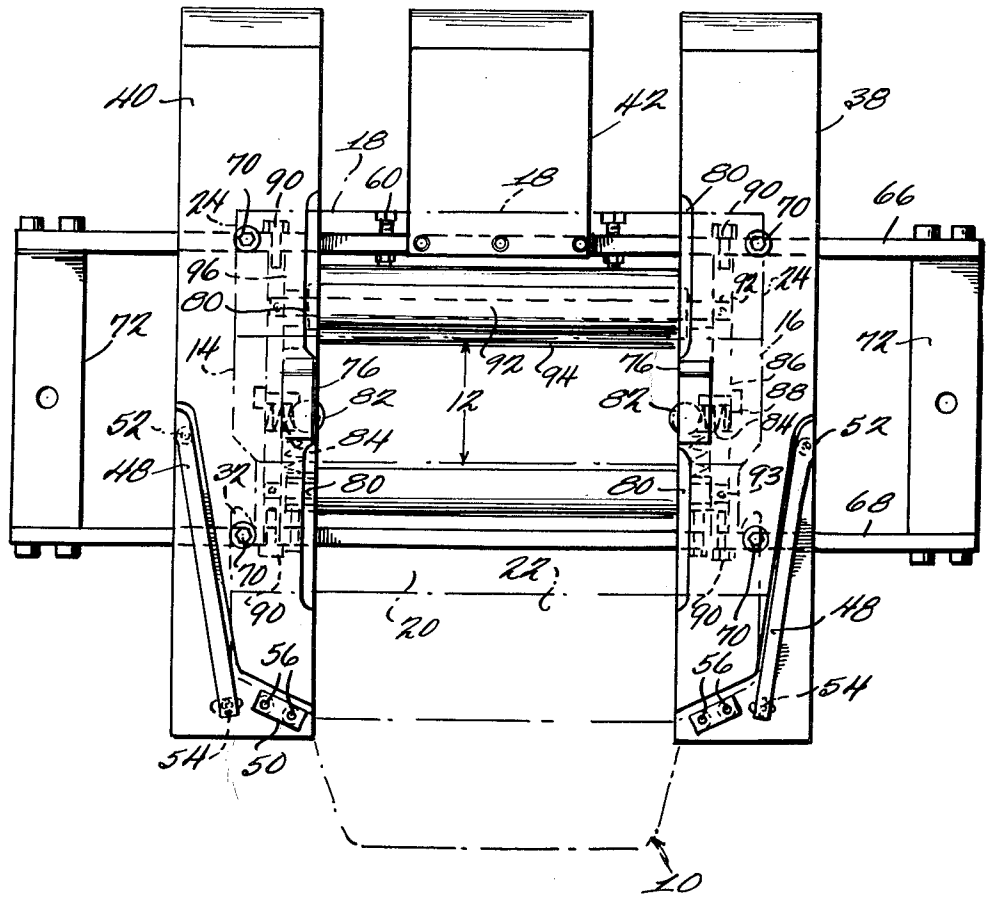
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BOXMAKER

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Fig. 1



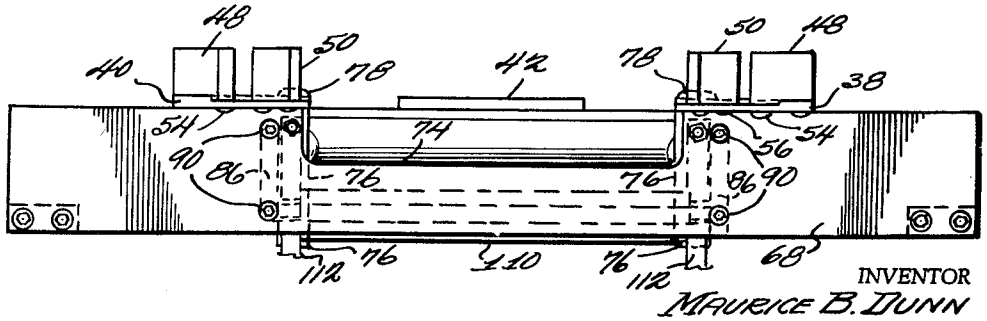


Fig. 5

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Fig. 16

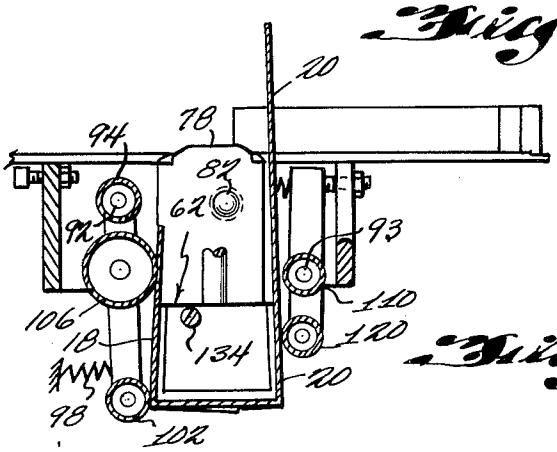


Fig. 15

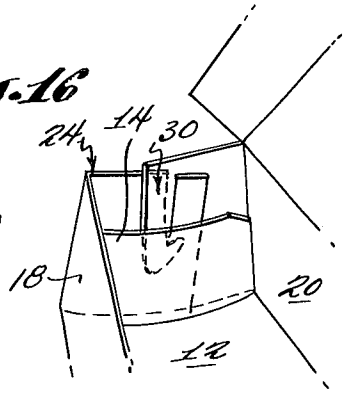


Fig. 17

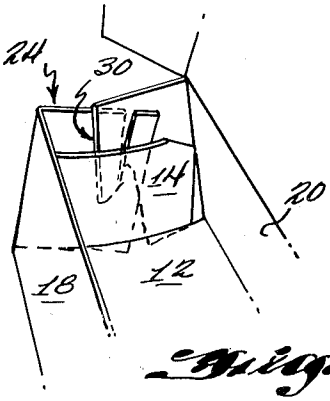


Fig. 18

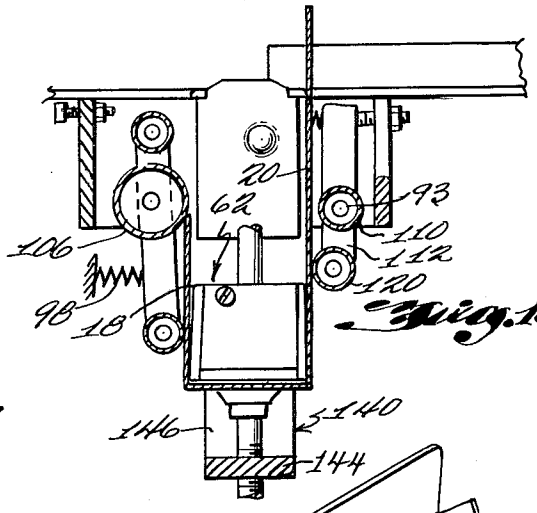


Fig. 3

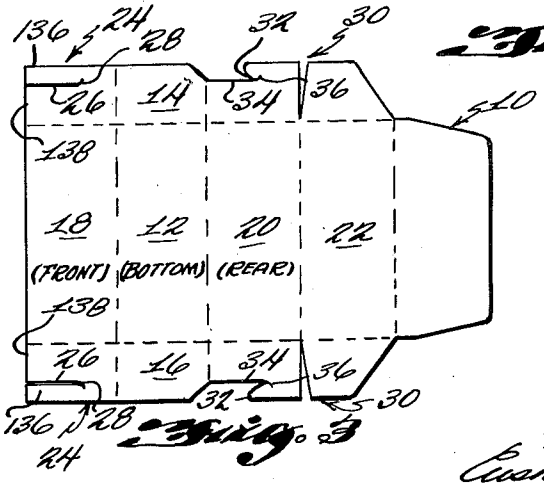
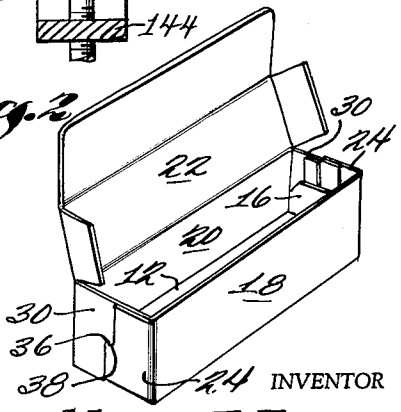


Fig. 2



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Fig. 6

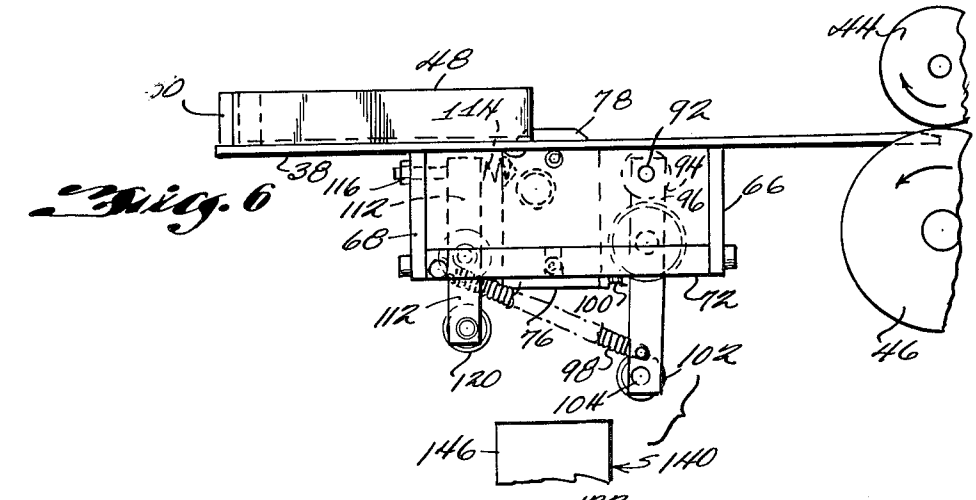


Fig. 4

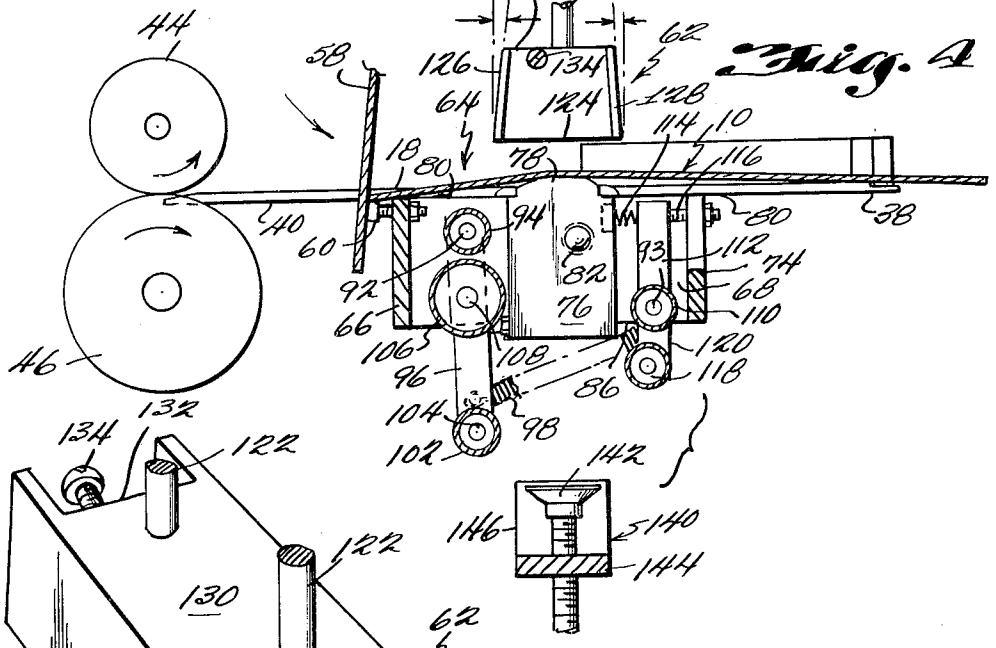
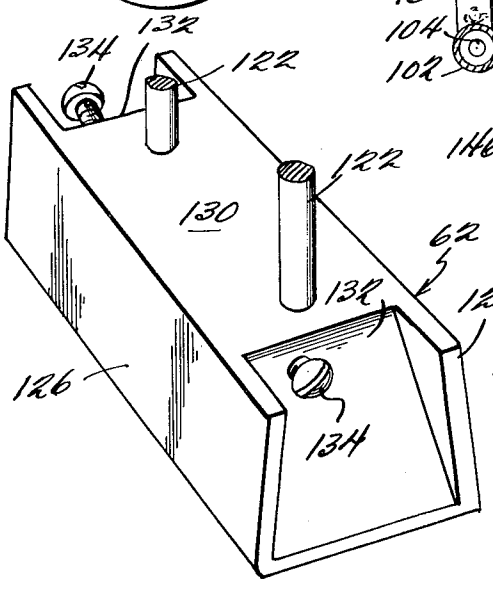


Fig. 7



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Fig. 8

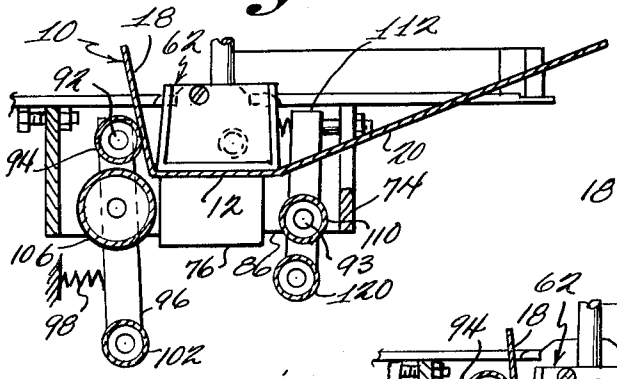


Fig. 9

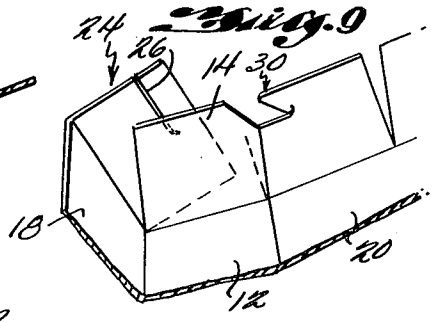


Fig. 10

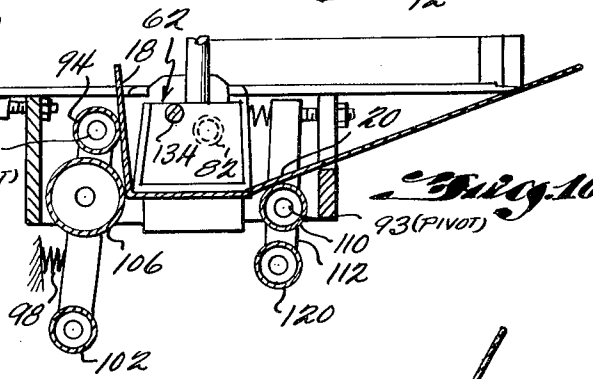


Fig. 11

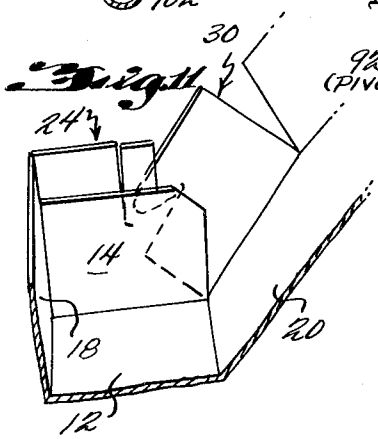


Fig. 12

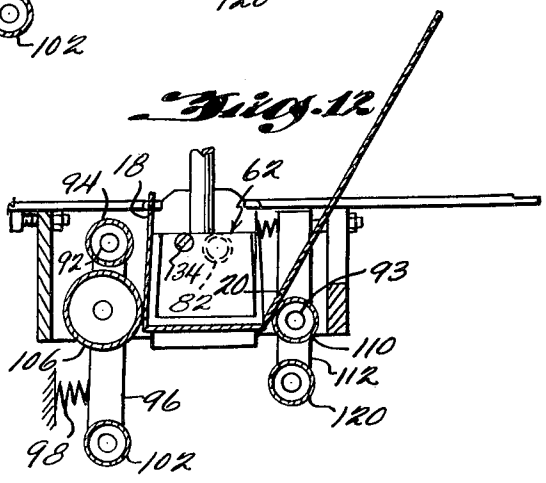


Fig. 13

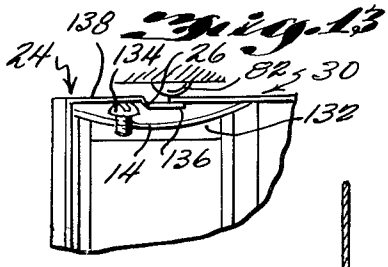
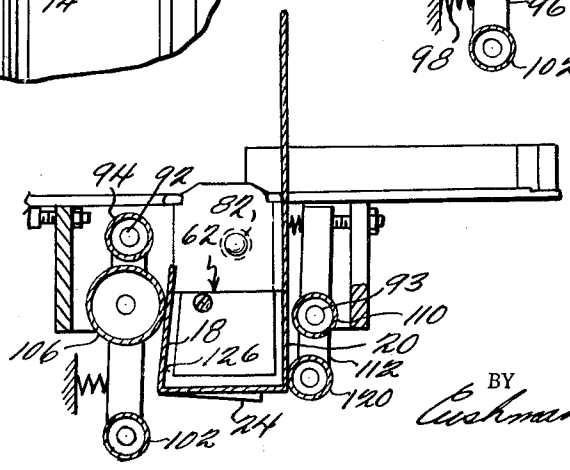


Fig. 14



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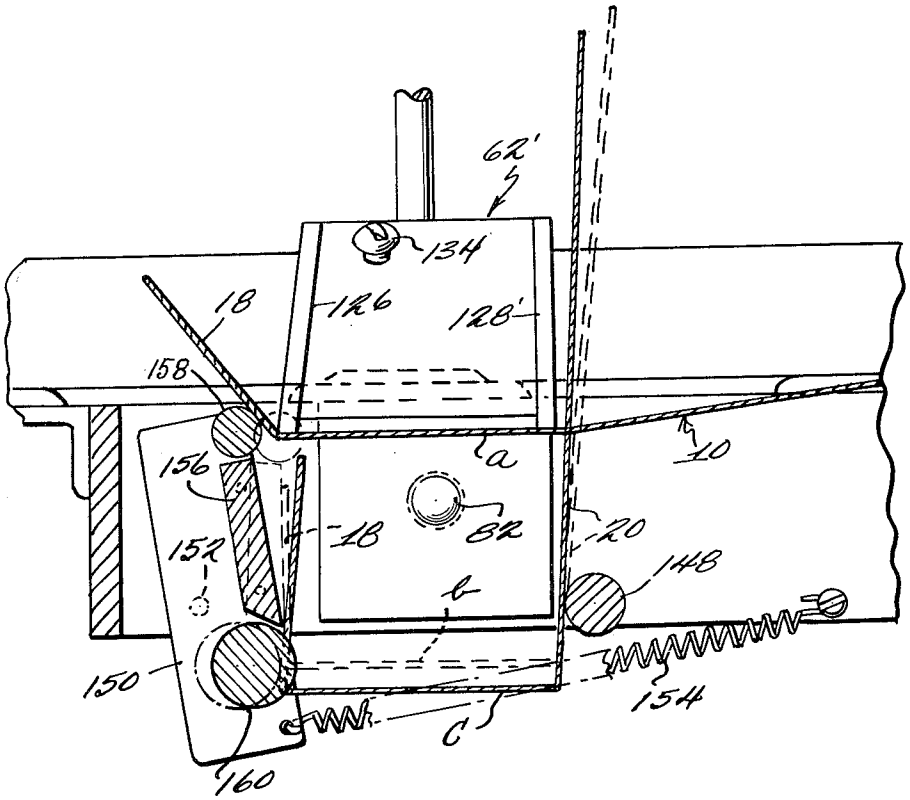


Fig. 19

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United States Patent Office 3,168,018 Patented Feb. 2, 1965

3,168,018

BOXMAKER

Maurice B. Dunn, Charlotte, N.C., assignor to Memco Machinery Corporation, Charlotte, N.C., a corporation of North Carolina

Filed Sept. 18, 1962, Ser. No. 224,374
19 Claims. (Cl. 93—51)

This invention relates to an apparatus for setting up a carton blank into box form, and, more particularly, to a machine for at least partially setting up such a blank into the general form of a donut type box, which will hold a half dozen donuts, for example.

The invention is not necessarily limited to the setting up of donut type boxes, but to cartons generally, since any other type box which is long relative to its width may be included as can be a cover for such a box.

The type of box which is hereinafter particularly described has a bottom panel with opposite lengthwise extending edges to which are respectively hingedly coupled front and back side panels each of which have a respective end flap hinged on corresponding panel ends. One of the end flaps of the front and back panels has a slot into which is inserted, when the front and back side panels are folded to a position generally perpendicular to and in the same direction from the bottom panel, a tab which is formed in the flap hinged to the other side panel. The tab and slot have respective curls that when hooked together give a positive lock that cannot be stripped open.

It is an object of this invention to provide apparatus which will set up a box of the type just described, folding it into box form with the ends of the box securely interlocked. Heretofore it has been impossible to accomplish this objective with machinery.

Boxes of the type above referred to are generally known in the art as of the Arthur lock style type.

Other objects and features of this invention will become apparent to those of ordinary skill in the art upon reading the appended claims and the following detailed embodiments in conjunction with the attached drawings, in which:

FIGURE 1 is a plan view of the female die;

FIGURE 2 shows the blank of FIGURE 3 set up into the box form effected by this invention;

FIGURE 3 illustrates a type of carton blank usable with this invention;

FIGURE 4 is a cross-sectional view of the apparatus;

FIGURE 5 is a front elevational view of the FIGURE 1 apparatus;

FIGURE 6 is a right side view of the FIGURE 1 apparatus;

FIGURE 7 is a perspective view of the male die;

FIGURES 8 through 18 are diagrammatic representations of the structure and folded carton respectively showing successive steps in the operating procedure and results; and

FIGURE 19 is a cross-sectional view similar to FIGURE 4 but of a modification of the apparatus showing diagrammatically successive steps in its operation.

In FIGURE 1, the carton or box blank is shown in broken lines resting on top of the apparatus in the position in which it is stopped after being set thereon in registry with the cavity of the female die for purposes of being erected into the form shown in FIGURE 2. As indicated in FIGURE 3, the box blank 10 includes a bottom panel 12 with end flaps 14 and 16. The dash lines between the bottom panel 12 and its end flap, as well as the remaining dash lines in FIGURE 3, refer to scores or the like which are predisposed in the carton blank for allowing a folding along the scored lines. In other words, these dash lines in FIGURE 10 represent a hinged coupling between the elements involved. On

the other hand, solid lines between different parts in FIGURE 3 indicate cuts through the material of which the blank is made, for example, paper board.

To the left of the bottom panel 12 in FIGURE 3, is a side panel 18, which for the sake of convenience will hereinafter be referred to as the "front" side panel, and hingedly coupled to the opposite lengthwise extending edge of the bottom panel 12 is another side panel 20, which accordingly will be referred to as the "rear" side panel. It will be appreciated, as the description of the box proceeds, and particularly with a realization that the panel 20 and the top panel 22 may share a transparent viewing area, that the panel 20, instead of panel 18, might well be referred to as a "front" panel instead of the "rear" panel. As far as this invention is concerned, it makes no difference which of the panels, 18 or 20, is the front or rear panel, and as above-indicated, the nomenclature being utilized in this detailed description is merely for purposes of convenience.

As will be noted in FIGURE 3, the front panel 18 has hingedly coupled to each of its opposite ends a flap 24 in which is a slot or slit 26 that extends from the outer side of the flap inwardly parallel to the end of the flap for a distance slightly more than half way, and there it curls outwardly as at 28. For purposes of mating with these slits 26, the rear panel 20 has two end flaps 30 hingedly coupled to itself at opposite ends, and each such flap has a tongue or tab 32 formed at the outward end of the flap 30 by virtue of a portion of the flap being removed or cut away along line 34. To effect the positive lock desired, line 34 as it becomes a slit adjacent tab 32 curls outwardly as at point 36 and in the set up position shown in FIGURE 2 hooks with the curl 28 in the front panel tab so that there is no possibility of the box inadvertertly opening due to disengagement of tabs 32 with their respective slots 26.

The carton blank 10 of FIGURE 3, in generally flat form, may be fed over the outer carton rest plates 38 (FIGURE 1) and 40 and the center rest plate 42 in any desirable manner, for example, as by the feed rollers 44 and 46 shown in FIGURE 4. Similarly, the carton blank may be brought to rest in the position desired on the machinery in any suitable manner. At the forward ends of rest plates 38 and 40 are upstanding guides 48 and upstanding stops 50. Preferably, rest plates 38 and 40 are recessed slightly in the area of guides 48 and stops 50 so that the lower edges of these guides and stops are below the general surface of rest plates 38 and 40, thereby eliminating the possibility of the edges of the carton blank tending to slip underneath the guides 48 or stops 50. Guides 48 are pivotally secured at respective points 52 for angular adjustment inwardly toward each other or outwardly, and are secured in the adjusted position by screws 54 or the like which cooperate with a respective slot in the recessed portion of the rest plates 38 and 40. Stops 50 are also adjustable in a direction parallel to the length of the rest plates by virtue of longitudinally extending slots in the recessed portion thereof through which screws 56 or the like are disposed to secure the stops.

In order to push the carton blank 10 onto the rest plates and against stops 50, a pair of fingers or the like may be employed to push against panel 18 as it comes out from feed rollers 44 and 46. Such a finger is indicated by numeral 58 in FIGURE 4 and comes to rest against respective stops 60 which are properly adjusted, in conjunction with stops 50, so that a carton blank comes to rest in proper registration under the male die 62 and over the female die 64. As will be noted particularly in FIGURE 4, when the carton blank 10 is at rest, it is not completely flat for its bottom end flaps 14 and 16 are elevated relative to the end flaps 24 and 30 of the front

and rear panels. The purpose of this will become more clear below during the discussion of the operation of the apparatus.

Before proceeding with the description of the operation of the machine, the details of the structure may be first noted. Rest plates **38** and **40** are spacedly secured at right angles atop and to upstanding tie support members **66** and **68**, by four screws or the like **70**. These tie supports are in turn spacedly secured to each other at opposite ends by cross members **72**, which may be utilized to secure the female die in a desired position in the overall machine. As will be noted by reference to FIGURE 5, tie support **68** is recessed as at **74** and, as will become more clear later, this is for the purpose of accommodating rear and top panels **20** and **22** during the time the blank is being depressed and folded in the die cavity.

Reference is now made to FIGURES 1, 4, 5 and 6. As will be particularly noted in FIGURE 1, each of the rest plates **38** and **40** adjacent the ends of the carton bottom panel **12** is recessed in rectangular form and inserted in the recess is a block **76**. The blocks extend upwardly slightly from the upper surface of rest plates **38** and **40** so as to form respective knolls on which the bottom end flaps **14** and **16** rest when the carton blank is in registration with the dies. To either side of blocks **76**, rest plates **38** and **40** are concavely relieved as at points **80**. These reliefs have a length at least as long as the carton end flaps **24** and **30** and cooperate with knolls **78** to assure folding up of the bottom end flaps **14** and **16** before the front and rear flaps **24** and **30**. It will be noted that knolls **78** are rounded on their inner sides and slope longitudinally toward the recesses **80**.

Each of the blocks **76** has an aperture, the inward opening of which is small enough to retain a biased ball **82**. The ball is biased by a spring **84** disposed against the outer side of the ball and held thereagainst by a closure and support plate **86**. Each plate **86**, of which there are two, one for each of the blocks **76**, is secured to a respective block **76** by screws **88** and to tie supports **66** and **68** by screws **90**.

Plates **86** also function to support the mechanism which aids in folding the carton blank as it is depressed by male die **62** into the cavity generally outlined by resting plates **38** and **40** and tie supports **66** and **68**. This mechanism includes two long shafts **92** and **94**, each of which is secured at both of its ends to the respective plates **86** by set screws or the like. On shaft **92** is disposed a roller **94** which extends slightly more than the full distance between rest plates **38** and **40**. Between the outside ends of rollers **40** and support plates **86** are pivotally secured to shaft **92** pivot bars **96** as will be particularly apparent in FIGURES 4 and 6. Pivot bars **96** extend downwardly, and at their lower end are biased inwardly by a respective spring **98** which is secured at its opposite end to the inside of the respective support plate **86**. At about its longitudinal center point, each pivot bar **96** carries a cap screw and jam nut arrangement **100** which acts as an adjustable stop against the lower end of block **76**. Generally, adjustment is made so that roller **102**, which extends the width of the cavity between rest plates **38** and **40** on a shaft **104** carried by both of the pivot bars **96**, has its inmost edge normally just slightly inward of the outside edge of the bottom-to-rear corner of the carton when same comes into contact in the cavity, for example, approximately $\frac{1}{32}$" inward. About one-third of the way down pivot bars **96** are disposed another roller **106** on a shaft **108** that extends between support plates **86**. This roller is larger than roller **102**, or roller **94**, and its periphery extends considerably inside the carton pathway so as to cause bar **96** to be pivoted about shaft **92** in an outwardly direction during progression of the male die into the cavity, as will be apparent later during the description of operation of the structure.

In the embodiment under consideration, there is also a spring biased pivot bar and set of rollers on the other side of the cavity. As indicated above, a shaft **94** extends between the opposite side supports **86**. This shaft carries a roller **110** which extends the full length of the cavity between rest plates **38** and **40**. Between the outer ends of rollers **110** and support plates **86** are disposed respective pivot bars **112**. As viewed in FIGURE 4, pivot bar **112** is biased in the clockwise direction by a respective spring **114** which is disposed between the bar and the respective block **76**, and the degree to which it is movable in that direction is set by adjusting screwstop **116** which is secured in tie support **68**. At its lower end, pivot bars **112** carry a shaft **118**, which in turn, rotatively carries a roller **120**. The inwardly facing periphery of this latter roller is, like the inner face of roller **102**, normally disposed, by virtue of the adjustment of set screw **116** to project slightly into the pathway of the carton blank as it proceeds downwardly to the cavity adjacent roller **120**, by approximately $\frac{1}{32}$", for example.

Reference is now made to FIGURE 7 to indicate some of the details of the male die **62** previously referred to in FIGURE 4. It will be apparent from these figures and the general discussion heretofore, that the male and female dies are mounted for relative vertical movement. Any particular type of mounting (not shown) desired to effect this purpose may be employed, and it will be understood that in this specific embodiment now being described the female die **64** is stationary while the male die **62** is movable vertically by virtue of its attachment to a mover (not shown) via rods **122**.

The bottom wall **124** of male die **62** is flat and corresponds in dimension to the bottom panel **12**. The side of the male die which cooperates with front panel **18** of the carton blank is designated **126**, and it will be noted that this side extends upwardly and inwardly at an acute angle relative to the vertical. Preferably, this angle is approximately 6½°, though it may range upwardly to the order of 15° and downwardly to approximately 1 to 2°. The purpose of this angle will become more clear in the later discussion of the operation of the apparatus.

The opposite side **128**, which cooperates with the rear panel **20** of the carton blank, also preferably extends upwardly and inwardly to form with the vertical a relatively small angle, for example, an angle of the order of 1½°. As will become apparent later, this angle can be reduced to 0°, or it may be increased as desired. The side walls **126** and **128** of the female die have their ends at right angles with the bottom **124** and top **130** of the male die **62**, but inbetween these side walls, the ends of the male die are relieved by an upwardly and inwardly slope **132**, say 20° relative to vertical. Considerable variation may be made in this angle. Protruding from each slope **132** to one side of the longitudinal center line of the male die is an adjustable length extension screw or stud **134**, the purpose of which is cooperation with the spring biased balls **82** during the folding operation to open slits **26** positively as will be more apparent during the following discussion of overall operation.

As has heretofore been indicated, carton blank **10** is initially properly registered in the position indicated in FIGURE 4 due to stops **50** and **60**. With knolls **78** extending upwardly above the upper surface of resting plates **38** and **40** with bottom panel end flaps **14** and **16** in registry therewith, while recesses **80** in the resting plates **38** and **40** allow front and rear panel flaps **24** and **30** to generally fall downwardly slightly, it is assured that the bottom panel flaps **14** and **16** are first from among all these flaps to start folding upwardly. Accordingly, as male die **62** moves downwardly, as indicated in FIGURE 8, bottom panel flaps **14**, as shown in FIGURE 9, precede flaps **24** and **30** in being bent relative to their respective panels, causing the bottom panel flaps to be on the inside and the front and rear flaps **24** and **30** to be on the outside. As the carton blank is pushed by the

male die 62 with the bottom panel 12 forward, i.e., downward, front panel 18 comes first into engagement with roller 94, causing this panel to fold gradually toward the vertical as is evident from FIGURE 10 wherein male die 62 is illustrated as having progressed still further downward. At the point of progression shown in FIGURE 10, rear panel 20 has started to engage roller 110 causing that panel to begin folding upwardly toward the vertical. Further downward progression of male die 62 effects folding to the degree illustrated in FIGURE 11, and further downward movement yet causes both front and rear panels 18 and 20 to be folded even more as indicated in FIGURE 12. Somewhere between the FIGURES 10 and 12 positions of male die 62, the lower left corner thereof has passed the center of roller 106 so that pivot bar 96 begins returning in a counterclockwise direction. This starts an overbending of side panel 18, i.e., begins to cause that panel to bend more than 90° and beyond the vertical. Along about this state of progression, spring biased ball 82 causes slit 26 in front panel end flap 24 to open by depressing portion 136 (see FIGURE 3) inwardly while stud 134 retains portion 138 vertical. At the same time, as shown in FIGURE 13, the rear panel end flap 30, due to the rear panel 20 being further folded by roller 110, is pushed between ball 82 and end flap portion 136. When the front panel 18 gets fully overbent against side 126 of the male die as is the case in FIGURE 14, with rear panel 20 being fairly vertical at this time, tab 32 is slipped through slot 26 approximately to the degree indicated in FIGURE 15. As indicated in FIGURES 14 and 15, the full overbend of front panel 18 causes the bottom edge of its end flap 24 to extend below the bottom of male die 62. This cocks slit 26 appropriately for full insertion and subsequent locking of tab 32 via curls 28 and 36. In FIGURE 16, rear panel 20 is also fully overbent (though, as will be recalled, especially by referring to FIGURE 4, the angle thereof is not as great as the overbending provided by the other side of male die 62) and this places tab 32 and its curl 36 in a potential locking position as shown in FIGURE 17.

During the times when there is any overbending of either front or rear sides 18 or 20, it will be appreciated that sloping recesses 132 in the ends of male die 62 allow the bottom end flaps 14 and 16 to bow inwardly or flex concavely as shown in FIGURE 13, especially as a result of the front side 18 being overbent.

Bending of the different elements of the blank by the roller apparatus is complete with the job as accomplished in FIGURE 16, giving the box configuration shown in FIGURE 17. Both bottom edges of both end flaps 24 and 30 protrude below the box at this point, but this is rectified during removal of the box from the male die. As indicated in FIGURES 4 and 6, as well as FIGURE 18, the overall apparatus includes a plunger arrangement 140. As the male die 62 moves further downward to the position shown in FIGURE 18, the plunger arrangement moves up to that position for purposes of grasping on to the folded carton and stripping it downward off the male die, while the male die moves back up to its starting position illustrated in FIGURE 4. The plunger arrangement includes, for example, three pneumatically operated vacuum cups 142 disposed longitudinally in a holder 144 at approximately equal increments along the length of male die 62. At opposite ends of holder 144 are vertically extending pusher plates 146, the upper extremity of which extends above the top of the vacuum cups to engage the carton end flaps 24, and flaps 30 also, if desired, at their bottom edges to push same upward while the vacuum cups lock onto the bottom surface of the bottom panel of the folded box to cause end flaps 24 and 30 to become erect so as to interlock same via curls 28 and 36 with tab 32 inserted in slot 26. The positive interlock between the end flaps 24 and 30, as thus effected, is such that these flaps cannot be easily stripped open, and the resultant box illustrated in FIGURE 2 is ready for use as it is disposed in an appropriate position for filling, as on a conveyer line to which it has been lowered by virtue of the vacuum cup arrangement 140.

FIGURE 19 relates to a modification of the apparatus heretofore described, and is quite similar except male die 62' has its side 128' vertical instead of angulated as in the previous embodiment. This means that there needs to be no bias on roller 148, and that roller is fixed in its rotative position to cause side panel 20 to be elevated to the vertical. On the opposite side, male die 62' is still angulated to a degree similar to that of the previous embodiment, but the arrangement causing the overbend by front panel 18 of the carton is slightly different than heretofore described. In the FIGURE 19 embodiment, two bars 150 are pivoted at opposite ends of the female die at points 152, with each bar 150 being biased counterclockwise by a spring 154. Between the two pivot bars 150 extends a cross bar 156 which keeps the two pivot bars operating in unison, and at opposite ends of the pivot bars are disposer rollers 158 and 160. The biased condition of the pivot bars and their respective rollers are shown in solid line and these are the positions for the carton 10 when it is in its solid line (*a*) position. As the male die moves downwardly to place carton blank 10 successively in positions (*b*) and (*c*), rollers 158 and 160 are pivoted counterclockwise, as indicated by the respective broken line circles. Therefore, side 18 is overbent in the same manner as previously described. From position (*c*) the male die may move further downward and be stripped of the formed carton with a plunger arrangement of the type referred to above. Of course, in the process of folding side panels 18 and 20 upwardly, the biased ball 82 and cooperating studs 134 allow the potential positive locking operation above described.

Thus, there has been described apparatus which will accomplish all the objects and advantages and contains all of the features herein indicated as well as others which one skilled in the art will discern upon reading this disclosure. Other modifications may be made without departing from the scope of this invention as defined by the appended claims.

What is claimed is:

1. In a machine for at least partially setting up a carton blank having a first panel with opposite lengthwise extending edges to which are respectively hingedly coupled second and third panels, each of said second and third panels having a respective end flap hinged on corresponding panel ends with the said second panel flap having a slot into which is insertable, when the said second and third panels are folded to a position generally perpendicular to and in the same direction from said third panel, a tab of said third panel flap to hold said second and third panels substantially in said folded position, the combination comprising:
   - a female die,
   - a male die having
     - a first side conforming to said first panel for pushing said carton blank into said female die first panel forward, and
     - for said second panel, a second side extending longitudinally of said first side and at an acute angle thereto at least at the corner therebetween,
   - said female die having folding means operative in response to movement of said male die in said female die and including
     - first means for holding said end flaps generally perpendicularly of their respective panels,
     - second means for folding said second panel at least at its flap end over onto said second male die side to effect substantially said acute angle between said first and second panels, and
     - third means for folding said third panel to cause said tab to be inserted into said slot to hold said second and third panels as aforesaid.

2. The combination of claim 1 and further including

means contactable with at least a said second panel end flap after said tab is inserted as aforesaid to return at least the said second panel to a substantially perpendicular relationship with said first panel and secure a positive interlock between said second and third panel end flaps.

3. The combination of claim 2 wherein said contactable means includes vacuum cup for stripping the folded carton from said male die.

4. The combination of claim 1 wherein said male die has a third side toward which said third panel is folded and which is perpendicular to said first side.

5. The combination of claim 4 wherein the means for folding said third panel includes roller means in said female die cooperable with said male die third side as it moves past said roller means to cause said third panel to fold substantially perpendicular to said first panel.

6. The combination of claim 1 wherein said male die has a third side against which said third panel is folded and which forms an acute angle with said first side.

7. The combination of claim 6 wherein said second and third panel folding means each include respective biased roller means respectively disposed to fold said second panel against said second side before folding said third panel against said third side.

8. The combination of claim 1 for use with a carton as aforesaid, the said first panel of which has a hinged end flap adjacent the other end flaps, wherein said female die further includes means for causing the said first panel end flap to be folded toward a perpendicular relationship with said first panel ahead of the said folding of said second and third panel flaps.

9. The combination of claim 8 wherein said male die includes a recessed end surface for receiving said first panel flap and allowing same to be bowed while at least said second panel folding means causes the second panel to lie against said second male die side.

10. In a machine for at least partially setting up a carton blank having a bottom panel with hinged flaps at opposite end edges and hinged first and second panels at opposite side edges, each of said first and second side panels having a respective pair of hinged end flaps, the flap at each end of the first side panel having a slot into which is insertable, when the carton blank sides and end flaps are folded, a tab of the adjacent second side panel flap, said slots and tabs including outwardly cut curls for effecting a positive interlock between the end flaps of the side panels, the combination comprising:

a female die having a cavity,

a male die vertically movable into and out of said cavity and having

a bottom side conforming in dimension to said bottom panel and movable relative to female die to push said carton blank downward into said cavity bottom panel forward, and

first and second sides respectively for said first and second panels and extending longitudinally of said bottom side,

at least said first side of the male die being at an acute angle relative to vertical and also relative to said bottom side,

said female die having folding means operative in response to movement of said male die in said cavity and including

first means for folding the bottom end flaps and then the side end flaps toward a perpendicular relationship relative to their respective panels,

second means including horizontally inwardly biased roller means extending crosswise of the cavity pathway of said first panel for folding the first panel and its end flaps substantially to the acute angle relationship aforesaid,

third means including other roller means extending crosswise of the cavity pathway of said second panel for folding the second panel later than said first panel to cause said tab to be inserted into said slot and effect a potential interlock between the adjacent side panel end flaps, and

means operative on at least the end flaps of said first panel for erecting at least the first panel and its end flaps from said acute angle to vertical to effect said positive interlock.

11. The combination of claim 10 wherein the said other roller means is also horizontally inwardly biased.

12. The combination of claim 10 including means for opening said slots while said tabs respectively insert therein.

13. The combination of claim 12 wherein said opening means includes a horizontally inwardly biased ball in each end of said cavity for pushing the outer part of the first side panel end flaps inwardly and studs on opposite ends of said male die for preventing the inner part of the first side end panels from moving inwardly.

14. In a machine for at least partially setting up a carton blank having a first panel with opposite lengthwise extending edges to which are respectively hingedly coupled second and third panels, each of said second and third panels having a respective end flap hinged on corresponding panel ends with the said second panel flap having a slot into which is insertable, when the said second and third panels are folded to a position generally perpendicular to and in the same direction from said third panel, a tab of said third panel flap to hold said second and third panels substantially in said folded position, the combination comprising:

a female die,

a male die having

a first side conforming to said first panel for pushing said carton blank into said female die first panel forward, and

for said second panel, a second side extending longitudinally of said first side and at an acute angle thereto at least at the corner therebetween,

said female die having

means for folding said end flaps generally perpendicularly of their respective panels,

means for folding said second panel at least at its flap end over onto said second male die side to effect substantially said acute angle between said first and second panels, and

means for folding said third panel to cause said tab to be inserted into said slot to hold said second and third panels as aforesaid,

wherein said second panel folding means includes a bar pivoted near the entry of the cavity of the female die with a first roller thereat for first partially folding the said second panel toward a perpendicular relationship with said first panel,

said bar having a second roller disposed further in the cavity the periphery of which biasingly extends into the pathway of the partially folded second panel for fully folding same after the edge between the first and second panels pushes said second roller outwardly and the bias thereon causes the second roller to follow back inwardly the incline of the said second side of the male die to effect the aforesaid acute angle between said first and second panels.

15. In a machine for at least partially setting up a carton blank having a first panel with opposite lengthwise extending edges to which are respectively hingedly coupled second and third panels, each of said second and third panels having a respective end flap hinged on corresponding panel ends with the said second panel flap having a slot into which is insertable, when the said second and third panels are folded to a position generally perpendicular to and in the same direction from said third panel, a tab of said third panel flap to hold said second

and third panels substantially in said folded position, the combination comprising:

a female die,

a male die having

a first side conforming to said first panel for pushing said carton blank into said female die first panel forward, and

for said second panel, a second side extending longitudinally of said first side and at an acute angle thereto at least at the corner therebetween,

said female die having

means for folding said end flaps generally perpendicularly of their respective panels,

means for folding said second panel at least at its flap end over onto said second male die side to effect substantially said acute angle between said first and second panels, and

means for folding said third panel to cause said tab to be inserted into said slot to hold said second and third panels as aforesaid,

wherein said second panel folding means includes

first and second roller means extending in said cavity longitudinally of the said second side of said male die,

said second roller means being further in said cavity than the first roller means,

means for pivotally mounting at least said second roller means for biased movement outwardly from said cavity from a normal position partially in the pathway of said male die,

said first roller means being operative to effect at least the initial folding up of said second panel as the male die moves through said cavity and causes the aforesaid outward movement of said second roller means whereupon at least one of said roller means completes the folding of the second panel over onto said second side of the male die.

16. The combination of claim 15 wherein said first roller means is pivotally mounted on said pivotal mounting means so as to move, with and in the opposite direction as said second roller means, from a normal position outside the pathway of said male die, whereat it effects the aforesaid initial folding of the second panel, toward a position adjacent the second side of the male die as the latter moves against the second roller means to pivot the first roller means and second panel against that side.

17. The combination of claim 15 wherein the axis of said first roller means forms the pivot point for said second roller means.

18. The combination of claim 15 wherein said male die has a third side against which said third panel is folded, and third roller means disposed to cause the third panel to be so folded after said second panel is folded against said second side.

19. The combination of claim 18 and further including fourth roller means pivotally mounted and disposed further in said cavity than said third roller means for biased movement outwardly from a normal position in the pathway of said third panel and side to cause said third panel to be folded fully against said third side.

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