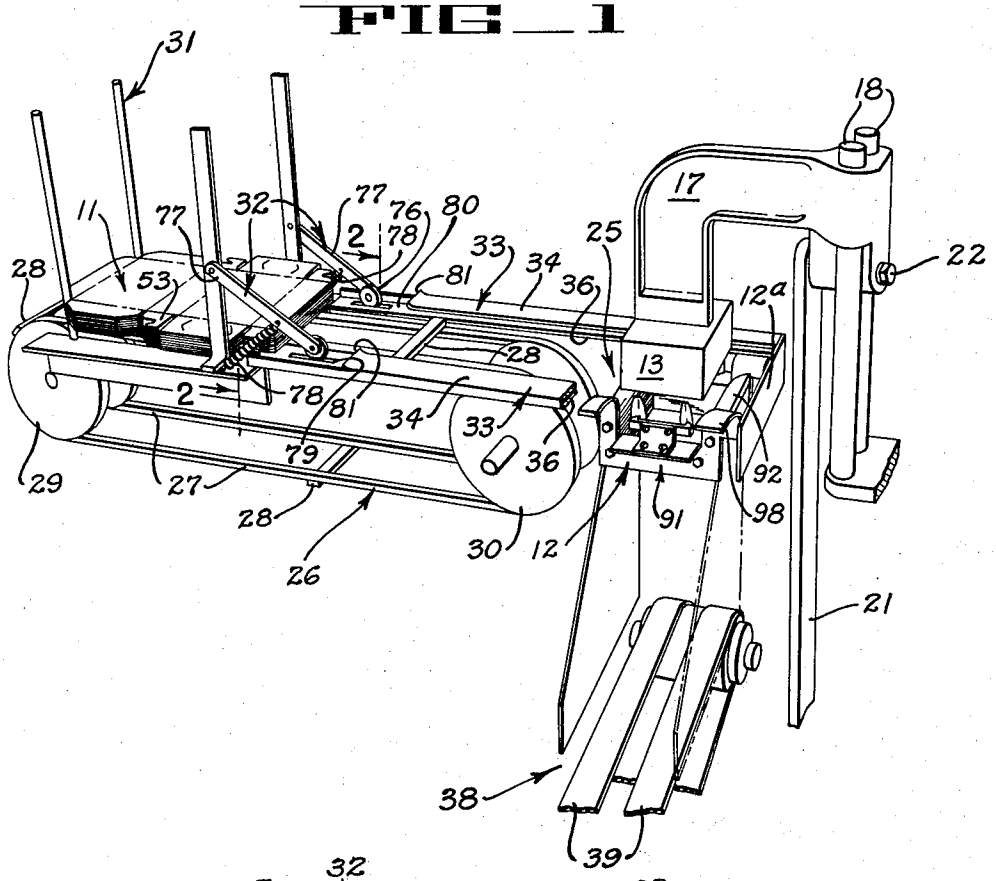
July 22, 1958 H. G. HOFFMEISTER 2,844,076

CARTON FORMING APPARATUS

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FIG_1



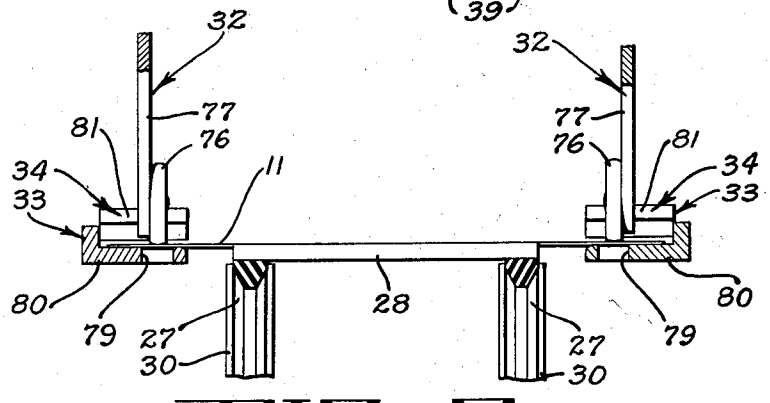


FIG_2

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CARTON FORMING APPARATUS

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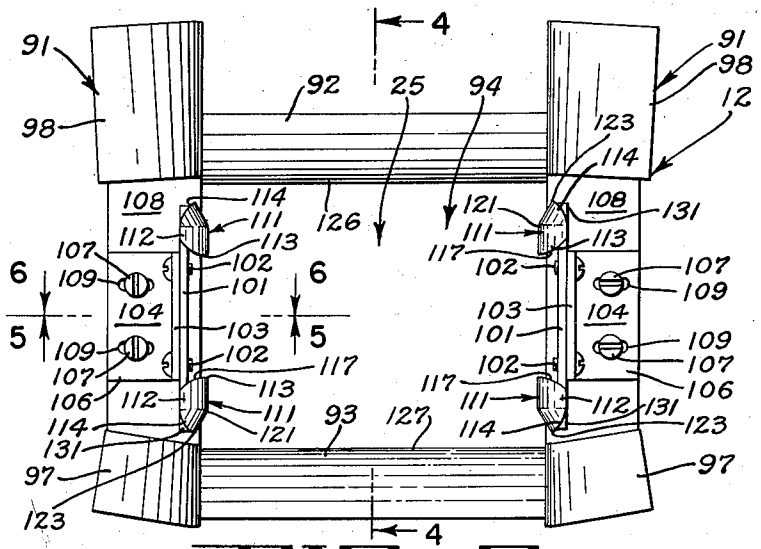


FIG_3

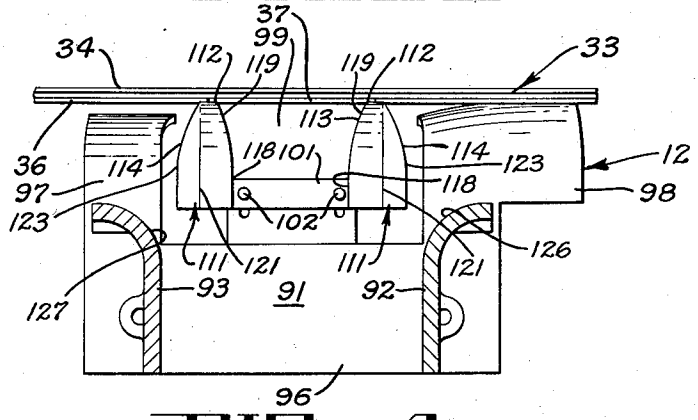


FIG_4

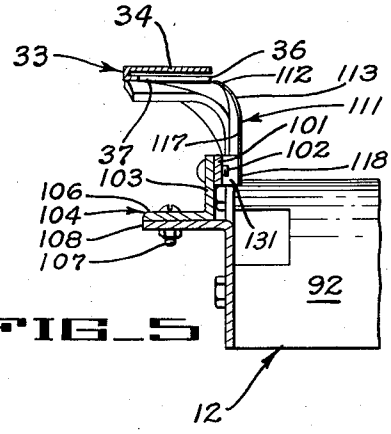


FIG_5

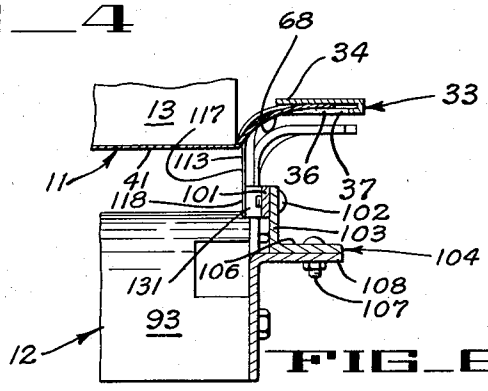


FIG_6

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CARTON FORMING APPARATUS

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FIG_7

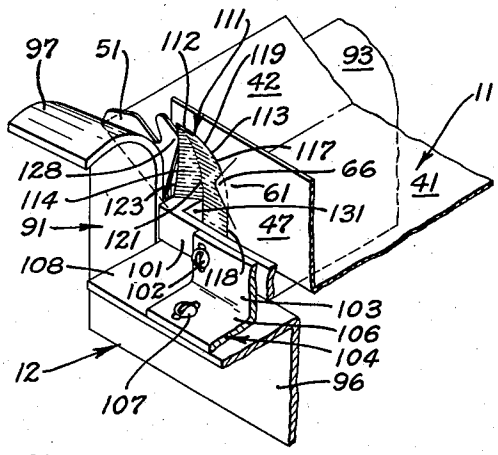
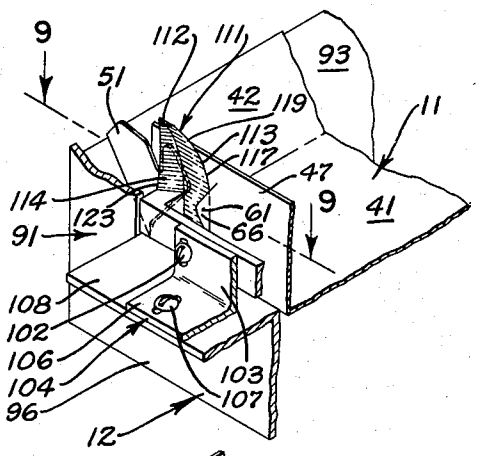


FIG_8



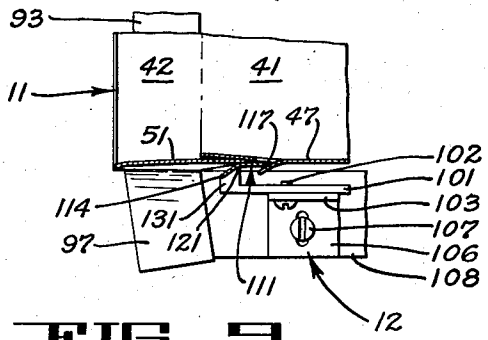


FIG_9

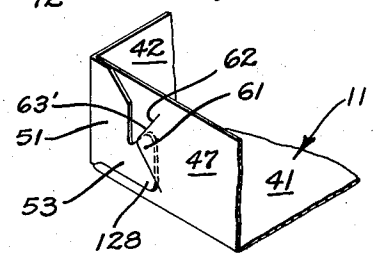


FIG_10

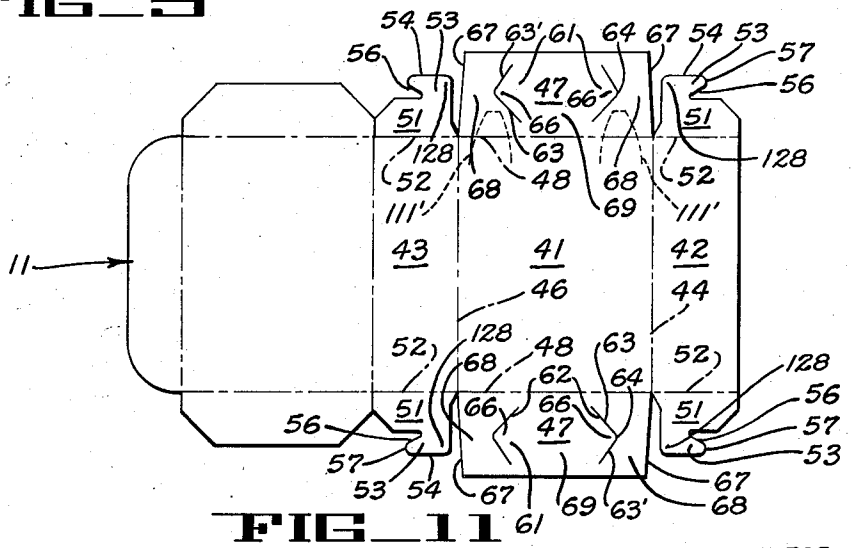


FIG_11

INVENTOR

Hans G. Hoffmeister

United States Patent Office 2,844,076 Patented July 22, 1958

2,844,076

CARTON FORMING APPARATUS

Hans G. Hoffmeister, San Jose, Calif., assignor to Food Machinery and Chemical Corporation, San Jose, Calif., a corporation of Delaware

Application July 15, 1953, Serial No. 368,070

23 Claims. (Cl. 93—51)

This invention relates to carton forming machines, and more particularly to apparatus for forming flat, shaped, pre-cut, and scored blanks of cardboard or similar sheet material into cartons that rely upon inter-engagement of parts of adjacent wall panels to retain them in formed arrangement.

An object of the invention is to provide an improved and simplified carton forming machine.

Another object is to provide a carton forming machine capable of operating at high speed for long periods of time.

Another object is to provide a carton forming machine which employs a plain plunger for propelling the blanks through a folding and interlocking die, and which employs a die devoid of any movable parts thereon.

Another object is to provide an improved carton forming die and plunger wherein all functions as folding, opening slots for the reception of interlocking tongues, and insertion of the tongues into the slots, are performed by a plunger and die arrangement which have no movable parts thereon.

Other objects and advantages of the present invention will become apparent from the following description and drawings in which:

Figure 1 is a perspective view illustrating the carton forming machine of the present invention, certain parts being broken away.

Figure 2 is a vertical section through the pre-breaking device, taken along lines 2—2 of Fig. 1.

Figure 3 is an enlarged plan view of the carton forming die of the machine.

Figure 4 is a vertical section taken along lines 4—4 of Fig. 3.

Figure 5 is a vertical section taken along lines 5—5 of Fig. 3.

Figure 6 is a vertical section taken along lines 6—6 of Fig. 3, with a portion of a carton shown in process of being folded.

Figures 7 and 8 are fragmentary perspective views of a part of the forming die, illustrating the manner of inter-engagement of the die and parts of a carton blank in progressive steps of folding the carton and interlocking the parts thereof in folded relation.

Figure 9 is a fragmentary section taken along lines 9—9 of Fig. 8.

Figure 10 is a fragmentary perspective view illustrating the fully folded and interlocked relation of the carton parts of Figs. 7 and 8.

Figure 11 is a plan view of a typical carton blank adapted to be formed into a carton by the apparatus of the present invention.

The carton forming machine illustrated in Fig. 1 includes an apparatus for supplying blanks 11 to a die 12 and a plunger 13 for propelling the blanks successively through the die. The die 12 is mounted on a suitable frame (not shown) holding the die rigidly and accurately in alignment with the plunger 13 which is mounted for reciprocatory movement relative to and through the die

12 by a crosshead 17 slidable upon stationary vertical guide rods 18. The plunger 13 is reciprocated by a connecting rod 21 pivotally attached at one end to the crosshead 17 by a wrist pin 22. The other end of the connecting rod is pivotally connected to any suitable actuating mechanism such as a motor driven crank pin (not shown) arranged to move at suitable speed in a circular path and thereby impart vertical reciprocatory movement to the crosshead 17 and plunger 13.

The die 12 is positioned with its central opening in register with the plunger 13 so that the reciprocating plunger can pass freely through the die. With each down stroke of the plunger 13, it carries a carton blank 11 with it toward and through the die. The blanks 11 are fed successively to a loading station 25 immediately above the die 12 and below the plunger 13 by a carton blank feeding mechanism 26. The carton blank feeding mechanism 26 and the plunger reciprocating mechanism are so synchronized that the plunger 13 is at or adjacent the upper end of its stroke whenever a blank 11 is delivered to and deposited at the loading station 25.

The carton blank feeding mechanism 26 (Figs. 1 and 2) comprises a plurality of parallel and laterally spaced endless belts 27 provided with a series of spaced, transverse pusher or feed bars 28 and trained around pulleys 29 and 30, driven at desired speed by any suitable means (not shown). The blanks 11 to be formed into cartons are stored in stacked relation in a magazine 31 arranged above the upper run of the belts 27 so that the feed bars 28 withdraw the blanks 11, one at a time, from the bottom of the stack, and advance the blanks past a pre-breaking mechanism 32 and thereafter project them into the loading station 25. Each blank 11 is guided from the pre-breaker 32 to the loading station 25 by opposed channels 33 receiving the lateral edges of the blank as the blank leaves the pre-breaking mechanism 32. The upper flanges 34 of the channels 33 continue to a vertical abutment plate 12a on the far side of the die 12, while the lower flanges 36 of the channels 33 are recessed, as indicated at 37 (Figs. 4, 5, and 6), in register with the die 12, for purposes later explained herein.

A suitable carton discharge conveyor or take-away mechanism 38 including a plurality of endless belts 39 is disposed below the die 12 in position to receive the assembled cartons from the die and to transport them to any suitable place of delivery such as a carton filling machine (not shown).

A typical form of blank 11 which may be assembled by the cooperating plunger 13 and die 12 is illustrated in Fig. 11 and comprises a bottom panel 41 and front and back wall panels 42 and 43, respectively, connected to the bottom 41 at fold lines 44 and 46, respectively, which are scored so as to facilitate and assure accuracy of folding. End wall panels 47 are similarly connected to the bottom 41 along scored fold lines 48. The front and back panels 42 and 43 are each provided with a wing 51 at each end thereof connected thereto along a scored fold line 52 which is a continuation of one of the fold lines 48. Each wing 51 carries at its outer end a tongue 53 having an outer edge 54, an inner edge 56 which slopes from the base of the tongue 53 outward and toward the edge 54, and a rounded end 57. Two substantially triangular tabs 61 are defined in each end panel 47. Each tab 61 is severed from the panel 47 along two edges by a cut or slot 62 having two angularly related portions 63 and 63' joined by an arcuate portion 64 outlining a round point 66 on the tab directed toward the associated end edge 67 of the panel. The two slots 62 partially separate the end portions 68 of the panel from the intermediate portion 69 thereof; and each slot 62 is located at such distance from the associated end 68 of its panel 47 that the tongue 53 of the nearest wing 51 of the associated front or back

wall panel 42 or 43, as the case might be, can enter and seat within the slot 62 when the panels 47 and 42 or 43 are folded to lie within planes perpendicular to each other and to the plane of the bottom panel 41.

When forming cartons from certain types of blanks or from blanks made from certain kinds of stock, it may be desirable to "pre-break" each blank, so as to loosen each of the tabs 61 by breaking any bond that may exist between each tab and the material of its supporting panel on the opposite side of the associated slot 62. In this manner, the subsequent operation of deflecting the tab 61 and thereby opening the slot 62 is facilitated. Such pre-breaking is especially desirable when the blanks 11 are made from waxed stock, since the wax with which the fibres of the material are impregnated is apt to cause the edges of the tabs 61 to adhere to the edges of the material on the opposite side of the slot. It is for the purpose of breaking any such bond and otherwise loosening the tabs 61 for facile subsequent deflection of the same from the planes of their respective end panels 47 that the pre-breaking mechanism 32 is employed.

Although various types of pre-breaking devices may be employed, the type described herein has been selected because of its simplicity and freedom of reciprocating parts which would require synchronization with other parts of the machine.

The pre-breaking device 32 (Figs. 1 and 2) is associated with the upper run of the belts 27 in such a manner that a roller 76 successively engages both tabs 61 of each end panel 47 as a blank 11 is advanced from the magazine 31 toward the loading station 26. Each of the rollers 76 is rotatably mounted at the outer end of a pivotally supported arm 77 pressed downward by a tension spring 78 which causes the roller 76 to bear with sufficient pressure against a carton blank 11 passing therebeneath to depress the free end of each tab 61 of one of the end panels 47 into a slot 79 in a horizontal plate 80. Each of the slotted plates 80 is an extension of the lower flange 36 of one of the channel guides 33, the upper flange 34 of which terminates at 81 and is deflected upward slightly to define a tapering entrance throat to the guideway between the flanges 34 and 36. The plates 80 support the portions of the end panels 47 adjacent the tabs 61 so that pressure exerted rather sharply against the tabs 61 by the relatively narrow and rounded bearing surfaces of the rollers 76 deflects the tabs 61 far enough into the slots 79 to displace each tab from the plane of its associated end panel 47.

The rollers 76 perform their function of loosening the tabs 61 without interrupting the forward progress of the blank 11 as it is being advanced into the channel guides 33 which are so disposed with relation to the feed belts 27 that as a blank 11 is advanced by the belts, the end panels 47 of the blank slide freely in the guideway between the flanges 34 and 36. The abutment plate 12*a* extending between the guides 33 at the terminal ends of the latter, arrests forward motion of each carton blank 11 and thereby locates the blank accurately at the loading station 25 in proper position above the die 12 at the moment the respective feed bar 28 travels around the pulleys 30 and out of engagement with the trailing edge of the carton blank.

The die 12 (Figs. 3 and 4) comprises two opposed end panel folding plates 91 arranged in parallel relation and spaced apart by a distance substantially equal to the length of the completed carton. The die 12 also comprises opposed front and back panel folding plates 92 and 93, respectively, extending perpendicularly with respect to the end panel folding plates 91 and spaced apart a distance substantially equal to the width of the completed carton. Accordingly, the die 12 defines a rectangular central opening 94 through which the plunger 13 forces blanks 11 one at a time with the bottom panel 41 flat against the under side of the plunger 13.

Each of the end folding plates 91 comprises a central portion 96 and upstanding extensions 97 and 98 at its ends leaving a space 99 between the upstanding portions 97 and 98. A horizontal foundation strip 101 is located within the space 99 and is fastened by machine screws 102 to the vertical flange 103 of an angle member 104, the horizontal flange 106 of which is secured by machine screws 107 to a horizontal extension 108 of the plate 91. The screws 107 extend through elongated slots 109 in the flange 106, which permit adjustment of the angle member 104 and the structure supported thereby to desired spacing with respect to the path of a blank 11 in its progress through the die 12.

A finger 111 is rigidly mounted upon each end of each of the foundation strips 101 and extends upward therefrom within the space 99 between the extensions 97 and 98 of the associated folding plate 91. The upper ends 112 of the fingers 111 are disposed slightly below the plane of the upper surfaces of the lower flanges 36 of the guides 33 to avoid interference with movement of blanks 11 along the guides 33 to the loading station 26.

Although each of the fingers 111 is of solid, unitary construction, it actually consists of three independent and yet cooperatively associated portions. The upper end 112 serves as an abutment engageable with the under surface of a panel 47 to interrupt downward motion of the panel and thereby initiate the operation of folding the same. The portion 113 of each finger 111 at that side thereof which is nearer the other finger 111 on the same supporting strip 101 is in effect a tab deflecting blade, and the portion 114 of the finger 111 at its opposite side constitutes a tongue intercepting and guiding flange, as will be explained more fully hereinbelow.

The tab deflecting blade portion 113 of each finger 111 has a relatively thin, though not actually sharp edge 117, the lower portion 118 of which is substantially straight and vertical and the upper portion 119 of which slopes laterally from the end 112 downward to merge with the lower portion 118.

As best shown in Figs. 4 and 5, the upper end 112 of the fingers 111 are the highest portions of the die 12. Hence, as a blank is carried downward from the loading station 26 by the plunger 13, the first engagement between the blank and the die is that of the fingers 111 with the end panels 47, which causes the panels 47 to start their folding motion about their respective fold lines 48 as the initial step in folding the blank. When the end panels 47 have assumed positions of considerable obliquity with respect to the plane of the bottom panel 41 the wings 51 of the front and rear panels 42 and 43, respectively, engage the upper ends of extensions 97 and 98, causing the wings 51 to be folded about their fold lines 52. Consequently, as the blank is advanced through the die by the plunger 13, the end panels 47 are folded upward toward positions in which they are perpendicular to the bottom panel 41, followed by the wings 51 and both the front and rear panels 42 and 43. Folding of the panels 42 and 43 and the wings 51 is facilitated by rounding the upper ends of the fingers 111 and the upper ends of the extensions 97 and 98 so that they are deflected outward (Figs. 5, 6, and 7), thus presenting smooth, curved surfaces over which the panel 42 and 43 and the wings 51 slide as the folding operation progresses.

The two fingers 111 at each end of the die 12 are so spaced apart that only the portions 68 of each end wall panel 47 engage the fingers 111, leaving the intermediate portion 69 of the panel unsupported. Therefore, while the fingers 111 provide abutments which interrupt the downward motion of the end portion 68, the downward pull exerted upon the panel 47 through the hinged connection of the same to the bottom panel 41, tends to drag the unsupported intermediate portion 69 down into the space between the fingers 111 (Fig. 6) displacing the intermediate portion 69 from alignment with the

end portions 68. Furthermore, the downward pull imposed upon the hinged, or proximal edge of the panel 47 bends the end portions 68 of the panel around the ends 112 of the two fingers 111 since the distal edge of the panel 47 is restrained from moving upward by the upper flange 34 of the associated channel guide 33 overlying the outer portion of the panel (Fig. 6). Therefore, the end portions 68 of the panel assume a curved configuration wherein their distal parts are substantially horizontal while their proximal parts curve downwardly to their line of juncture with the bottom panel 41. The central portion 69, however, being unsupported by the fingers 111, is flexed to a considerably lesser extent, i. e., it extends in a more nearly straight line from its proximal to its distal edge. The recess 37 is provided in the lower flange 36 of each guide channel 33 so as to insure that the channels 33 do not not present any obstacle to downward motion of the intermediate portions 69 of the panels 47. Accordingly the intermediate portion 69 of each panel is pulled downward between the ends 112 of the fingers, and since the tabs 61 are carried by the intermediate portion 69 and are severed from the end portion 68, the tabs 61 are displaced outwardly from the end portions 68. In this manner, the slots 62 are opened, and the tabs are lowered to such an extent that at least their ends 66 are lower than the outwardly deflected ends 112 of the fingers.

The fingers 111 are so positioned that they engage a panel 47 substantially at the locations indicated at 111' in Fig. 11, wherein a part of the outwardly deflected end 112 of each finger is in alignment with the end 66 of one of the tabs 61. As the plunger 13 advances the blank 11 through the die, the panel 47 is dragged over the ends of the fingers, which enter the space between the plane of the end portion 68 and the lowered ends of the tabs, without, however, entering the slots 62, since at least a portion of the end of each finger bears against the associated end portion 68, which slides over the upper surface of the end 112 of the finger, around the curved portion, and down the inner surface of the vertical part of the finger (Fig. 7). But the end of the tab slides along the under surface of the end 112, around the curved portion, and down the outer surface of the finger. At the same time, the blade portion 113 of the finger 111 continues to penetrate more deeply into the space between the tab 61 and the outer portion 68 of the panel, owing to the sloping nature of the upper portion 119 of the edge 117 and the corresponding increase in width of the blade 113. By the time the tab reaches the straight portion 118 adjacent the base of the finger, the tab 61 is pried a substantial distance out of the plane of the end panel 47 which by this time has reached or closely approached a vertical position perpendicular to the base (Figs. 8 and 9).

Throughout the entire vertical length of each finger 111, the inner face of the guiding flange 114 is disposed in an oblique position flaring outward from the central portion 121 of the finger 111 (Figs. 3 and 9), thereby spacing the extreme outer edge 123 of the flange from the plane of the panel 47. In this manner each finger 111 is provided on the side thereof which is nearest the associated end 68 of the respective panel 47, with a sloping surface leading directly into one of the slots 62 throughout the time that the tab 61 engages the associated finger 111.

The upper edges of the plates 92 and 93 (Fig. 4) for folding the front and back panels 42 and 43, respectively, are curved outward at their upper edges as indicated at 126 and 127, respectively, and are disposed at a sufficiently lower elevation than the upper ends of the extensions 97 and 98 to assure that the wings 51 are folded closely adjacent the outer faces of the end panels 47 before the front and rear panels 42 and 43 start their folding movement. This assures that the end panels 47 will almost, if not actually, reach their positions of perpendicularity with the bottom panel 41, and that the wings 51 will be folded through only a slightly smaller angle of hinging movement about their fold lines 52, before the front and back panels 42 and 43 start their pivotal movement about their respective fold lines 44 and 46. Consequently, as the front and rear panels 42 and 43 swing upward, they carry the wings 51 with them, each wing moving end-wise in a plane parallel to and only slightly outside the vertical plane of the folded end panel 47 at the associated end of the blank 11. Therefore, the tongues 57 are in alignment with the outwardly flaring portions 114 of the fingers 111 before the leading corners 128 of the tongues 53 reach the fingers 111, and as the folding motion of the panels 42 and 43 continues, the corners 128 of the tongues 53 are intercepted by the sloping inner surfaces of the flanges 114 (Fig. 7) and are guided thereby between the blade portions 113 of the fingers 111 and the panel portions 68 into the slots 62.

Further folding motion of the panels 42 and 43 from the position illustrated in Figures 8 and 9, causes the leading corner 128 of each tongue 53 to clear the downwardly and inwardly inclined portion 63 of the associated slot so that only the distal end of the tongue 53 remains within the slot 62 as shown in Fig. 10. After the blank has progressed through the die far enough to remove the end panels 47 from the fingers 111, the inherent resilience of the tabs 61 causes them to spring back and exert sufficient pressure against the outer faces of the tongues 53 to deflect the ends of the tongues slightly inward. This enables the edge 56 of each tongue 53 to engage an edge of the portion 63' of the slot 62, and thus lock the panels 42 and 43 securely in their folded positions. Moreover, the wings 51 which are folded around the ends of the end panels 47 retain the end panels 47 in their folded positions, thus assuring that when the carton is discharged from the die, it will be retained against unfolding and hence in useful condition.

The sole support for the finger 111 is the strip 101 which is secured to the outer face of the finger by an inwardly deflected portion 131 (Figs. 3, 7, 8, and 9) at the end of the strip 101. This leaves both the inner and outer faces of the blade portion 113 of the finger 111 uninterrupted so that the panel 47 and tab 61 can pass freely off the lower end of the finger 111 after the actions of the various parts of the finger 111 in folding and interlocking parts of the blank 11 have been completed. Thus the folded blank, in carton form, can pass freely on through the die 12 and onto the take-away mechanism 38. To assure removal of the formed carton from the plunger 13 when the same reaches its lowermost position a suction cup stripping mechanism well known in the art may be employed.

Under some circumstances, it may be desirable to carry the operation of pre-breaking the cartons further than hereinabove described, so as to flex the tabs 61 far enough to cause them to remain in a partially opened position until the blank of which they are a part is advanced into the die. Such pre-opening of the tabs 61 would facilitate entrance of the ends of the fingers 111 under the tabs.

Thus it may be seen that I have provided novel and efficient apparatus for forming or setting up cartons in which a plain plunger advances the blanks successively through a forming and parts-interlocking die. In spite of the very simple construction of the die, which is devoid of any parts movably mounted thereon, the die contains within itself all the actuator elements for folding the carton panels and inserting the locking tongues of certain wall panels into locking engagement with the tabs of adjacent wall panels. The simplicity and comparatively small number of these actuating elements are factors which contribute to the efficiency and dependability of the apparatus in the continuous operation thereof. Furthermore, the absence of any moving parts on either

the plunger or the die permits a higher speed of operation of the machine than has heretofore been possible with carton forming machines of conventional design.

While I have described a particular embodiment of the present invention, it will be understood that various changes and modification may be made without departing from the spirit of the present invention and the scope of the appended claims.

Having thus described my invention, what I claim and desire to protect by Letters Patent is:

1. Apparatus for forming a carton from a blank having a bottom panel and a wall panel slotted to receive a tongue on a second wall panel, said apparatus comprising a die, means for feeding the blank to said die, means cooperating with said feeding means for pre-breaking the slots in the wall panel as the blank is moved toward said die, a plunger movable with respect to said die to propel the blank therethrough, means on the die for folding the slotted panel and the tongue with respect to the bottom panel of said blank, means on the die for opening the slot of the slotted panel, and means on the die for folding said second panel with respect to the bottom panel to advance the folded tongue into said opened slot.

2. A die for carton forming apparatus wherein a movable plunger propels a carton blank in a predetermined path, said blank having a bottom, a panel connected to the bottom along a fold line, and a tab severed at one end from the panel, said die comprising an upstanding finger arranged adjacent said path, means on the finger providing an abutment adapted to intercept the panel to fold it about said fold line as the blank is advanced and to flex the panel to displace the outer end of said tab from the panel, and a blade carried by said die having an edge extending between the path of said panel and the path of the outer end of said tab.

3. A die for carton forming apparatus wherein a movable plunger advances a carton blank past the die with a panel portion of said blank projecting laterally beyond said plunger, said panel having an angular slot therein defining a tab severed at its outer end from the panel, said die comprising a finger mounted adjacent and substantially parallel to the path of the plunger in position for an end of the finger to intercept the panel portion and fold it about an edge of the plunger and to flex a portion of the panel from planar alignment with the tab, and a blade at one edge of the finger extending in a plane between the path of the panel and the plane of the outer end of the tab to wedge the outer end of the tab away from the panel.

4. A die for carton forming apparatus wherein a movable plunger propels a carton blank in a predetermined path adjacent the die, said blank having a bottom and two wall panels connected to the bottom along fold lines extending angularly with respect to each other, one of the panels having therein a slot defining a tab severed at its outer end from its associated panel and the other panel having a tongue extending from an end thereof and connected thereto along a fold line, said die comprising means for folding said panels and tongue about their respective fold lines and for displacing said tab from the plane of its associated panel, a blade adjacent the path of the slotted panel in position to engage the inner face of the displaced tab to force the tab away from the slotted panel and thereby open said slot, and a guiding flange adjacent said blade in the path of said tongue and sloping from its outer edge toward the path of the slotted panel to guide the tongue between the blade and the panel and into the slot.

5. A die for carton forming apparatus wherein a movable plunger propels a carton blank in a predetermined path, said blank having a bottom and two wall panels connected to said bottom along fold lines extending angularly with respect to each other, one of the panels having a slot therein defining a tab severed at its outer end from its associated panel and the other panel having a tongue extending from an end thereof and connected thereto along a fold line, said die comprising an upstanding finger mounted adjacent said path in position to engage the slotted panel and fold it about its associated fold line to angularity with said bottom and to flex the slotted panel and thereby displace the tab from the plane of the slotted panel, one edge of said finger defining a blade extending between the path of the slotted panel and the path of the outer end of said displaced tab to flex said tab away from the plane of the slotted panel, the opposite edge of the finger being deflected outward to define a flange flaring away from the path of the slotted panel, means for folding said tongue about its fold line, and means for folding said other panel about its fold line to push the tongue endwise into engagement with the flange whereby the tongue is guided between said blade and said slotted panel and into said slot.

6. Apparatus for converting into box form a blank having a body portion, a panel hingedly connected to the body portion, and a tab joined at one end to the panel and having a free end severed from the panel, said apparatus comprising means for propelling the blank in a predetermined path, a die mounted in the path of said panel, means on the die engageable by said panel to fold the panel to a position wherein it is substantially parallel to said predetermined path and to displace said tab to a position wherein said free end is offset outward from the outer face of the panel, and means presenting an edge in a plane closely adjacent the outer face of the panel and in position adapting the edge to enter space between the tab and the panel and pry the tab to a position of greater displacement from the plane of the panel as said blank advances along said path.

7. Apparatus for converting into box form a blank having a body portion, a panel hingedly connected to the body portion, and a tab joined at its base to the panel adjacent an end thereof and having a free end severed from the panel, said apparatus comprising means engageable with said body portion for advancing the blank in a predetermined path and a die mounted in the path of the panel and including a finger having an end lying in the path of the panel as the blank advances, said end of the finger being offset outward from the path of the hinge line of the panel to present an abutment for folding the panel to angular relation with body portion of the blank, said end being engageable with said panel between said tab and said end of the panel whereby the portion of said panel adjacent the tab is displaced from planar alignment with the free end of the tab, and a blade on said die having an edge lying in a plane closely adjacent the outer face of the panel and sloping in the direction of advance of said blank toward the path of the base of the tongue whereby the blade is adapted to enter space between the tab and the panel and pry the tab to a position of greater displacement from the plane of the panel as said blank advances.

8. Apparatus for forming a carton from a blank having a bottom, a panel hingedly joined to said bottom along an edge thereof, and a tab connected at one end to the center portion of said panel and having a free end severed from an end portion of the panel, said apparatus comprising means engageable with the bottom for propelling the blank in a predetermined path, a die mounted in cooperative relation to said propelling means and including an abutment in the path of said end portion of the panel to fold the panel to a position of angularity with said bottom as said blank is propelled past said die, and a guide mounted beyond the abutment and outside the path of said bottom and in position to be engaged by the distal edge of the panel as the panel is folded to flex said end portion of the panel around the abutment and thereby displace the center portion of the panel and the tab from the plane of the panel.

9. Apparatus for forming a carton from a blank having a bottom, a wall panel hingedly joined along an edge

thereof to the bottom, and a pair of tabs spaced apart on opposite sides of the center portion of the panel, each of the tabs being connected at one end thereof to said center portion and having a free end severed from an end portion of the panel, said apparatus comprising a plunger and a die movable with respect to each other to propel a blank positioned therebetween through the die, means for depositing the blank between the plunger and die with said bottom in register with the plunger, means on said die providing spaced abutments engageable with the end portions of the panel as the blank approaches the die to resist motion of the end portions of the panel while the center portion of the same and the tabs are advanced into the die, and a guide flange rigid with the die and engaging the face of the panel nearer the plunger and adjacent the outer edge of the panel to restrain the panel from rising as the inner edge of the panel advances with the plunger whereby the end portions are arched and displaced from planar alignment with the tabs.

10. Apparatus for forming a carton from a blank having a bottom, a panel hingedly joined to the bottom along an edge thereof, and a tab connected at one end to the panel and having a free end severed from th panel, said apparatus comprising means for pre-breaking the carton to loosen the free end of said tab from the panel, means for propelling the blank in a predetermined path through said pre-breaking means, a die mounted adjacent said path and including an upstanding finger having an end disposed in the path of the panel to arrest advance thereof and thereby fold the panel to a position of angularity with said bottom and to flex the panel to offset said free end of the tab from the panel, and a blade on the finger having an edge rounded toward its outer end to present a portion oblique to the path of said free end of the tab and closely adjacent the plane of the outer face of the panel whereby said edge is adapted to enter the space between the tab and the panel and pry the free end of the tab to a position of greater displacement from the panel.

11. In a die for forming shaped blanks into box-like form, a folding member comprising a finger having a deflected end defining a panel-engaging and folding abutment, an edge of said finger extending laterally away from said abutment to present a tab engaging and deflecting portion, and a flange on the opposite edge of said finger extending angularly with relation to said finger to present a tongue-engaging and guiding surface.

12. A die for forming shaped blanks into box-like form, comprising a foundation strip, and a finger carried by said strip adjacent each end thereof in position upstanding therefrom, the upper end of each of said finger being deflected to one side to present a panel-engaging and folding abutment, one lateral edge of each of said fingers being inclined from said end of the associated finger and toward the other finger to present a tab-deflecting portion, and a flange adjacent the other edge of each of the fingers, each of said flanges defining a tongue-engaging and guiding surface inclining away from its associated finger and to the same side thereof as that to which said end is deflected.

13. Apparatus for forming a carton from a blank having a bottom, a wall panel hingedly joined along an edge thereof to the bottom, and a pair of tabs spaced apart on opposite sides of the center portion of the panel, each of the tabes being connected at one end thereof to said center portion and having a free end severed from an end portion of the panel, said apparatus comprising a plunger and a die movable with respect to each other to propel a blank positioned therebetween through the die, means for pre-breaking the panel to loosen the free end of each of said tabs from the respectively contiguous portions of the panel, means for depositing the blank between the plunger and die with said bottom in register with the plunger, means on said die providing spaced abutments engageable with the end portions of the panel as the blank approaches the die to resist motion of the end portions of the panel while the center portion of the same and the tabs are moved forwardly into the die, and a guide flange rigid with the die and engaging the face of the panel nearer the plunger and adjacent the outer edge of the panel to restrain the panel from moving rearwardly as the inner edge of the panel advances with the plunger whereby the end portions are arched and displaced from planar alignment with the tabs.

14. Apparatus for folding a carton blank having a body portion, a panel hingedly connected to the body portion and a pair of spaced slits separating the panel into a central portion and two side portions, the combination of means for propelling the blank along a predetermined path, a die mounted in the path of movement of the panel, means on said die engageable by said panel to fold the side portions of said panel to a position substantially parallel to said predetermined path and to displace said central panel portion to a position offset outward from the outer face of said panel side portions to open said slits, and means on said die positioned to enter into said slits to hold them in open position.

15. Apparatus for folding a carton blank having a body portion, a panel hingedly connected to the body portion, and a pair of spaced slits separating the panel into a central portion and two side portions, said apparatus comprising a die having a die aperture corresponding in area to the body portion of the blank and having a pair of spaced guide members engageable with the side portions of said panel and an opening between said guide members arranged to receive the central portion of the panel as the blank is forced through said die aperture, means for forcing the blank through the die aperture to move said side panel portions into engagement with said spaced guide members and to move said central panel portion into said die opening whereby to open said slits, and means on said die positioned to enter said slits and retain them in open position.

16. Apparatus for folding a carton blank having a body portion, two panels hingedly connected to the body portion, a tongue hingedly connected to each end of one panel, and a pair of spaced slits separating the other panel into a central portion and two side portions, each of said slits being arranged to receive one of said tongues, said apparatus comprising a die having a die aperture corresponding in area to the body portion of the blank and having a pair of spaced guide members engageable with the side portions of said panel and an opening between said guide members arranged to receive the central portion of the panel as the blank is forced through said die aperture, means for forcing the blank through the die aperture to move said side panel portions into engagement with said spaced guide members and to move said central panel portion into said opening whereby to open said slits, means on said die having guide surfaces positioned to extend into said slits as said blank is moved through the die, and means on said die for folding the tangues of said panel into engagement with said guide surfaces to be guided into said slits.

17. A die for folding carton blanks comprising an upstanding member having an upper deflected end defining a panel-engaging and folding abutment, a tab-engaging and deflecting member on one side of said upstanding member extending laterally away from said abutment, and a tongue-engaging and guiding member on the opposite side of said upstanding member and extending in an angular direction away from said upstanding member.

18. Apparatus for converting into box form a blank having a body portion, a panel hingedly connected to the body portion, and a tab joined at one end to the panel and having a free end severed from the panel, said apparatus comprising means for propelling the blank in a predetermined path, a die mounted in the path of said panel, means on the die engageable by said panel to fold the panel to a position wherein it is substantially parallel

to said predetermined path and to engage said tab and to positively move the same to a position wherein said free end is offset outward from the outer face of the panel, and means presenting an edge in a plane closely adjacent the outer face of the panel and in position adapting the edge to enter the space between the tab and the panel.

19. Apparatus for forming a carton from a blank having a bottom, a panel hingedly joined to the bottom along an edge thereof, and a tab connected at one end to the panel and having a free end severed from the panel, said apparatus comprising a die mounted adjacent said path and including an upstanding finger having an end disposed in the path of the panel to arrest advance thereof and thereby fold the panel to a position of angularity with said bottom and to flex the panel to offset said free end of the tab from the panel, and a blade on the finger having an edge rounded toward its outer end to present a portion oblique to the path of said free end of the tab and closely adjacent the plane of the outer face of the panel whereby said edge is adapted to enter the space between the tab and the panel and pry the free end of the tab to a position of greater displacement from the panel.

20. Apparatus for forming a carton from a blank having a bottom and side and end panels hingedly connected to the bottom, one of the panels being slitted to define a tab having a free end severed from the panel, the other of said panels having a locking tongue hingedly connected thereto, said apparatus comprising a die and a plunger movable with respect to each other to propel a blank positioned therebetween through the die, said die including a first folding member disposed in the path of the slitted panel in position to engage the leading face of the slitted panel intermediately of its hinged and distal edges for folding the slitted panel to angularity with the bottom, means engageable with the trailing face of the slitted panel adjacent the distal edge thereof to positively flex the slitted panel around said first folding member and thereby open the slit defining the tab, a second folding member engageable with the tongue to fold the same to angularity with the other panel, and a third folding member engageable with said other panel to fold the same to angularity with the bottom and to propel the folded tongue into the opened slit in the slitted panel.

21. Apparatus for forming a carton from a blank including a bottom and two panels hingedly connected thereto, one of the panels having a slit therein, the other panel having a locking tongue hingedly connected thereto, said apparatus comprising a plunger and a die movable with respect to each other to propel a blank through the die, said die including a folding member engageable with an intermediate part of the leading face of the slitted panel to fold the same to angularity with the bottom, means engageable with the trailing face of the slitted panel adjacent the distal edge of the panel to flex the slitted panel around said first folding member to open the slit therein, means for folding the tongue to angularity with said other panel, means for folding said other panel to angularity with the bottom to propel the folded tongue endwise, and means on said folding member for guiding the tongue into said slit.

22. Apparatus for erecting a carton from a blank including a bottom and a slitted panel hingedly connected thereto, said apparatus comprising means for advancing said blank along a predetermined path, a first abutment means mounted in said path in position to be engaged by a leading surface of the panel in a region thereof spaced from the axis of the hinged connection of the panel to the bottom to fold the panel rearwardly about said axis, and a second abutment means engaging a trailing surface of the panel in a part thereof more distant from said axis than the region engaged by the first abutment means to prevent rearward movement of the distal part of the panel and thereby flex the panel over the first abutment means and open the slit in the panel.

23. Apparatus for folding a carton blank including a slitted panel hingedly connected thereto, said apparatus comprising means for moving the blank along a predetermined path, a first abutment means mounted within said path in position to be engaged by the panel to pivot the panel rearwardly, and a second abutment means engaging a trailing surface of the panel adjacent the distal edge of the panel to bend the panel over the first abutment means whereby to open the slit in the panel.

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UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 2,844,076 July 22, 1958

Hans G. Hoffmeister

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 5, line 17, strike out "not", second occurrence; line 41, after "end" insert -- 66 --; column 9, line 50, for "finger" read -- fingers --; line 64, for "tabes" read -- tabs --; column 10, line 58, for "tangues" read -- tongues --.

Signed and sealed this 22nd day of March 1960.

(SEAL)
Attest:

KARL H. AXLINE
Attesting Officer

ROBERT C. WATSON
Commissioner of Patents