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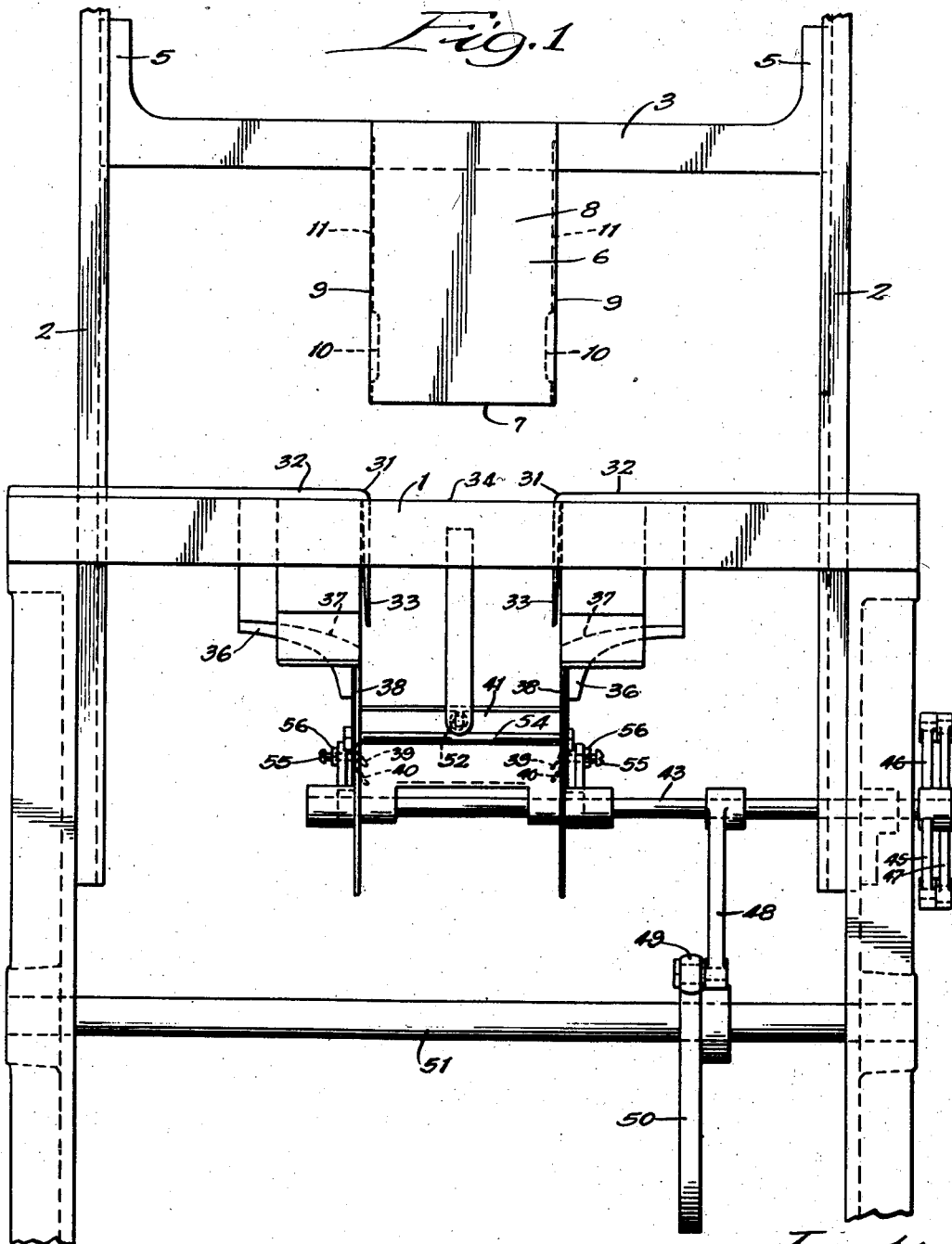
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2,416,748

CARTON FOLDING MECHANISM

Filed Aug. 23, 1945

4 Sheets-Sheet 1



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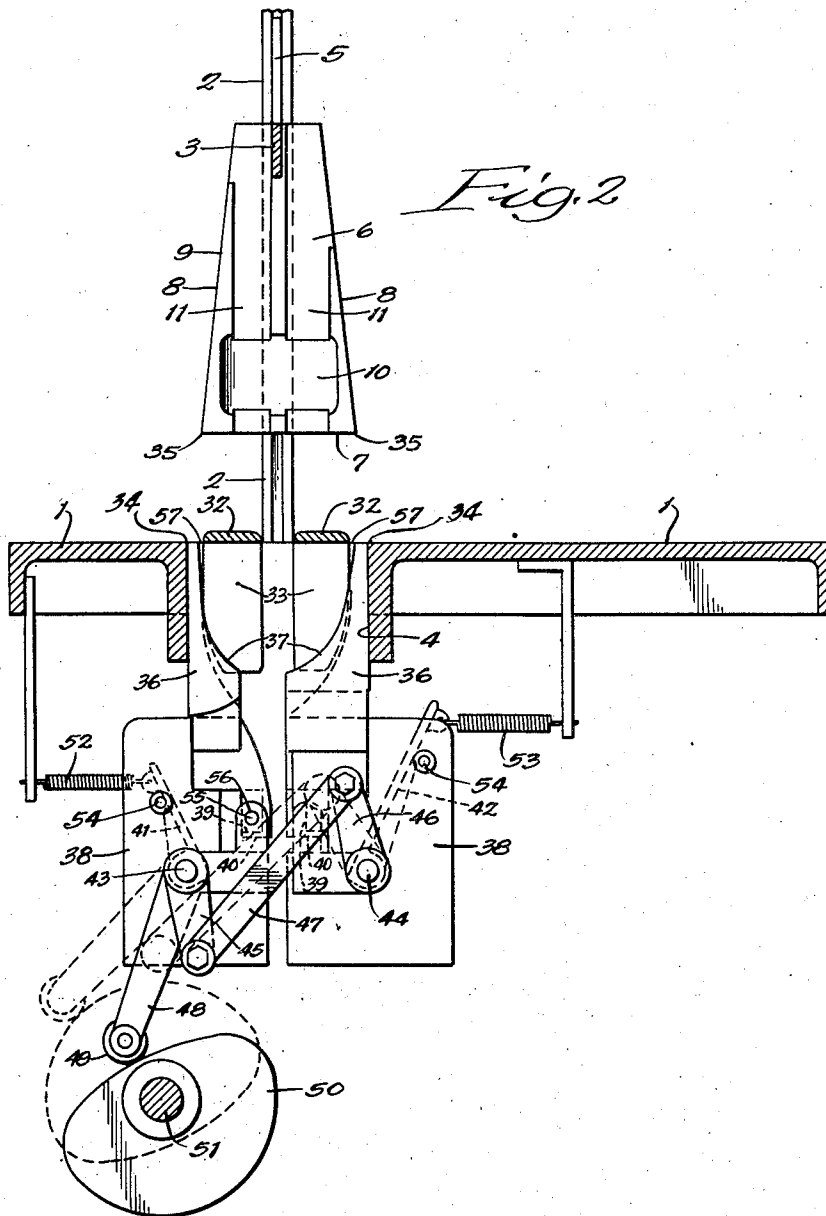
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CARTON FOLDING MECHANISM

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4 Sheets-Sheet 2



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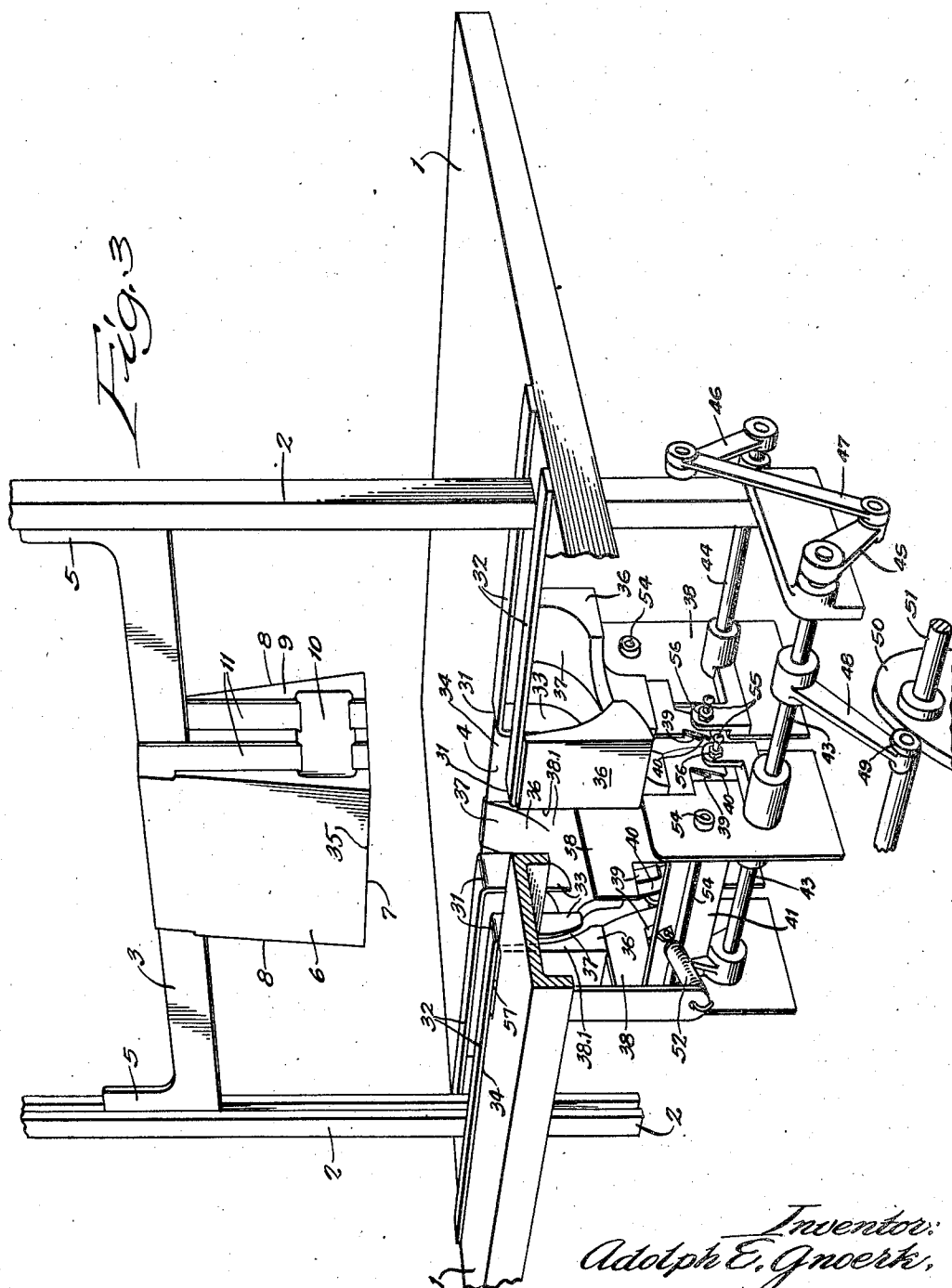
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CARTON FOLDING MECHANISM

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4 Sheets-Sheet 3



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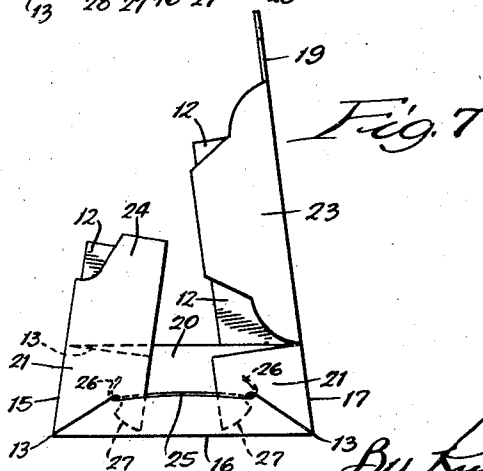
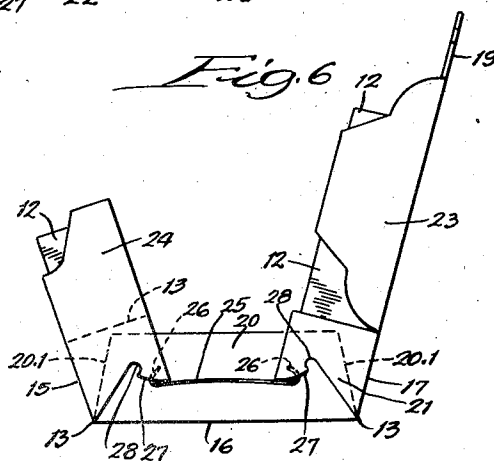
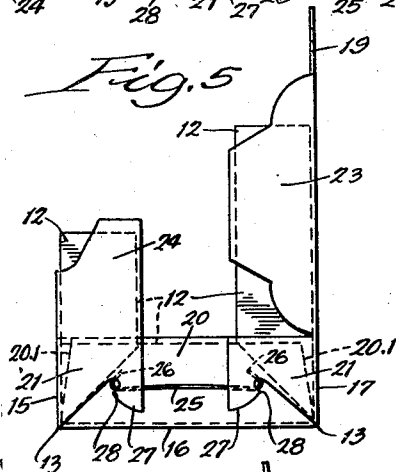
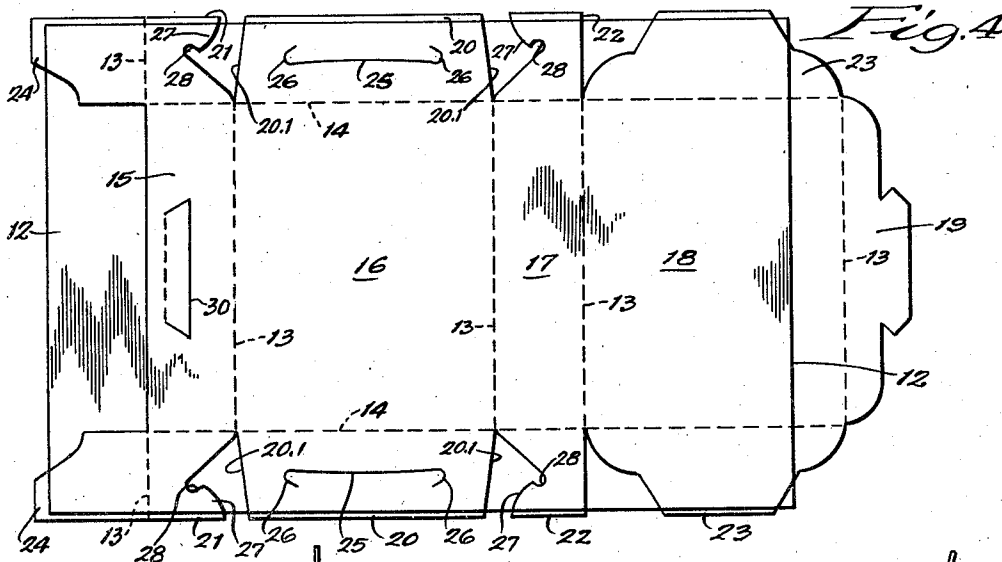
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CARTON FOLDING MECHANISM

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UNITED STATES PATENT OFFICE

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CARTON FOLDING MECHANISM

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9 Claims. (Cl. 93—51)

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This invention relates to machines for folding cartons preparatory to a filling operation. The hereindescribed mechanism is a development of certain features of folding devices in machines of the type shown in my copending application Serial No. 585,645, filed March 30, 1945, for Carton forming and lining machine, and is particularly directed to the handling of a special form of carton.

The main objects of this invention are to provide an improved form of carton folding mechanism wherein hook-shaped tabs formed on the end flaps of the opposite sides of a carton are caused to engage slits of hook-form formed in the end flaps of the bottom of the carton; to provide improved means for folding the side and end flaps with respect to the bottom of the carton; improved means for retracting the hook-shaped tabs for entrance into the hook-shaped slits, and improved means for tucking and forcing the tabs into proper engagement with their interlocking slits.

A specific embodiment of this invention is illustrated in the accompanying drawings, in which:

Figure 1 is a fragmentary front elevation of the folding mechanism and some of the associated structures of the machine.

Fig. 2 is an end view of the same with some parts shown in elevation and some in section.

Fig. 3 is a perspective view of the same with a portion of the table broken away so as to illustrate some of the mechanism that would otherwise be hidden thereby.

Fig. 4 is a plan of a carton blank and liner of the form for which the hereindescribed folding mechanism is designed.

Fig. 5 is an end elevation of the carton showing the same in partly completed folded relation of its parts.

Fig. 6 is a corresponding view showing the manner in which the side portions of the carton are swung outward in order to retract the locking tongue to a position for entrance into the locking slit of the end flaps.

Fig. 7 is a similar view showing the side portions pushed inward to a point beyond the vertical, being a position which these parts occupy after the completion of tucking operation, the overthrow assuring that the parts will be permanently interlocked when the sides are returned to their vertical positions.

In the form shown in the drawings, the supporting frame of the machine comprises a table 1, and a pair of vertical guideways 2 for cross bars

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3 which are carried by a pair of endless conveyor belts, not shown, which cause the cross bars 3 (of which only one is shown in the drawing) to travel vertically downward through an opening 4 in the table. Each of the cross bars 3 is provided with a vertical fin 5 at each end thereof that travels in the guideway 2 in a straight vertical path, from the position in which it is shown in the drawings, through the opening 4 to a point below the flap folding devices hereinafter described.

Each cross bar 3 carries a form block 6 having its rectangular bottom 7 of the same shape as the bottom panel of the carton which is to be folded. The opposite side faces 8 are inclined inwardly and upwardly from the vertical and the end faces 9 are vertical and each end face 9 is formed with a tucking depression 10 and with a pair of spaced vertical grooves 11.

The type of carton blank for which the present machine is particularly designed is illustrated in Fig. 4 and consists of a cardboard body of the form shown in Fig. 4, which may be overlaid by a rectangular liner sheet 12. If the liner sheet 12 is of extremely thin material, such as Cellophane, it should be appropriately spot-pasted to the carton blank but if it is of heavier material, it need not be attached to the blank.

The carton blank is scored on a plurality of transverse score lines 13 and longitudinal score lines 14 to define a front end panel 15, a bottom panel 16, a rear end panel 17, a top panel 18, a top securing front flap 19, bottom end flaps 20, side end flaps 21 and 22, top securing end flaps 23, and inner wing flaps 24 which are attached to the top edges of the front side wing flaps 21. The end flaps 20 are provided with closure slits 25 which have the main portion thereof parallel with the scores 14 and their end portions 26 curved inwardly toward the outer ends of the flaps 20. The flaps 21 and 22 are shaped to form hooked tabs 27 positioned to interlock with the slits 25 when the carton is folded, and having shoulders 28 positioned to engage the sides of the intumed ends of slots 26. The cover panel 18 of the carton is provided with closure flaps 23 and 19 on its unattached edges, which flaps coact with the slits 25 in the bottom end flaps 20 and the slit 30 in the front side panel when the carton is finally closed.

The opening 4 in the top of the table 1 is of such size as to allow the forming block 6 to pass through it. The mechanism for feeding the carton blanks to the machine in position to coact with the folding mechanism, is not illustrated in the drawings but it will be understood that the

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carton blanks are delivered successively in proper timed relation to the arrival of the form blocks 6, to a position above the top of the table and with the bottom panel of the carton blank in registering alignment with the path of movement of the bottom 7 of the forming block 6.

As the carton blank is pressed by the forming block 6 downwardly through the opening 4, its bottom end panels 20 are folded upwardly by shoulders 31, which are formed at the inner ends of bars 32, mounted on the table so as to overhang end portions of the opening 4. The bars 32 are spaced inward from the sides of opening 4 and the inner ends of the bars 32 are bent downwardly to form thin blades 33 directed along the path of the forming blocks 6.

Shoulders 34, formed by the sides of the opening 4 in the table, coact with the bottom edges 35 of the forming block 6 to bend up the front side panel 15 and the rear side panel 17 of the carton. In view of the fact that the shoulders 31 engage the carton blank in advance of its being engaged by the shoulders 34 as the forming block 6 passes through the table, the end flaps 20 are turned up in advance of the turning up of the front and rear panels of the carton. Form blocks 36 attached to the table have warped surfaces 37 which cooperate with the blades 33 to fold the end flaps 21, 22, 23 and 24 against the ends 9 of the forming block and into the position in which these parts are shown in Fig. 5. These end flaps are thereafter held in place by guiding plates 38.

Attached behind the guide plates 38 and extending through an aperture therein are springs 39 which frictionally engage the locking tabs 27 of the side end flaps 21 and 22, causing them to be retarded frictionally as the forming block 6 moves downwardly. The result of this retardation is to cause the side panels to swing outwardly as indicated in Fig. 6.

It will be seen from this figure that when the parts are in this position, the tabs 27 are retracted to a position above the slits 25 in the end flaps 20. A second set of springs 40, somewhat stiffer than the springs 39, next engage the tips of the tabs 27 in such manner as to press them into the depression 10 in the form block to open the slits 25.

When the parts of the carton are in this position, the side panels of the carton will be engaged by plates 41 and 42 (Fig. 2) and these plates will be swung on their pivotal centers 43 and 44 to carry the side parts of the carton inwardly into the position shown in Fig. 7 and cause the tabs 27 to enter the slits 25. To this end the side edges 45 of the end flaps 20 are cut back to permit this angular movement of the side flaps 15 and 17 beyond the vertical, as shown in Fig. 7.

The side plates 41 and 42 are fast on rockshafts 43 and 44 respectively and these shafts are rotated by oppositely directed lever arms 45 and 46 connected by a cross link 47. The shaft 43 has a crank arm 48 carrying a roller 49 which rides on cam 50 carried by shaft 51. Springs 52 and 53 normally urge the plates 41 and 42 outward against stop rods 54.

The structure of mechanism for driving cam 50 in timed relation to the successive arrivals of forming blocks 6 in position for cooperation with the plates 41 and 42 is well known in this art and has been omitted from the drawings in order to simplify the disclosure of the mechanical elements that directly coact with the carton blank to accomplish the folding operations.

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Adjusting screws 55 with lock nuts 56 regulate the pressure of the tucking springs 40.

The operation of the device shown is as follows:

The conveyor belt, not shown but of which is to be understood to comprise a series of bars 3, carries a succession of uniformly spaced blocks 6 which are guided by the fins 5 of the bars 3 riding in the guideway 2 so as to travel in a vertical path downwardly through the opening 4 in the table 1 of the machine. A complete machine of the general type to which this invention is applicable is illustrated in my aforesaid copending application. It will however be understood by those skilled in the art that the shaft 51 is suitably geared into the operating mechanism, as for example to an adjacent sprocket-carrying shaft of the conveyor, so that the rotation of the shaft 51 will be accurately timed to swing the plates 41 and 42 inwardly at the instant when the forming block 6 arrives at the position where the slits 25 of the carton reach the lower ends of the tucking springs 40.

When a form block 6 arrives at about the position in which it is shown in Fig. 3, a carton blank together with its liner, if it has one, is supplied by delivery devices, not shown, and caused to settle down on the table with its bottom panel 16 in registration with the folding shoulders 31 and 34 which surround and define the path of the bottom 7 of the form block 6. The downwardly moving form block now forces the carton through the table; the shoulders 31 first cause the bottom end flaps 20 to be folded upward on their score lines 14; and then the front and rear portions of the carton are folded upward on the score lines 13 of the bottom panel 16 as the bottom 7 of the form block passes the shoulders 34 which are spaced below the level of the shoulders 31.

During the stage of the folding operation, the end flaps 21 and 24 of the front panel 15 of the carton and the end flaps 22 and 23 of the panels 17 and 18 of the carton remain in planar alignment with their respective panels and pass downwardly through the slot-like spaces 57 between the bars 32 and the table edges that form the shoulders 34.

The warped surfaces 37 of the blocks 36 then act, through the movement of the form block, to fold these end tabs inwardly so that they overlie the end flaps 20 and pass downwardly between the blades 33 and the end faces 38.1 of the blocks 36, Fig. 3. The parts of the carton now occupy the relative positions in which they are shown in Fig. 5. When the tabs 27 of the carton come into contact with the friction springs 39, the side portions of the carton will have passed clear of the table and will be swung, by frictional engagement with the springs 39, to the position in which they are shown in Fig. 6, with the panels 17 and 18 lying against the plate 42 and the panel 15 lying against the plate 41 of the folding mechanism. The abutments 54 limit the outward movement of plates 41 and 42 against which the sides of the carton can be shifted under the action of friction springs 39. Thus the abutments 54 limit the retracted positions to which the tabs 27 of the carton folds can be moved by the friction springs 39.

The carton next reaches the point where the tucking springs 40 press the tabs 27 inwardly into the depressions 10 of the forming block above the slit 25. The cam 50 now causes the plates 41, 42 to swing inwardly carrying the carton parts to the relative positions shown in Fig. 7. During

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this last mentioned movement the tucking springs 40 guide tabs 27 so that they enter the slits 25 causing barbs 28 to interlock with the hook portions 26 of the slits 25. The overthrow indicated in Fig. 7 assures a proper interlocking of these parts, so that when the side panel 17 moves back to a vertical position, it completes the interlocking.

After the carton has been thus formed, it is removed from the block and the filling and closing of the carton is completed by devices which are not a part of the present invention.

Although but one specific embodiment of this invention is herein shown and described, it will be understood that numerous details of the structure shown may be altered or omitted without departing from the spirit of this invention as defined by the following claims.

I claim:

1. In a machine for forming a carton blank shaped to provide bottom and side panels having end flaps shaped and positioned to overlap one another to form an end panel of the finished carton, one of said side panel end flaps having a locking tongue and another of said end flaps having a slot to receive said tongue, the combination of a traveling form block, stationary guides positioned about the path of said block and acting in overlapping succession to fold said bottom end flaps against said block, then to fold said side panels against said block, and then to fold said tongued end flap against said block in overlapping relation to said slotted end flap, said last-named stationary guide comprising a surface of double curvature leading from alinement with the respective side panel guide to a position at right angles thereto.

2. In a machine for forming a carton blank shaped to provide bottom and side panels having end flaps shaped and positioned to overlap one another to form an end panel of the finished carton, one of said side panel end flaps having a locking tongue and another of said end flaps having a slot to receive said tongue, the combination of a traveling form block, stationary guides positioned about the path of said block and acting in overlapping succession to fold said bottom end flaps against said block, then to fold said side panels against said block, and then to fold said tongued end flap against said block in overlapping relation to said slotted end flap, said bottom end flap guide being spaced inward from said side panel guide and having a blade extending along said path to hold said bottom end flap against said block, and said tongued-end-flap guide comprising a surface of double curvature leading from a position in alinement with the respective side panel guide to a position adjacent to and parallel with said blade.

3. In a machine for forming a carton blank shaped to provide bottom and side panels having end flaps shaped and positioned to overlap one another to form an end panel of the finished carton, one of said side panel end flaps having a locking tongue and another of said end flaps having a slot to receive said tongue, the combination of a traveling form block, means coacting with said block to fold said side panels and end flaps against said block to form the carton, and a friction spring positioned to bear on the tongue bearing flap to retard its movement to swing the tongue into position to enter said slot, tucking means bearing on said tongue to open said slot and guide said tongue, and means for swinging said tongue into said slot,

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4. In a machine for forming a carton blank shaped to provide bottom and side panels having end flaps shaped and positioned to overlap one another to form an end panel of the finished carton, one of said side panel end flaps having a locking tongue and another of said end flaps having a slot to receive said tongue, the combination of a traveling form block, means coacting with said block to fold said side panels and end flaps against said block to form the carton, a friction spring positioned to bear on the tongue bearing flap to retard its movement to swing the tongue into position to enter said slot, a stationary tucking spring bearing on said tongue to open said slot and guide said tongue, and means for swinging said tongue into said slot.

5. In a machine for forming a carton blank shaped to provide bottom and side panels having end flaps shaped and positioned to overlap one another to form an end panel of the finished carton, one of said side panel end flaps having a locking tongue and another of said end flaps having a slot to receive said tongue, the combination of a traveling form block, means coacting with said block to fold said side panels and end flaps against said block to form the carton, a friction spring positioned to bear on the tongue bearing flap to retard its movement to swing the tongue into position to enter said slot, a stationary tucking spring bearing on said tongue to open said slot and guide said tongue, and means for swinging said tongue into said slot, said last-named means comprising a cam actuated plate bearing on the respective side panel of the carton.

6. In a machine for forming a carton from a shaped blank comprising side and bottom panels and end flaps attached to said panels including a pair adapted to occupy overlapping positions in the finished carton, one member of such pair having a locking tongue and the other member having a slot to receive said tongue, the combination of a traveling form block, means for wrapping the carton blank about said form block through the movement of said block, a friction spring adjacent the path of said block in position to engage said tongue bearing flap and shift it to a retracted position with respect to said slot, abutment means to limit such shifting of said tongue bearing flap, a second spring positioned to bear on said retracted tongue to open said slot, and means timed to coact with said second spring for tucking said tongue into said slot.

7. In a machine for folding a carton comprising bottom and side panels having flaps at their ends adapted to overlap to form end panels, each bottom end flap having a tongue-receiving slot therein, and each side end flap having a tongue formed thereon for insertion into the slot in the corresponding bottom end flap, the combination of a forming block having an end shaped to register with said bottom panel and mounted to travel in the direction faced by its said end, a pair of guides having parallel shoulders lying in a plane transverse to the path of said block and coacting therewith to fold said bottom end flaps against said block and having blades extending along the path of said block, other guides having parallel shoulders positioned to fold said side panels against said block and spaced from the outer edges of said blades to provide passages for the end flaps on said sides, means providing warped surfaces extending from said side panel folding shoulders outside of said blades for fold-

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ing said side panel end flaps against the outer faces of said blades.

8. In a machine for folding a carton comprising bottom and side panels having flaps at their ends adapted to overlap to form end panels, each bottom end flap having a tongue-receiving slot therein, and each side end flap having a tongue formed thereon for insertion into the slot in the corresponding bottom end flap, the combination of a forming block having an end shaped to register with said bottom panel and mounted to travel in the direction faced by its said end, a pair of guides having parallel shoulders lying in a plane transverse to the path of said block and coacting therewith to fold said bottom end flaps against said block and having blades extending along the path of said block, other guides having parallel shoulders positioned to fold said side panels against said block and spaced from the outer edges of said blades to provide passages for the end flaps on said sides, means providing warped surfaces extending from said side panel folding shoulders outside of said blades for folding said side panel end flaps against the outer faces of said blades, guide walls for loosely holding said side end flaps in their folded positions, means engaging said side panel end flaps to swing said side panels outward to carry their tongues rearward of said slots, stationary tucking springs positioned to bear on said tongues to open said slots, and means coacting with said tucking springs to swing said side panels against said block and cause said tongues to enter said slots.

9. A carton forming machine, comprising a

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traveling form block, and an assemblage of stationary carton-folding guides surrounding the path of said block and comprising side and end guides adjacent to and parallel with the paths of the sides of the block and presenting parallel shoulders to meet the carton, said end guide shoulders being positioned to engage the carton before engagement by said side guide shoulders, said end guides having blade-like extensions directed along the path of the block and being spaced inwardly from said side guides, and side flap folding guides presenting concave guide surfaces of double curvature extending along the path of said block around the portions of said blades that are next adjacent to said shoulders and commencing at a position of alinement with said side guide shoulders and ending at a position of parallelism with and close to said blades.

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REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,025,880	Peters	May 7, 1912
1,957,957	Hartman	May 8, 1934
2,146,407	Rose	Feb. 7, 1939
1,430,232	Horton	Sept. 26, 1922

FOREIGN PATENTS

Number	Country	Date
507,058	Great Britain	June 1, 1939