

Aug. 26, 1958

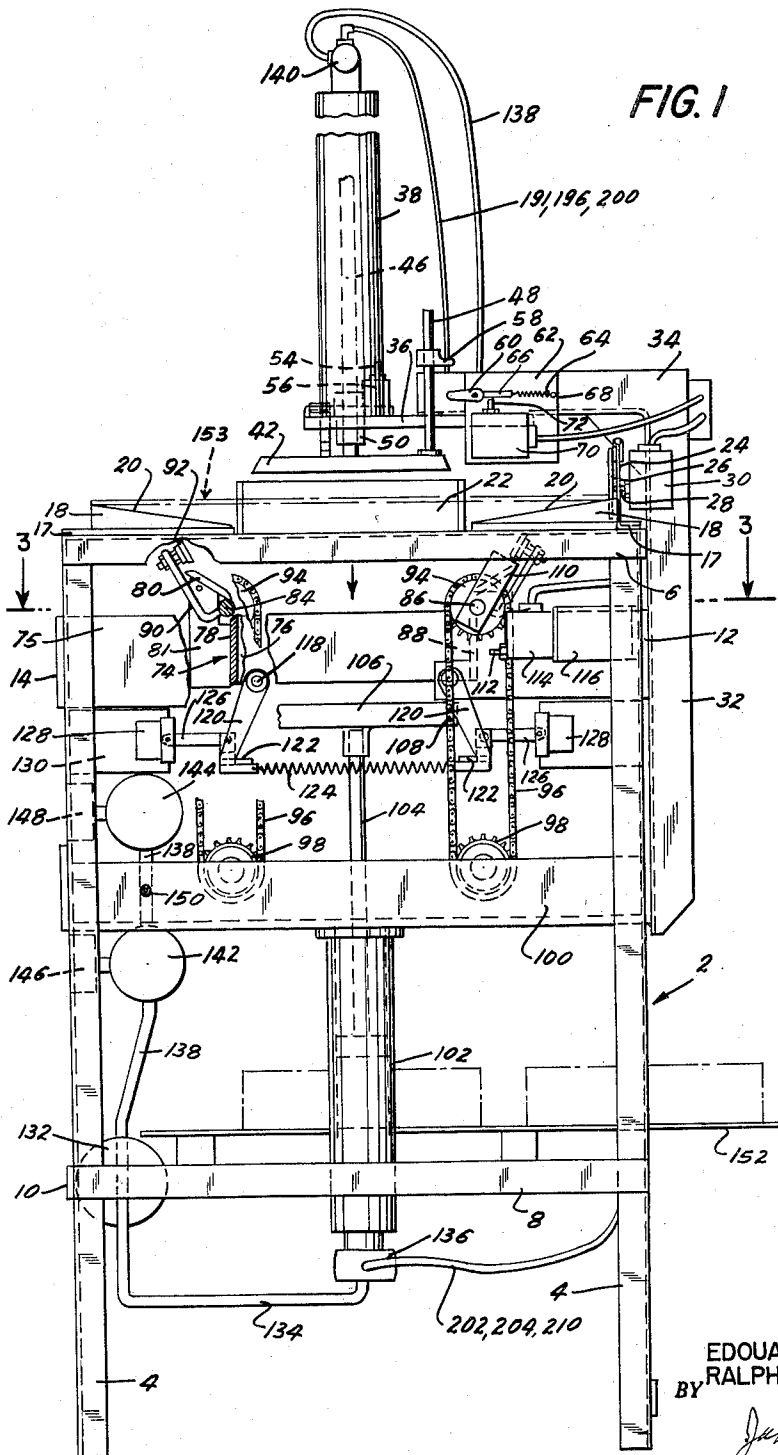
E. E. GSCHWIND ET AL

2,848,926

CARTON ERECTING MACHINE

Filed April 17, 1956

6 Sheets-Sheet 1



INVENTORS.
EDOUARD GSCHWIND
RALPH N. GREENE
BY *James and Franklin*
ATTORNEY

Aug. 26, 1958

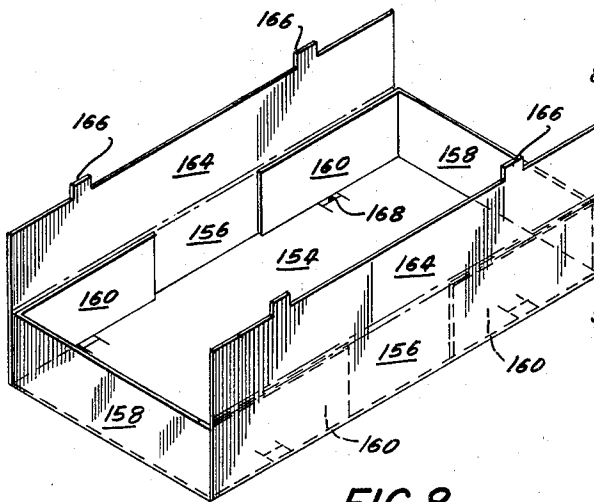
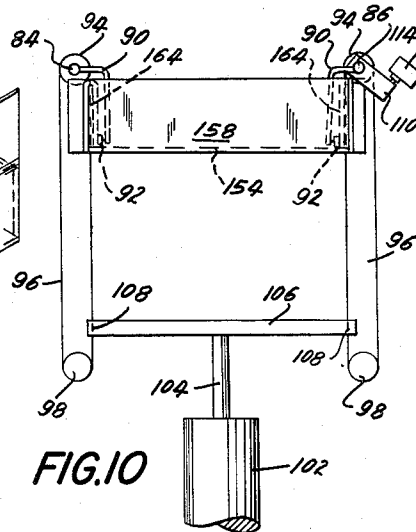
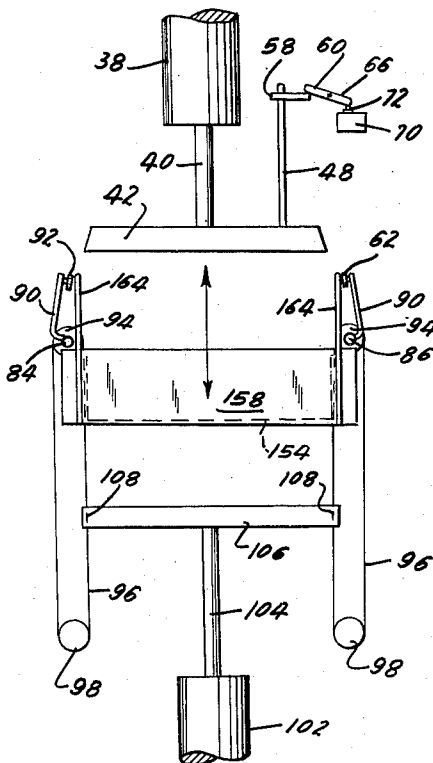
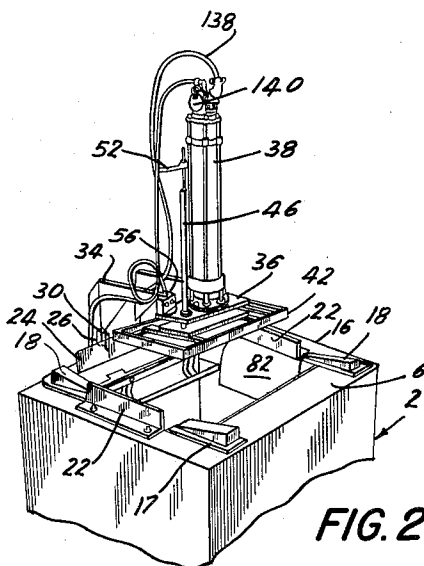
E. E. GSCHWIND ET AL

2,848,926

CARTON ERECTING MACHINE

Filed April 17, 1956

6 Sheets-Sheet 2



EDOUARD
RALPH N. GREENE
BY *James and Franklin*
ATTORNEY.

Aug. 26, 1958

E. E. GSCHWIND ET AL
CARTON ERECTING MACHINE

2,848,926

Filed April 17, 1956

6 Sheets-Sheet 4

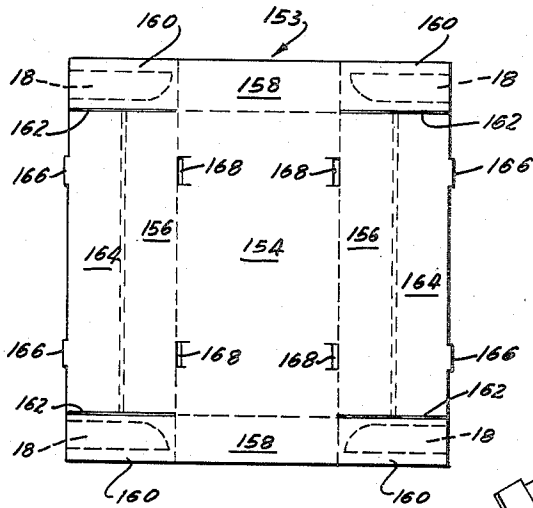


FIG. 5

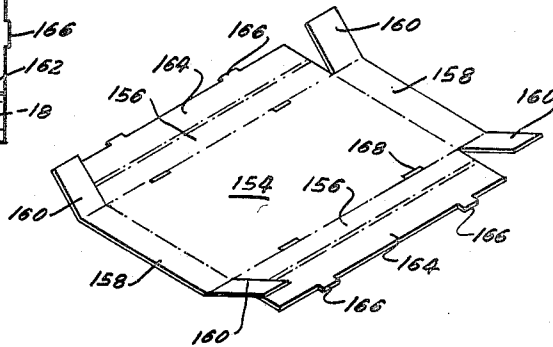


FIG. 6 A

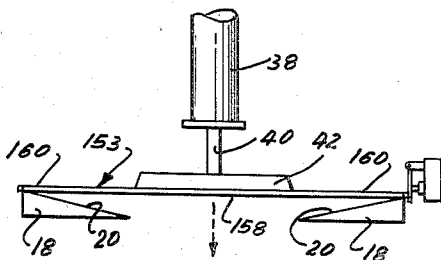


FIG. 6

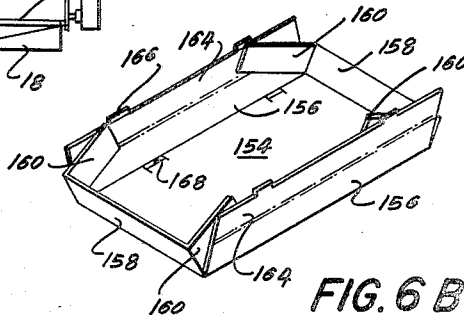


FIG. 6 B

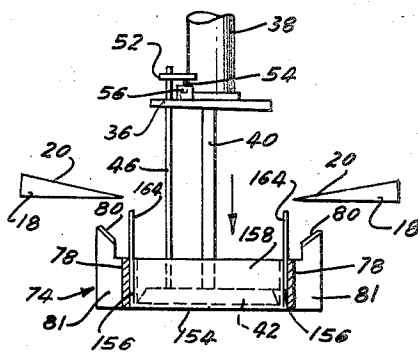


FIG. 7

INVENTORS.
EDOUARD GSCHWIND
RALPH N. GREENE
BY
James and Franklin
ATTORNEY

Aug. 26, 1958

E. E. GSCHWIND ET AL
CARTON ERECTING MACHINE

2,848,926

Filed April 17, 1956

6 Sheets-Sheet 5

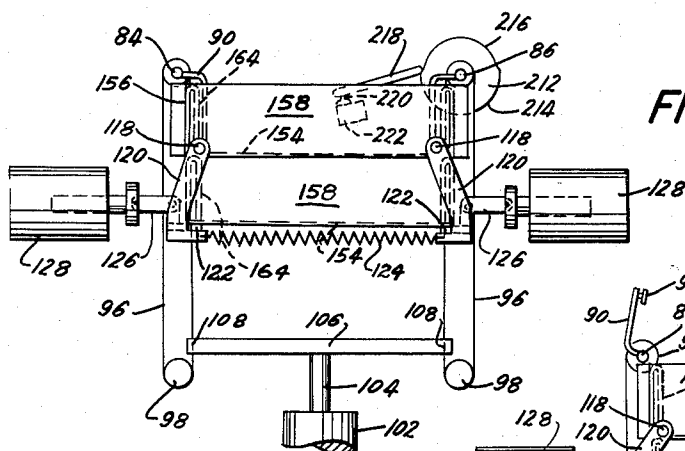


FIG. 11

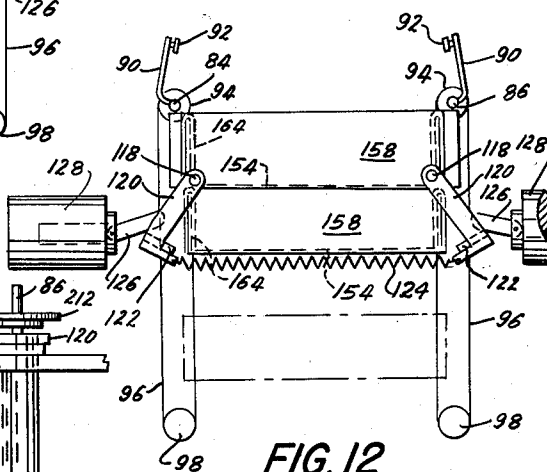


FIG. 12

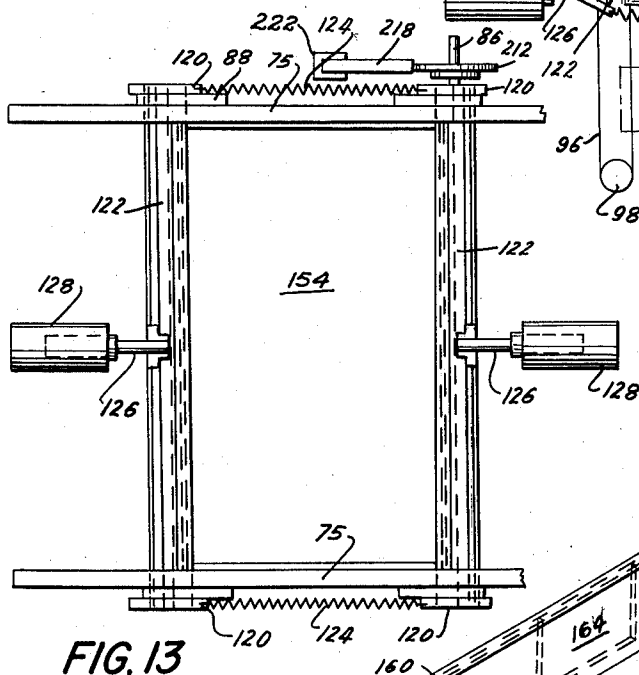


FIG. 13

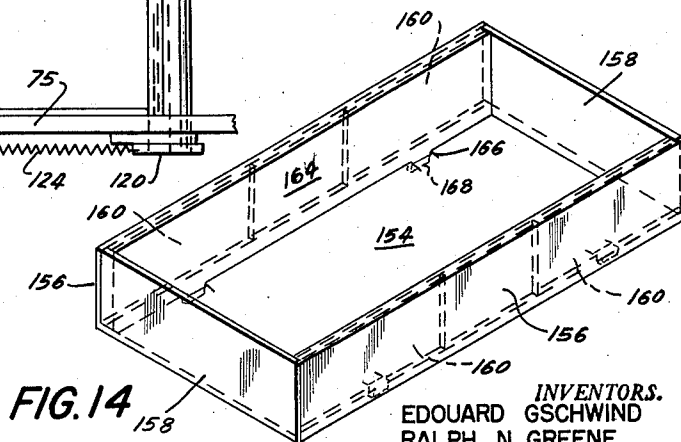


FIG. 14

INVENTORS.
EDOUARD GSCHWIND
RALPH N. GREENE
BY

James and Franklin
ATTORNEY

Aug. 26, 1958

E. E. GSCHWIND ET AL
CARTON ERECTING MACHINE

2,848,926

Filed April 17, 1956

6 Sheets-Sheet 6

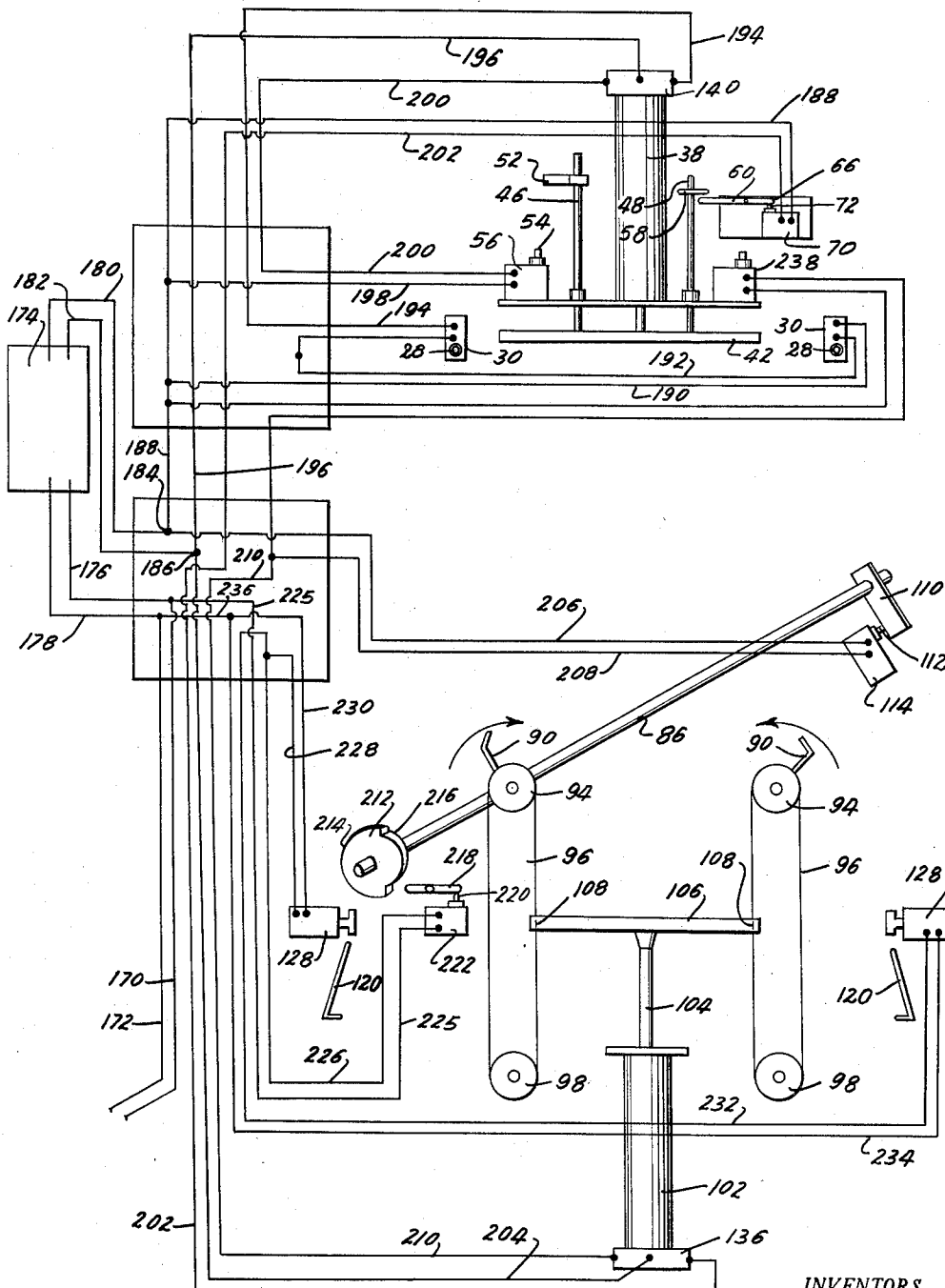


FIG. 15

BY EDOUARD G. SCHWIND
RALPH N. GREENE

BY

James and Franklin
ATTORNEY

2,848,926

CARTON ERECTING MACHINE

Edouard E. Gschwind and Ralph N. Greene, Jacksonville, Fla., assignors, by mesne assignments, to Owens-Illinois Glass Company, Toledo, Ohio, a corporation of Ohio

Application April 17, 1956, Serial No. 578,335

15 Claims. (Cl. 93—51)

The present invention relates to novel apparatus for automatically setting up a carton from a blank of foldable material such as corrugated paperboard, for carrying out the operations involved in such an operation in effective and reliable manner, and for ejecting from the apparatus the erected cartons.

The disclosed apparatus is specially designed for the erecting of cartons having a bottom wall, side and end walls foldably secured thereto, flaps foldably secured to one opposed pair of side or end walls and adapted to be folded alongside the other opposed pair of side or end walls when the carton is erected, and panels foldably secured to the upper edges of said other opposed pair of side or end walls and adapted to be folded over and preferably down inside the box. Means are therefore provided for performing the necessary folding operations in the desired sequence.

The machine is designed to function in a substantially continuous manner, cartons being erected sequentially at one station and ejected from the apparatus at another station so as not to interfere with the erection of new containers. A special feature of the apparatus here disclosed is that each blank, as it is forced into the apparatus, engages the previously erected blank and moves that erected blank to a new position, means being provided in the apparatus for retaining the previously erected blank in its new position so as to limit the downward movement of the blank being erected.

One prime feature of the machine here under discussion is the specific means provided, in the form of appropriately positioned wedge-shaped blocks, for ensuring that the flaps secured to one pair of side or end walls are folded up substantially perpendicular to those walls before the side and end walls themselves are folded up substantially perpendicular to the bottom wall.

The machine of the present invention is outstanding in simplicity, positiveness of operation and rapidity of operation. A series of interlocks are provided so that the various operative mechanisms function in proper timed relation in order to achieve the desired results. There are but three movable operative parts, to wit, a plunger movable into and out of a stationary die, folders for infolding the wall panels secured to the upper edges of one pair of side or end walls, and a bottom carton retainer to provide a bottom support for the blanks during and after erection and for permitting erected cartons to escape from the machine. Separate and independent moving means are provided for each of these operative elements. In the form here specifically disclosed the plunger and the movable panel folders are powered by valve-controlled hydraulic or pneumatic cylinders. The bottom retainer is powered by a solenoid. The solenoid is, of course, electrically actuated, and so are the valves which control the plunger and panel folder cylinders. Electrical energization of the solenoid and the valves is controlled by a series of switches provided on the machine and actuated by parts of the machine at appropriate times during a cycle of operation. The cycle is adapted to be started

automatically as soon as a blank has been properly positioned above the die, there to be engaged by the plunger and moved into the die. Such initiation of the cycle of operation is accomplished by means of switches adapted to be engaged by the blank when the latter is in proper position and to actuate the plunger valve so as to cause the plunger to move into the die.

By reason of the construction, arrangement and operative interconnection of the various parts of the machine here under discussion, a simple apparatus has been produced which is so reliable in operation as to make it feasible for such machines to be acquired and used by concerns needing only a moderate quantity of cartons. This is particularly significant in the fruit and vegetable industry, where individual growers or groups of growers wish to package their products in corrugated board boxes erected at the point of use but whose operation are not sufficiently extensive to warrant the great expenses involved in acquiring and using the types of carton erection machines heretofore available. The present invention makes automatic machine erection of cartons much more widely available.

To the accomplishment of the above, and to such other objects as may hereinafter appear, the present invention relates to the construction and arrangement of a carton erecting machine as defined in the appended claims and as described in this specification, taken together with the accompanying drawings, in which:

Fig. 1 is a side elevational view, partly broken away, of the machine of the present invention;

Fig. 2 is a three-quarter perspective view of the apparatus;

Fig. 3 is a cross sectional view taken along the line 3—3 of Fig. 1, the movable panel folders being shown in an intermediate position;

Fig. 4 is a fragmentary end elevational view taken along the line 4—4 of Fig. 2;

Fig. 5 is a top plan view of a blank adapted to be erected by the apparatus of the present invention, certain portions of that apparatus being shown in broken lines in the positions which they assume when the blank is properly positioned above the die preparatory to being forced into the die;

Fig. 6 is a schematic view illustrating the positions assumed by the blank, the plunger, and the wedge-like folding blocks at the very beginning of the folding sequence;

Fig. 6A is a three-quarter perspective view of the blank showing the position which the various parts assume a moment after the apparatus has assumed its position shown in Fig. 6;

Fig. 6B is a three-quarter perspective view of the blank showing the positions which the parts assume at a later time in the movement of the plunger downward;

Fig. 7 is a schematic view showing the die, the wedge-like folding blocks and the blank, the plunger being shown in its lowermost position;

Fig. 8 is a three-quarter perspective view of the blank in the position it assumes in Fig. 7;

Fig. 9 is a schematic view showing the die, plunger, movable folders, and the means for moving said folders, all in the position which they assume after the plunger has been withdrawn from the die;

Fig. 10 is a view similar to Fig. 9 but without the plunger and showing the folders moved to their operative folding position;

Fig. 11 is a schematic view showing the die, movable folders, means for moving the folders, bottom retainer, and means for moving the bottom retainers, the bottom retainers being shown in their operative position supporting an erected blank;

Fig. 12 is a view similar to Fig. 11 but showing the

3

positions of the various parts as the folders move to their inoperative position and with the bottom retainers in their inoperative position;

Fig. 13 is a bottom plan view of the apparatus of Fig. 12 showing the bottom retainers;

Fig. 14 is a three-quarter perspective view of the erected container; and

Fig. 15 is a schematic wiring diagram of the electrical controls for the machine.

The machine is mounted on a support generally designated 2 and comprising legs 4 supporting a tabletop frame 6. The lower portion of the legs are reinforced by tie bars 8 and 10, and the upper portions of the legs 4 are secured together by tie bars 12 and 14. The central portion of the tabletop frame 6 is provided with an aperture 16 considerably greater in size than the outside size and shape of the carton to be erected. Mounted on the tabletop 6 over the corners of the aperture 16 by means of brackets 17 are four wedge-like blocks 18, the upper surfaces 20 of the blocks 18 being inclined inwardly and downwardly toward the central portion of the tabletop 6. Side guide plates 22 extend up from the tabletop 6 outside the blocks 18 and at the sides of the aperture 16. A stop plate 24 extends up from the tabletop 6 adjacent the righthand end of the aperture 16 as viewed in Fig. 1. Adjacent either end thereof is a switch 30 having a plunger 28 projecting toward the aperture 16 and covered by a movable or guidable plate 26.

A bracket 32 is secured to the rear of the support 2 (the righthand side as viewed in Fig. 1), extends up above the tabletop 6, and has an arm 34 extending over the tabletop 6. The switches 30 may be mounted on the bracket 32. Secured to the arm 34 and extending out therefrom partially over the aperture 16 in the tabletop 6 is a support 36 upon which a power cylinder 38 is mounted, the cylinder 38 being either of the hydraulic or pneumatic type. In the form here specifically disclosed it is a pneumatic cylinder. Extending downwardly from the cylinder 38 is a piston rod 40 which carries at its lower end a plunger 42 of substantially the same shape as the bottom wall of the container to be erected. The plunger 42 is in registration with the aperture 16 in the tabletop 6 and is, upon appropriate actuation of the cylinder 38, movable between its withdrawn position shown in Fig. 1, well above the tabletop 6, and a projected position shown in Fig. 7 in which it passes through and beyond the aperture 16. The plunger 42 carries guide rods 46 and 48 respectively, the rod 46 sliding through bushing 50 on the support 36 and carrying a finger element 52 adjustably positionable along its upper end, the tip of the finger element 52 being engageable, when the plunger 42 is projected through the aperture 16 in the tabletop 6, with the plunger 54 of a switch 56 mounted on the fixed support 36. (See Fig. 7.) The rod 48 carries an adjustably positionable finger element 58 the tip of which is in line with a trip finger 60 pivotally mounted on plate 62 secured to the side of the bracket arm 34, a tension spring 64 being connected between the portion 66 of the trip finger 60 and an anchoring element 68 on the plate 62. A switch 70 is mounted on the plate 62 and has a plunger 72 extending up therefrom to a point immediately below the portion 66 of the trip finger 60. (See Fig. 9.)

A folding die generally designated 74 is mounted on the support 2 by means of the support plates 75 so as to be located beneath the tabletop 6 and in registration with the opening 16 therein. This die comprises end walls 76 and side walls 78, and has an inner size and shape substantially the same as the desired outer size and shape of the erected container. Guide bars 80 extend upwardly and outwardly from the central portions of the side walls 78 of the die 74, being secured thereto by means of brackets 81. Auxiliary walls 82 incline upwardly and outwardly from the top edges of the end walls 76 of the die to the corresponding edges of the aperture

4

16 in the tabletop 6 adjacent the lower edges of the side guide plates 22.

A pair of shafts 84 and 86 are rotatably mounted on brackets 88 fastened to the support plates 75, the shafts 84 and 86 being located just above and slightly to one side of the upper edges of the die side walls 78, and between those upper edges and the lower edges of the guide bars 80. These shafts are each provided with a pair of L-shaped arms 90, one on each side of the guide bars 80, and these arms carry at their upper ends a bar 92 which extends substantially the full length of the die side walls 78. At one end each of the shafts 84 and 86 are provided with sprocket wheels 94 around which sprocket chains 96 extend, the lower portions of the sprocket chains 96 passing around sprocket wheels 98 journaled for rotation in the bracket 100 which extends across the frame 2. Mounted on and extending below the bracket 100 is a power cylinder 102, which may be either of the hydraulic or pneumatic type. In the form here specifically disclosed it is of the pneumatic type. A piston rod 104 extends up from the cylinder 102 and carries a crosshead 106 which is secured at each end, at 108, to the sprocket chains 96. Thus movement of the piston rod 104 between its extended position shown in Figs. 1 and 9 and its withdrawn position shown in Fig. 10 will cause the shafts 84 and 86 to rotate so that the bars 92 will assume their outer positions shown in Figs. 1 and 9, in which they are beyond the open top of the die 74, and their operative positions shown in Fig. 10 in which they have moved into the die 74.

Carried by the shaft 86 at one end thereof is a trip finger 110 which, when the shaft 86 is rotated so that the folder bar 92 carried thereby is in its position shown in Fig. 10, will engage the plunger 112 of a switch 114 mounted on the bracket 116.

Pivotally mounted on the outside of the support plates 75 by pins 118 are box release hooks 120, the hooked part of each pair of hooks 120 adjacent each side of the die 74 supporting a plate 122 which extends across the open bottom of the die 74 and is positioned below that open bottom by a distance substantially equal to the height of an erected carton. Springs 124 are operative between the hooks 120 so as to urge them toward one another, in which position, as best shown in Fig. 11, the plates 122 are inside a vertical projection of the inner surfaces of the die 74. Links 126 connect the plates 122 to solenoids 128 mounted on brackets 130, and energization of the solenoids 128 are effective to pull the links 126 outwardly, thus causing the hooks 120 to pivot outwardly and move the plates 122 carried thereby to positions outside a vertical projection of the interior surfaces of the die 74. (See Fig. 12.)

An air tank 132 is mounted on the frame 2, and appropriate pneumatic connections 134 are provided between the air tank 132 and a valve 136 which controls the application of air pressure within the cylinder 120. Suitable pneumatic connections 138 are provided between the air cylinder 132 and the valve 140 controlling the application of pressure within the cylinder 38, the connections 138 including a pair of air pressure regulators 142 and 144 each provided with a pressure gauge 146 and 148 respectively and separated by an air inlet connection 150 by means of which the supply of air in the tank 132 may be replenished. The settings of the regulators 142 and 144 will control the speed at which the pistons in the cylinders 102 and 38 respectively will operate.

A platform 152 is provided in the frame 2 beneath the die 74 and the plates 122 carried by the box release hooks 120. This platform is here specifically disclosed as stationary, but it is within the scope of the present invention to make it in the form of a slow moving conveyor.

The blank generally designated 153, upon which the herein disclosed machine is specifically designed to operate, is best shown in Fig. 5. It comprises a bottom

5

wall panel 154, side wall panels 156 and end wall panels 158 foldably connected thereto, flaps 160 foldably connected to the end walls 158 and otherwise separated from the blank by means of cuts 162, and inner side wall panels 164 foldably connected to the upper edges of the side wall panels 156. The inner side wall panels 164 may be provided with tabs 166 adapted, when the container is erected, to be lockingly received within apertures or depressions 168 appropriately positioned on the bottom wall panel 154.

Operation

The mode of operation of the present machine will now be described, the electrical interconnection between the various elements, as shown in Fig. 15, being explained in connection therewith. Preparatory thereto, it should be noted that the power for operation of the plunger 42 and the movable folders 92 is derived pneumatically from the air tank 132 and that the valves 136 and 140 for the power cylinders 102 and 38 respectively are electrically energized and controlled, and will remain in a given position, once they reach that position, until energized in a contrary sense. The solenoids 128 are also electrically energized or controlled. Electrical power may be 110 volts A. C. and is stepped down to 8 volts by transformer 174, connected to the lines 170 and 172 by lines 176 and 178 respectively. The 8-volt output from the transformer 174 is fed along lines 180 and 182 respectively to points 184 and 186.

With the apparatus in its initial position, ready to operate upon a blank, the valve 140 for the cylinder 138 is energized so that the plunger 42 is withdrawn (up), the valve 136 for the cylinder 102 is energized so that the piston rod 104 is extended (up), and the solenoids 128 are de-energized. Various operative parts of the machine will therefore assume their position shown in Fig. 1.

A blank 153 is then moved into position. When it is in position, and as may best be seen from Fig. 6, each of its flaps 160 will be over the wedge-like blocks 18 and the blank 153 will thus be supported above the tabletop 6 on the raised outer portions of the blocks 18 as shown in phantom lines in Fig. 1. Prior orientation of the blank 153 is assured by sliding the blank between the side guide plates 22. When the blank is in position the righthand end thereof as viewed in Fig. 1 will engage the plates 26, two of which are employed, one on each side of the centerline of the tabletop 6. These plates 26 will thus be moved by the blank 153 so as to close the switches 30, which are connected in series. A circuit may then be traced from point 184 through lines 188 and 190 to the first switch 30, through that switch 30 and line 192 to the second switch 30, through line 194 to the valve 140 and then through return line 196 to point 186. The valve 140 will thus be energized to cause the piston rod 40 to be extended from the cylinder 38, the plunger 42 thus being carried downwardly.

The plunger 42 has a size and shape corresponding to the bottom panel 154 of the blank 153 and is positioned in registration therewith. It will first move downwardly to the position shown in Fig. 6, and as it moves beyond that position it will move the blank 153 down with it. Since the blocks 18 extend up above the tabletop 6, at first only the flaps 160 of the blank 153 will be bent up to a position represented in Fig. 6A. As the plunger 42 continues to move downwardly the end walls 158 of the blank will engage with the inclined walls 82 so that the end walls 158 will start to fold upwardly relative to the bottom wall 154. As the plunger 42 continues to descend the side walls 156 of the blank will engage with the inclined walls 80, and hence they will commence to fold up with respect to the bottom wall 154. The blank will then assume a position such as that shown in Fig. 6B.

The plunger 42 moves downwardly into the die 74

6

through the open top thereof until the bottom wall 154 of the blank 153 is positioned below the upper edges of the die 74 by a distance substantially corresponding to the depth of an erected container. (See Fig. 7.) When it has reached this position the side walls 156 and the end walls 158 will both be perpendicular to the bottom wall 154, and the flaps 160 will be received inside the side walls 156, as shown in Fig. 8. The inner end wall panels 164 will remain upright.

When the plunger 42 has reached the lower limit of its travel the finger 52 carried by the rod 46 will engage the plunger 54 of the switch 56 to close the latter. A circuit may then be traced from point 184 through lines 188 and 198 to the switch 56, through the switch 56 and along line 200 to the valve 140, and then along line 196 to point 186. The valve 140 will thus be energized to cause the piston rod 40 to be withdrawn within the cylinder 38. Of course, the energization of the valve 140 to piston rod projecting position (down) through the closing of the switches 30 is no longer in effect, since the switches 30 opened as soon as the blank was moved by the plunger 42 out of engagement with the switch actuating elements 26.

While the plunger 42 was moving downwardly the finger 58 carried by the rod 48 engaged the trip finger 60 and caused that finger 60 to pivot in a counter-clockwise direction as viewed in Fig. 1. This had no effect on the switch 70, and after the element finger 58 passed the trip finger 60 the spring 64 returned the trip finger 60 to its illustrated position. Upon upward movement of the plunger 42, however, engagement between the element 58 carried by the rod 48 and the trip finger 60 will cause the latter to pivot in a clockwise direction, the trip finger portion 66 thus depressing the plunger 72 of the switch 70 so as to close the switch 70. (See Fig. 9.) A circuit may then be traced from point 184 through line 188 to the switch 70 and then from line 202 to valve 136 for the power cylinder 102, the circuit being completed via line 204 to point 186. Energization of the valve 136 in this sense will cause the piston rod 104 to be withdrawn within the cylinder 102. The corresponding motion of the sprocket chains 96 will cause the shafts 84 and 86 to rotate to move the arms 90 and folding bars 92 from their positions shown in Fig. 9 to their positions shown in Fig. 10. In thus moving the movable folding bars 92 will engage the upstanding panels 164 of the blank 153 and fold them down into the container so that they extend along the inner surfaces of the flaps 160 and so that their tabs 166 are lockingly received within the apertures 168 in the bottom wall 154. This will complete the erection of the container.

When the shafts 84 and 86 have moved to their position shown in Fig. 10 the trip finger 110 will engage the plunger 112 of the switch 114 so as to close the latter. A circuit may then be traced from point 184 through line 206 to switch 114 and then, via lines 208 and 210, to the valve 136 and the cylinder 102, the circuit being completed through line 204 to point 186. The valve 136 will thus be actuated to cause the piston rod 104 to be extended from the cylinder 102, the sprocket chains 96 will move in the opposite direction, and the shafts 84 and 86 will rotate to bring the movable folding bars 92 back to their initial position.

The carton thus erected will be frictionally retained within the die 74. The apparatus will now be in condition for another cycle of operation, to be initiated when a new blank 153 is properly positioned over the die 74 so as to close the switches 30. As this next blank is forced into the die 74 it will engage the upper edges of the previously erected blank and force that blank downwardly out through the open bottom of the die 74.

In the form here specifically disclosed it is desired that some more or less positive means be provided for supporting the bottom of the blank being erected or at least positively preventing excessive downward move-

ment of the blank 153 in the die 74 prior to the infolding of the panels 164. It is here that the plates 122 carried by the box release hooks 120 come into play, those plates defining a bottom carton support. When the previously erected container has been pushed out from the die 74 by the blank newly being erected, it will fall down onto and be supported by the plates 122, and in this position will define a support for, or at least will provide a means for positively limiting the downward movement of, the blank in the process of erection. After the new blank has been erected, however, the previously erected blank must be dispensed. Accordingly, one of the shafts 84 or 86, and here shown as the shaft 86, is provided with a cam 212 (see Figs. 4 and 11) having a raised portion 214 and a lower portion 216. The cam cooperates with a pivotally mounted trip finger 218 which in turn is operatively associated with plunger 220 of switch 222, a tension spring 224 being active on the trip finger 218 as shown in Fig. 4, so as to retain the trip finger 218 in a position close to but out of engagement with the switch plunger 220. When the trip finger 218 engages with the lower portion 216 of the cam 212 the trip finger 218 will assume a position in line with the spring 224 and out of engagement with the switch plunger 220. When the trip finger 218 is engaged with the raised portion 214 of the cam 212 it will assume a position at an angle to its spring 224. When the shaft 86 is rotating in a direction such as to move the folding plates 92 into the die 74 the direction of rotation of the cam 212 will be as shown in Fig. 4, and consequently the trip finger 218 will still not engage with the switch plunger 220. When the folding bars 92 have reached their fully operative position shown in Figs. 10 and 11 the trip finger 218 will engage the lower portion 216 of the cam 212 and will therefore assume a position in line with the spring 224 but still not operatively engaging the switch plunger 220. As the folding bars 92 return to their normal positions shown in Figs. 1 and 8 the trip finger 218 will engage the raised cam portion 214, and this time will be pivoted clockwise from its spring urged position as viewed in Fig. 4, depressing the switch plunger 220 and closing the switch 222. A circuit may then be traced directly from line 170 through line 225 to switch 222, then through lines 226 and 228 to solenoid 128 and then through line 230 to line 172. A circuit may similarly be traced from line 226 through line 232 to the other solenoid 128, and then through line 234 and line 236 to line 172. The solenoids 128 will thus be energized, the box release hooks 120 will be pulled outwardly, and the container supported by the plates 122 carried thereby will be permitted to drop freely onto the platform 152. At some time prior to the return of the folding bars 92 to their normal position the trip finger 218 will move off of the raised cam portion 214 and onto the lowered cam portion 216, the trip finger 218 will resume its spring urged position, the solenoids 128 will be de-energized, and the springs 124 will pull the box release hooks 120 back to their normal position, in which the plates 122 carried thereby are beneath the open bottom of the die 74, and in position to receive and support the erected carton then in the die 74 when that carton is pushed out from the die 74 by the next carton to be erected.

A manual control switch 238 may be provided, and may be mounted on the bracket arm 34, electrically in parallel with the switch 114 in order, when actuated, to cause the movable folding bars 92 to return to their normal position if they become jammed during automatic operation. Manual actuation of the exposed switch 56 will cause the plunger 42 to return to its normal withdrawn position in the event that it should become jammed.

It will be seen from the above description that the box erecting machine of the present invention is of extremely simplified construction and may be manufactured at low cost. By reason of the arrangement and inter-

connection of parts a fairly complicated folding sequence may be accomplished in a positive and automatic manner. In actual operation the machine has shown itself capable of producing properly erected cartons almost as fast as blanks can be fed thereto.

While but a single embodiment of the present invention has been here disclosed, it will be apparent that many variations may be made therein, all within the spirit of the invention as defined in the following claims.

We claim:

1. A carton erecting machine comprising a support, a blank folding die the interior of which is substantially of the size and shape of the outside of an erected carton, said die being mounted on said support and having an open top and an open bottom, a bottom carton retainer mounted on said support and movable between first and second positions respectively beneath and beyond the open bottom of said die at a distance from the open top thereof which is at least n times the depth of an erected carton, where n is any integer greater than 1, whereby at least two carton-erected blanks may be supported one above the other on said bottom support, at least the uppermost of said carton-erected blanks being within said die, means for moving said bottom retainer between said first and second positions, a plunger movable into said die via the open top thereof to a distance above said bottom retainer no less than the depth of a single carton-erected blank, and an interlock between said plunger and said means for moving said bottom retainer effective to move said bottom retainer from its first to its second position only after said plunger has moved into said die to said distance, whereby a blank moved into said die by said plunger will move the preceding carton-erected blank down onto said bottom retainer and said preceding carton-erected blank will pass down beyond said bottom retainer after said plunger has moved the next succeeding blank into said die.

2. The carton erecting machine of claim 1, in which the inner portion of said die at least at its upper portion is of closely the same inside size as the outside size of a carton-erected blank, thereby to frictionally hold the upper of said carton-erected blanks in place therein, the interior of the defined structure being at least somewhat larger than the outside size of a carton-erected blank for a distance above said bottom retainer substantially corresponding at least to the depth of a single carton-erected blank, whereby the lower of said carton-erected blanks is retained within said structure substantially solely by said bottom retainer and will fall out from said structure when said bottom retainer is moved to its second position.

3. The carton erecting machine of claim 1, in which said machine comprises panel folders mounted on said support and movable between first and second positions respectively beyond and over the open top of said die, means for moving said panel folders between said first and second positions, and a second interlock between said plunger and said means for moving said panel folders, said first mentioned and second interlocks being effective to cause said panel folders to move from their first to second positions only after said plunger has moved into said die to said distance, and to cause said bottom retainers to move from their first to second positions only after said panel folders have moved to their second positions.

4. The carton erecting machine of claim 3, in which the inner portion of said die at least at its upper portion is of closely the same inside size as the outside size of a carton-erected blank, thereby to frictionally hold the upper of said carton-erected blanks in place therein, the interior of the defined structure being at least somewhat larger than the outside size of a carton-erected blank for a distance above said bottom retainer substantially corresponding at least to the depth of a single carton-erected blank, whereby the lower of said carton-

9

erected blanks is retained within said structure substantially solely by said bottom retainer and will fall out from said structure when said bottom retainer is moved to its second position.

5. The carton erecting machine of claim 3, in which said first mentioned and second interlocks are effective to cause the following sequence of operations: (1) plunger moves into die to said distance, (2) plunger moves out of die, (3) panel folders move from first to second position, (4) panel folders return to first position, (5) bottom retainer moves from first to second position.

6. The carton erecting machine of claim 1, in which said interlock is effective to move said bottom retainer from first to second position only after said plunger has moved into and then out from said die.

7. A carton erecting machine comprising a support, a blank folding die the interior of which is substantially of the size and shape of the outside of an erected carton, said die being mounted on said support and having an open top and an open bottom, a bottom carton retainer mounted on said support and movable between first and second positions respectively beneath and beyond the open bottom of said die at a distance from the open top thereof substantially corresponding to the depth of an erected carton or to a multiple thereof, means for moving said bottom retainer between said first and second positions, a plunger movable into said die via the open top thereof to a distance above said bottom retainer no less than the depth of a single carton-erected blank, and an interlock between said plunger and said means for moving said bottom retainer effective to move said bottom retainer from its first to second position only after said plunger has moved into said die to said distance and then has moved out of said die, whereby said bottom retainer will at least indirectly define a bottom support for the blank moved into said die by said plunger after said blank has been fully moved thereinto.

8. The carton erecting machine of claim 7, in which said machine comprises panel folders mounted on said support and movable between first and second positions respectively beyond and over the open top of said die, means for moving said panel folders between said first and second positions, and a second interlock between said plunger and said means for moving said panel folders, said first mentioned and second interlocks being effective to cause said panel folders to move from their first to second positions, only after said plunger has moved into said die to said distance, and to cause said bottom retainer to move from its first to second position only after said panel folders have moved to their second positions.

9. The carton erecting machine of claim 8, in which said first mentioned and second interlocks are effective to cause the following sequence of operations: (1) plunger moves into die to said distance, (2) plunger moves out of die, (3) panel folders move from first to second position, (4) panel folders return to first position, (5) bottom retainers move from first to second position.

10. A carton erecting machine comprising a support, a blank folding die having an open top, a plunger movable on said support through the open top of said die between a first position within said die and a second position withdrawn from said die, means for moving said plunger, a first control element on said support adjacent said die and adapted to be operatively engaged and actuated by a carton blank when the latter is in position above said die, a second control element on said support, a member movable with said plunger and actuatingly operatively engageable with said second control element when said plunger is in its first position, and operative connections between said first and second control elements and said means for moving said plunger effective, upon actuation of said first control element, to cause said plunger to move from its second to first position and, upon actua-

10

tion of said second control element, to cause said plunger to move from its first to second positions.

11. In the carton erecting machine of claim 10, panel folders on said support and movable between first and second positions beyond and over said die, means for moving said panel folders, a third control element on said support, a member movable with said plunger and actuatingly operatively engageable with said third control element by movement of said plunger toward its second position, a fourth control element on said support, a member movable with said panel folders and actuatingly operatively engageable with said fourth control element when said panel folders are in their second position, and operative connections between said third and fourth control elements and said means for moving said panel folders effective, upon actuation of said third control element to cause said panel folders to move to their second position and, upon actuation of said fourth control element, to cause said panel folders to move to their first position.

12. In the carton erecting machine of claim 11, said die having an open bottom, a bottom carton retainer mounted on said support and movable between first and second positions respectively beneath and beyond the open bottom of said die, means for moving said bottom retainer, a fifth control element on said support, an element movable with said panel folders and actuatingly operatively engageable with said fifth control element upon movement of said panel folders toward their first position, and an operative connection between said fifth control element and said means for moving said bottom retainer effective, upon actuation of said fifth control element, to cause said bottom retainer to move to its second position and to cause said bottom retainer to move to its first position when said fifth control element is not actuated.

13. In the carton erecting machine of claim 11, said die having an open bottom, a bottom carton retainer mounted on said support and movable between first and second positions respectively beneath and beyond the open bottom of said die, means for moving said bottom retainer, a fifth control element on said support, an element movable with said panel folders and actuatingly operatively engageable with said fifth control element upon movement of said panel folders toward their first position, said element being operatively disengaged from said fifth control element when said panel folders are in their first position, and an operative connection between said fifth control element and said means for moving said bottom retainer, effective, upon actuation of said fifth control element, to cause said bottom retainer to move to its second position when said fifth control element is actuated and to cause said bottom retainer to move to its first position when said fifth control element is not actuated.

14. In the carton erecting machine of claim 11, said die having an open bottom, a bottom carton retainer mounted on said support and movable between first and second positions respectively beneath and beyond the open bottom and said die, means for moving said bottom retainer comprising resilient means for urging said bottom retainer to its first position and forcing means for moving said bottom retainer to its second position in opposition to the action of said resilient means, a fifth control element on said support, an element movable with said panel folders and actuatingly operatively engageable with said fifth control element upon movement of said panel folders toward their first position, and an operative connection between said fifth control element and said forcing means effective to actuate said forcing means to move said bottom retainer to its second position when said fifth control element is actuated and effective to render said resilient means active to move said bottom retainer to its first position when said fifth control element is not actuated.

11

15. In the carton erecting machine of claim 11, said die having an open bottom, a bottom carton retainer mounted on said support and movable between first and second positions respectively beneath and beyond the open bottom of said die, means for moving said bottom retainer comprising resilient means for urging said bottom retainer to its first position and forcing means for moving said bottom retainer to its second position in opposition to the action of said resilient means, a fifth control element on said support, an element movable with said panel folders and actuatingly operatively engageable with said fifth control element upon movement of said panel folders toward their first position, said element being operatively disengaged from said fifth control element when said panel folders are in their first position, and an operative connection between said fifth

12

control element and said forcing means effective to actuate said forcing means to move said bottom retainer to its second position when said fifth control element is actuated and effective to render said resilient means active to move said bottom retainer to its first position when said fifth control element is not actuated.

References Cited in the file of this patent

UNITED STATES PATENTS

10	1,287,032	Johnson -----	Dec. 10, 1918
	2,653,524	Hickin -----	Sept. 29, 1953
	2,684,616	Hickin -----	July 27, 1954
	2,697,968	Cote et al. -----	Dec. 28, 1954
15	2,727,444	Wethe -----	Dec. 20, 1955