edge flap folding means is comprised of L-shaped arms whose free ends are provided with notches for capturing the free edges of said edge flaps as the edge flap folding means move the edge flaps inwardly from their unfolded position to assure proper positioning of the edge flaps to complete their folding and sealing operation.

11. The apparatus of claim 7 wherein the side panels of said tray and lid portions which are parallel to the

hinged connections and the tray portion side panel hingedly connected to the lid portion are each provided with bendable tabs extending outwardly from their sides and toward the adjacent side panels to abut the corner gussets and urge them against the side panels having edge flaps to assure proper positioning of the corner gussets during the folding and sealing of the edge flaps.

12. The apparatus of claim 10 wherein the L-shaped arms are arranged at spaced intervals and the bottom surfaces of said plunger are each provided with a plurality of spaced fingers extending toward the side walls of said cavities wherein the fingers are positioned in the spaces between said L-shaped arms to enable the plunger to move out of the cavities toward the reset position when the L-shaped arms are pressed against the edge flaps.

13. The apparatus of claim 10 wherein the L-shaped arms are arranged in a plurality of groups, each group being adapted to fold and seal one of said edge flaps; the ends of said L-shaped arms opposite said free end being joined to a rigid block;  
 a rotatably mounted hub;  
 a pair of arms having their first ends secured to said hub;  
 said block being pivotally mounted between the second ends of said pair of arms;  
 first drive means for rotating said hub to swing said block toward and away from said cavities;  
 a rod pivotally connected to said block and second drive means coupled to said rod to swing the free ends of said L-shaped arms into and out of said cavities;  
 means for controlling said first and second drive means to be sequenced to move the free ends of the L-shaped arms upwardly, then inwardly toward its associated cavity, then downwardly into said cavity and then outwardly against the edge flaps in said cavity to fold and seal the edge flaps to their associated side panels, then upwardly and outwardly

from its cavity.

14. Apparatus for erecting cartons from a substantially flat carton blank having tray and lid portions, side panels forming the sides of said tray portion and side panels forming the sides of said lid portion wherein said lid portion is hingedly coupled to one of said tray portion side panels along a fold line, said apparatus comprising:

stationary blank receiving means having a cavity defined by a first pair of spaced parallel sidewalls; the floor of said cavity having a pair of spaced parallel rectangular stationary surfaces extending between said side walls and forming upper and lower step like floor portions;

an intermediate wall aligned transverse to said side walls and extending between the adjacent edges of said upper and lower floor portions forming a riser therebetween;

the upper floor portion having an end wall parallel to said riser and extending between said side walls; reciprocating plunger means having first and second bottom surfaces displaced from one another by a distance substantially equal to the displacement distance between said floor portions;

said first and second surfaces being adapted to respectively enter said cavity when said plunger is moved in a carton erecting direction to press the lid and tray portions of a carton blank respectively against said first and second floor portions and cause said lid and tray side panels to be moved to the erected position;

means for retaining the erected blank in the cavity as the plunger means is lifted from the cavity;

means for moving the erected carton in a direction transverse to the movement of said reciprocating plunger means to eject the erected carton out of said cavity when said plunger means moves out of the cavity in the reset direction.

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