

May 11, 1948.

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2,441,445

METHOD AND MACHINE FOR FORMING AND FILLING RECLOSABLE CARTONS

Filed April 12, 1943

7 Sheets-Sheet 1

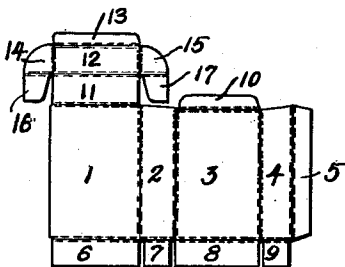


Fig. 1.

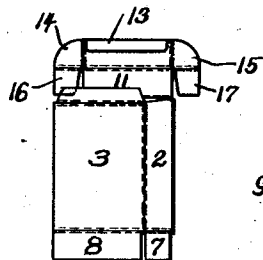


Fig. 2.

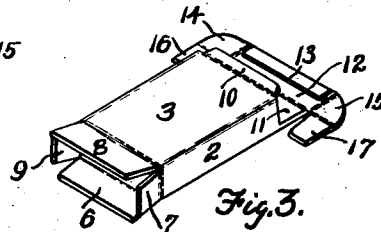


Fig. 3.

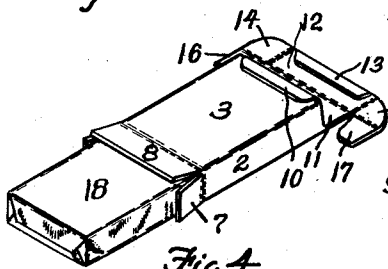


Fig. 4.

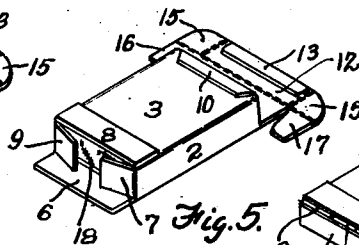


Fig. 5.

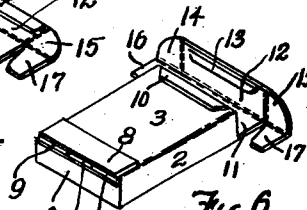


Fig. 6.

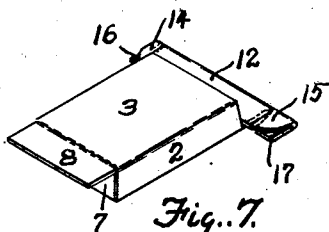


Fig. 7.

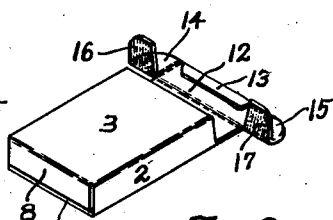


Fig. 8.

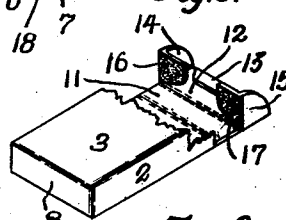


Fig. 9.

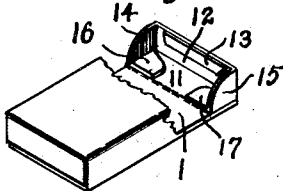


Fig. 10.

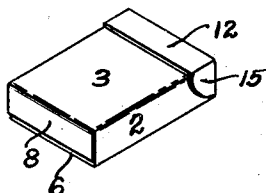


Fig. 11.

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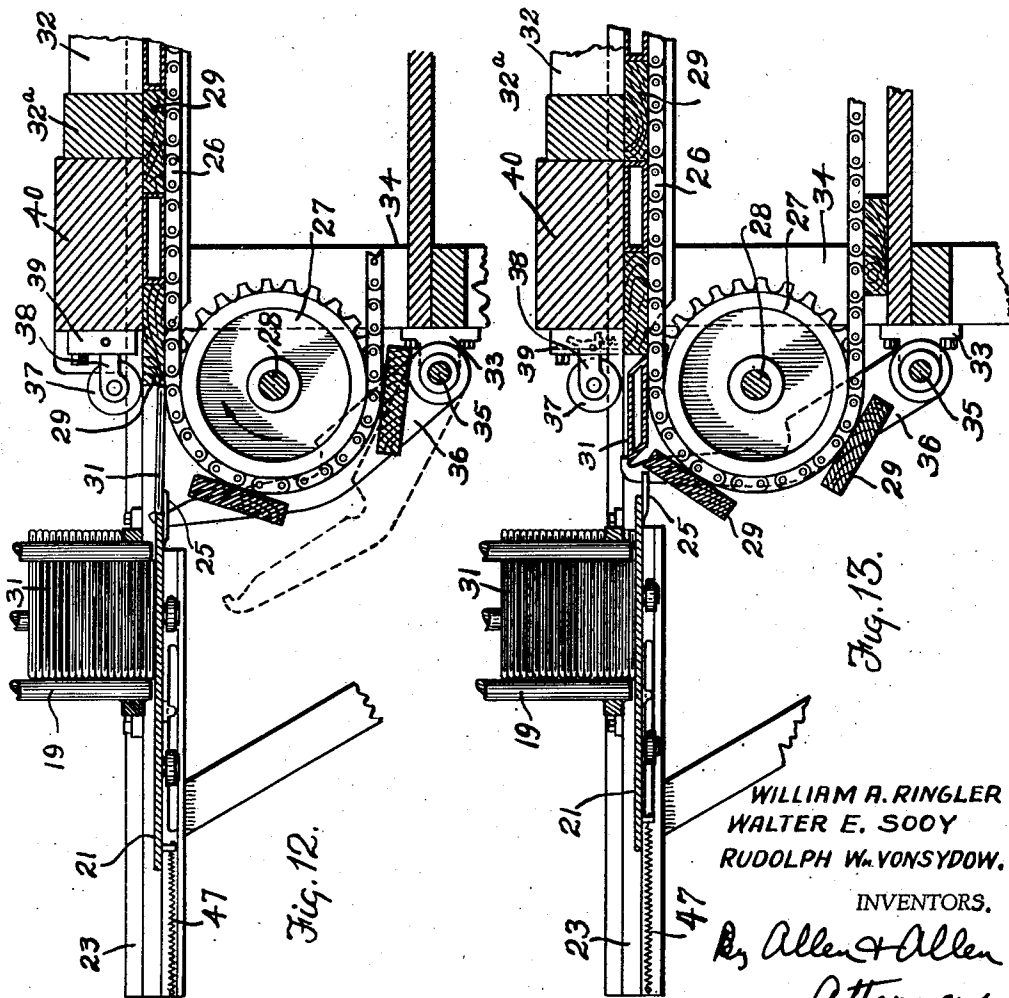
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7 Sheets-Sheet 3

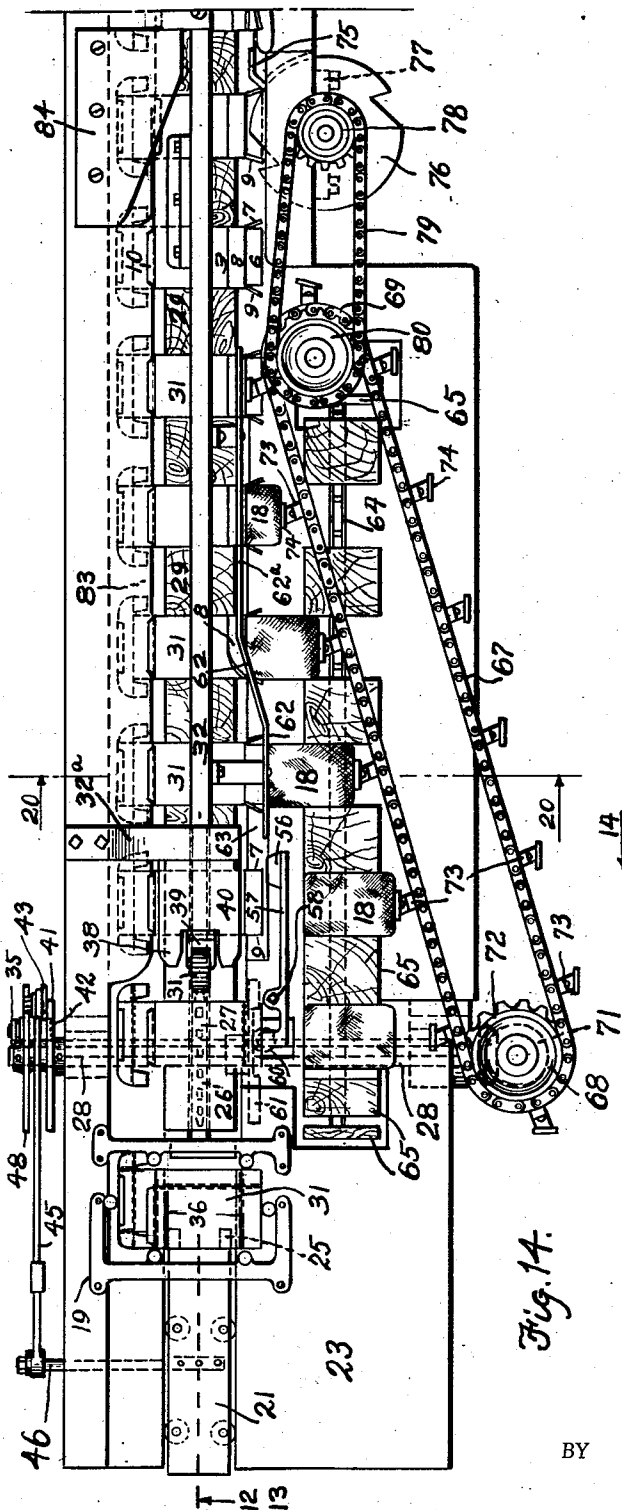


Fig. 14.

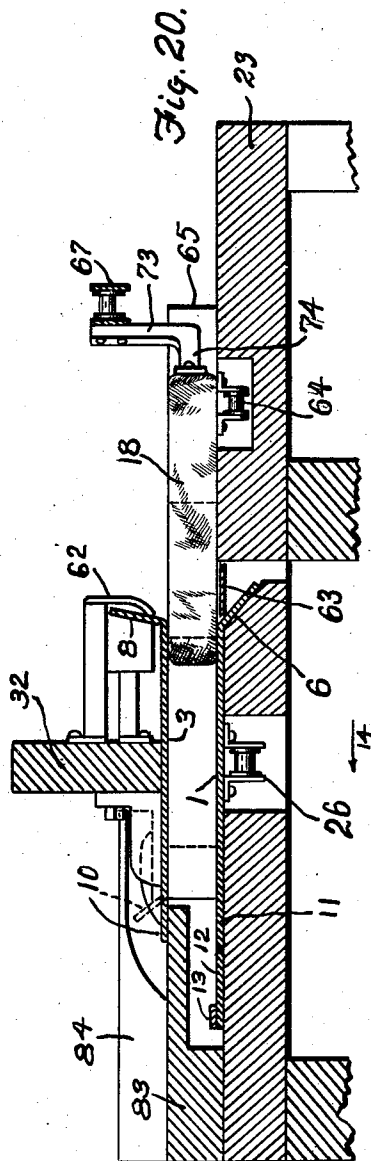


Fig. 20.

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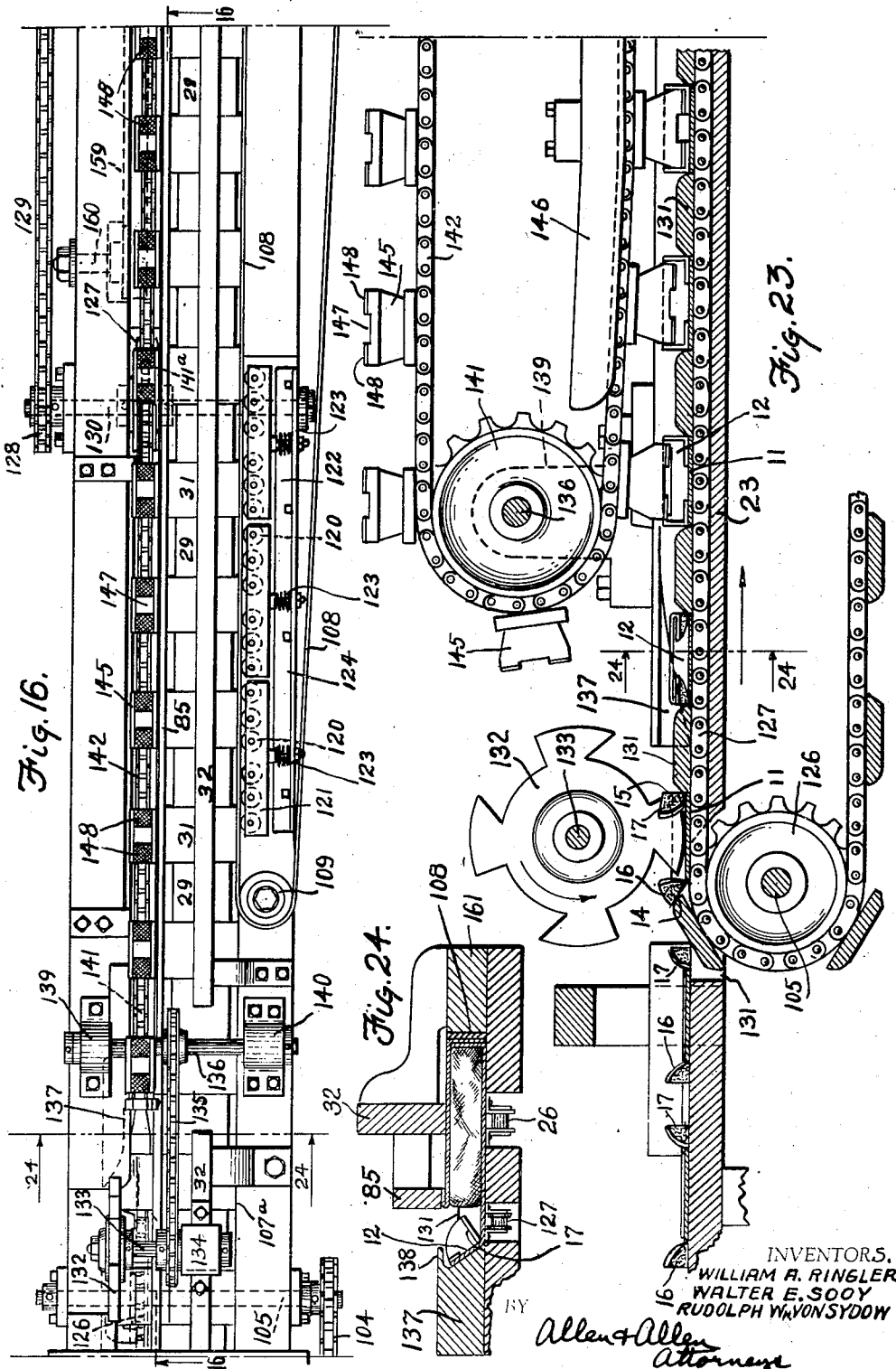
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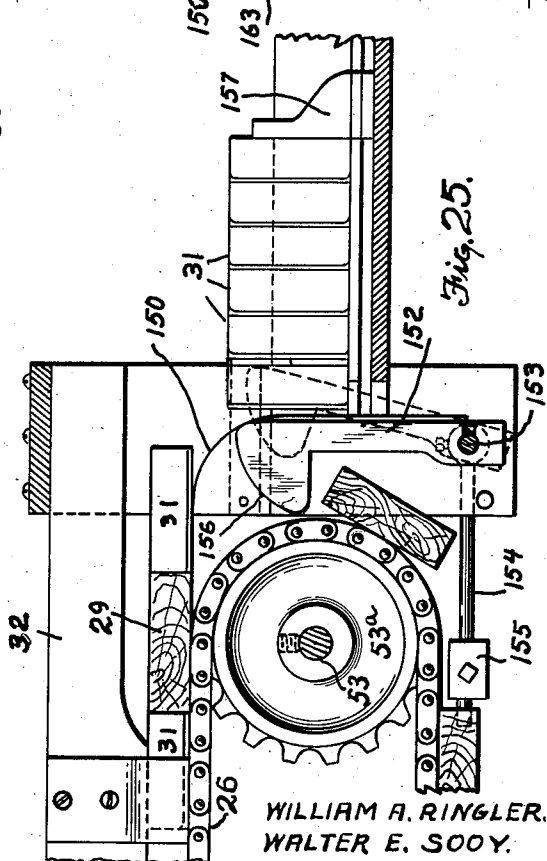
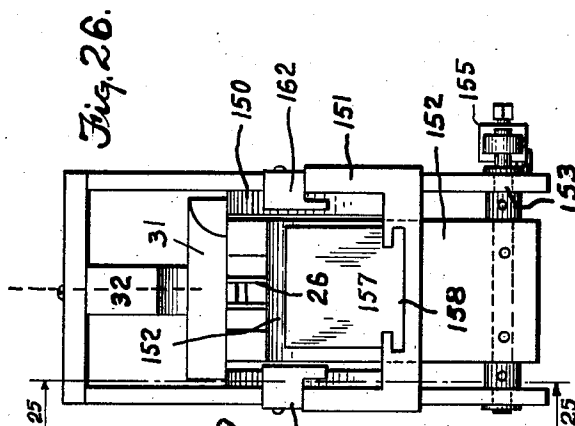
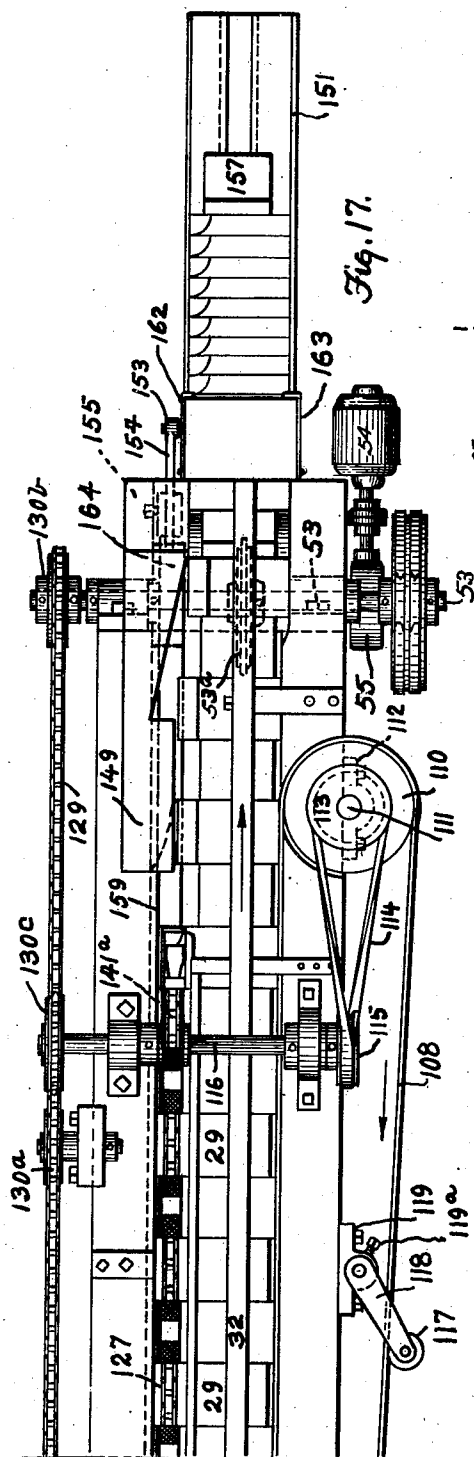
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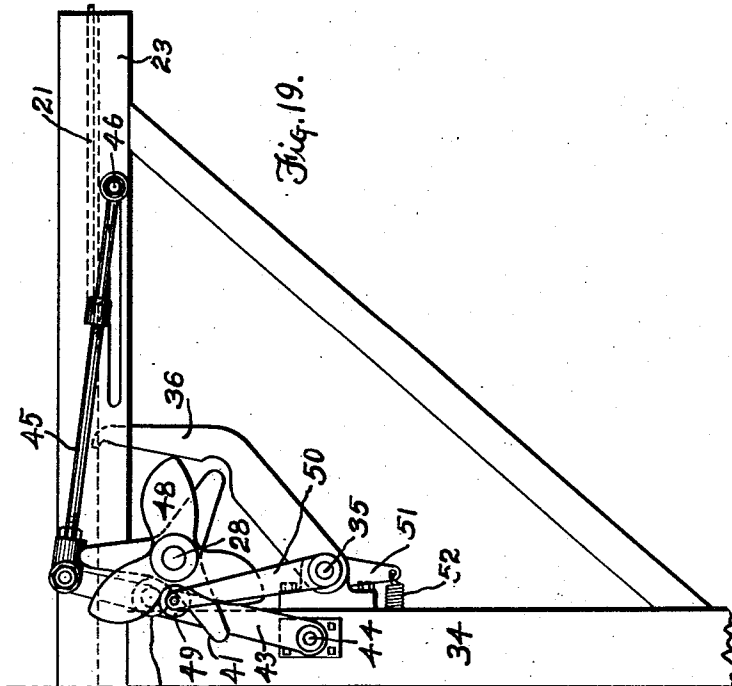


Fig. 19.

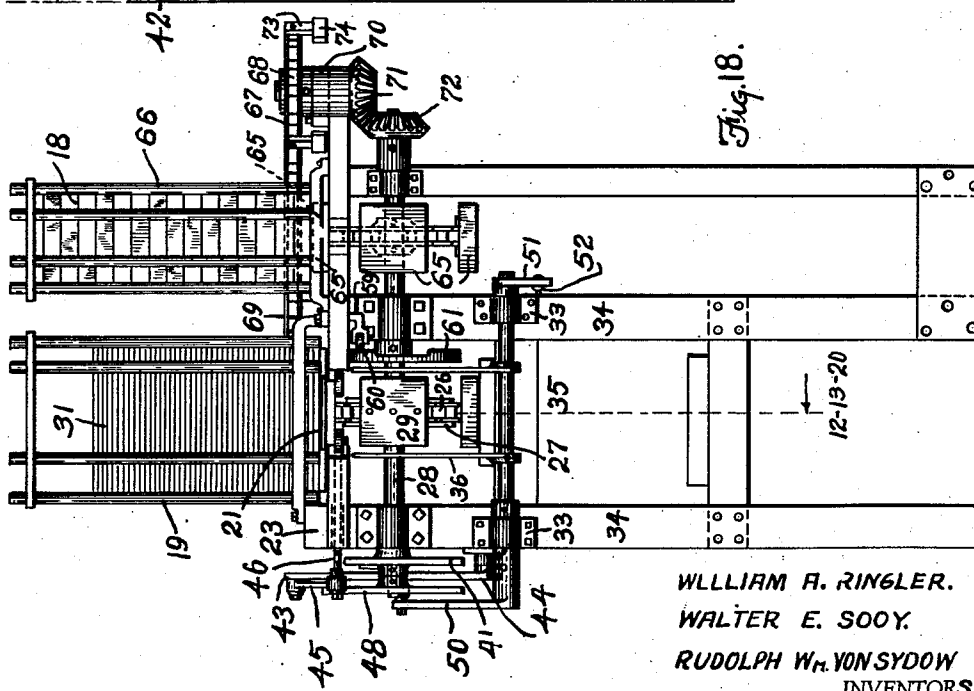


Fig. 18.

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UNITED STATES PATENT OFFICE

2,441,445

METHOD AND MACHINE FOR FORMING AND FILLING RECLOSABLE CARTONS

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Application April 12, 1943, Serial No. 482,806

19 Claims. (Cl. 93—6)

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Our invention has for its principal object the provision of a machine for forming up, filling and closing a type of boxboard carton for which the usual filling and sealing mechanism is not available. The carton itself is not herein claimed, but it will be described since an understanding of its nature is necessary to an understanding of the present invention. Generally characterized, it is a tubular carton having (preferably) at one end the usual seal end construction, but at the other a cover member, articulated to the body of the carton and swingable from a closed to an open position. When the cover is in closed position, coacting parts effect a retention of the cover in that position and offer a substantial resistance to the opening of the cover. The action is automatic, and the carton may be opened and closed indefinitely, within the wear-strength of the board from which it is made.

The exemplary carton employed for purposes of illustration herein is one intended for use as a pocket container for pipe and cigarette tobacco. It will be understood, however, that the carton may be given various sizes and shapes for a variety of uses. Various subcombinations of the apparatus and method herein disclosed may be employed in treating cartons of other types than the exemplary one, and in this event the body of the carton may be widely changed through a variety of known types, as well as the nature of the bottom end closure. Also our invention in some of its aspects is applicable to the formation of top end closures of modified type with or without the automatic feature mentioned above. Closures having the automatic feature will hereinafter be referred to for convenience as "click top" closures.

It is an object of our invention to provide means and a method for forming a click top closure on a carton.

It is an object of our invention to provide a means and method effective for erecting a carton, filling it, closing and sealing the bottom end, forming a click top structure, closing the top, and delivering the finished package, as a series of interconnected steps.

Since the formation of the click-top closure involves the making of a plurality of folds in a plurality of directions, it is an object of our invention to simplify the formation of these folds by mechanical means, and more particularly to correlate the operations so that the formation of certain folds is a factor in the formation of others, as will hereinafter be explained.

These and other objects of our invention, which

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will be later set forth or will be apparent to one skilled in the art upon reading these specifications, we accomplish by that certain construction and arrangement of parts and by that mode of operation, of which we shall now describe an exemplary embodiment. Reference is made to the drawings which form a part hereof and in which:

Figure 1 is a plan view of the blank for the exemplary carton.

Figure 2 is a plan view of the carton in tubed condition, i. e. in the form in which it may be delivered to our machine.

Figures 3 to 11 inclusive are perspective views of the carton showing the several operations performed by the machine.

Figure 12 is a partial sectional view showing the relationship of a feeder to a conveyor for the cartons.

Figure 13 is a similar view showing the action of erecting fingers which we prefer to provide.

Figures 14, 15, 16 and 17 are partial plan views taken along the length of the machine, to be taken together and in the order in which the figures are numbered.

Figure 18 is an elevational view of the entering portion of the machine.

Figure 19 is a fragmentary elevation showing cam mechanism for operating the carton feeder and erecting fingers.

Figure 20 is a transverse section taken along the line 20—20 of Figure 18, and showing mechanism concerned with the operation of feeding contents into cartons.

Figure 21 is a sectional view of the machine taken along the line 21—21 of Figure 15, and relating to the folding of bottom flaps.

Figure 22 is a section taken along the line 22—22 of Figure 15, and relating to a gluing operation.

Figure 23 is a longitudinal section on an enlarged scale taken of the portion of the machine shown at the left hand end of Figure 16.

Figure 24 is a section related to the line 24—24 of Figure 16.

Figure 25 is a partial, longitudinal sectional view of instrumentalities at the delivery end of the machine.

Figure 26 is a partial end elevation of the delivery end of the machine.

In the blank for the exemplary carton, as shown in Figure 1, four body walls 1, 2, 3 and 4 are articulated together by score lines shown as dotted lines. A glue flap 5 is articulated to the wall 4. At the lower ends of the body walls, there are sealing flaps of usual form, indicated at 6, 7, 8 and 9.

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To the top of the front body wall 3 there is articulated a click flap 10, the function of which will hereinafter be described. To the top of the back body wall 1, there is articulated a cover top wall 11, to which, in turn, is articulated a cover front wall 12, bearing an abutment flap 13. Cover side walls 14 and 15 are articulated to the cover front wall 12; and these bear glue tabs 16 and 17 which are ultimately to be attached to the cover top wall 11.

The carton blank is manufactured in the usual fashion by providing boxboard, printing it as may be desired, and sending it through a cutting and scoring press. The completed blank, (as shown in Figure 1), may then be sent through the usual carton folding machine wherein it is tubed, i. e. folded on two of its longitudinal score lines, and its glue flap 5 attached to the wall 1. When this is done, the blank is in the flat form shown in Figure 2. By means of the same machine with a suitable attachment, or by means of a separate machine, we prefer to fold over the abutment flap 13 and glue it to the cover front wall 12. In this condition the collapsed cartons are shipped to the manufacturer of the goods to be packaged in them.

A consideration of the steps through which the carton passes in our machine will indicate our manner of operating upon the carton and will help in an understanding of the mechanism subsequently described. The first operation is that of erecting or squaring up the tubular carton, whereby it is brought into the condition shown in Figure 3. Next, the bottom end sealing flaps are spread apart sufficiently to be out of the way, and the contents are inserted into the erected carton body through its lower end. In Figure 4 a charge of tobacco previously wrapped in paper, as at 18, is shown being inserted as a unit into the carton. While this is being done, the click-flap 10 may be turned over outwardly so as to lie against the front wall 3.

When the charge of tobacco has been fully inserted, operations for closing the bottom of the carton are begun. In our operation, one of the longer sealing flaps 8 is bent over against the front wall 3 so as to get it out of the way, and the shorter sealing flaps are bent over as shown in Figure 5. The sealing flap 6 may then be bent upwardly against the sealing flaps 7 and 9 as shown in Figure 6. While this is being done, the cover front wall 12 is being bent upwardly carrying with it the cover side walls 14 and 15, which remain in the plane of the wall 12. This folding is continued as shown in Figure 7 until the wall 12 has been doubled over on its respective glue tabs 16 and 17. During this time also, the folding downwardly of the bottom sealing flap 8 may be begun. A glue application will be made not only to the glue flap 8 but to the under sides of the glue tabs 16 and 17, at the stage of carton folding illustrated in Figure 7.

Figure 8 illustrates a stage of the operation wherein the bottom glue flap 8 has been folded into final position, (whereby the bottom closure and seal is completed), and wherein the cover front wall 12 has been folded back again to its original position. It will be noted that the cover side walls 14 and 15 are still coplanar with the cover front wall 12. The result of the folding operation is to cause the glue tabs 16 and 17 to project upwardly at an angle to the plane of the remainder of the cover parts. This effect has been accomplished by folding means acting upon the cover front wall and the associated cover side

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walls 14 and 15, but not by mechanical means acting directly on the glue tabs 16 and 17. The operation is mechanically a simple one. We are thus able to leave our glue tabs 16 and 17 free for the application of glue, (which is indicated by stipple marks); but we avoid the necessity of moving folding means acting on the glue tabs. The reason why the glue tabs rise to the position shown in Figure 8 is that the board lacks complete resiliency, and when the cover side walls have been bent over into superposed relationship with the glue tabs (as in Fig. 7) and then bent back (as in Fig. 8), the glue tabs spring away somewhat from the cover side walls, but will not reassume a 180° relationship with them.

As a further consequence of this procedure and action, it will be seen that when the cover side walls 14 and 15 are bent upwardly with respect to the cover front wall 12 (as shown in Figure 9), the glue tabs 16 and 17 are caused to extend inwardly and toward each other, still without the necessity of folding means acting directly upon them. If now the cover front wall is bent upwardly with respect to the cover top wall 11, as shown in Figure 10, the various cover parts will assume their final relative relationship, with the glue tabs located inside the cover top wall. They may now be pressed against the cover top wall 11. It remains to close the cover as shown in Figure 11, whereupon the filled and closed carton is complete as such. Needless to say, it may be subsequently wrapped, as in Cellophane where this is desired; and in the packaging of tobacco products it will be usual to affix a revenue stamp in such manner that the stamp must be broken to open the cover of the carton.

With the carton in closed position as in Figure 11, the click-flap 10 lies inwardly against the cover front wall 12 and coplanar or substantially so with the abutment 13. Thus resistance is offered to the opening of the carton, for the click-flap 10 must swing upwardly until the abutment is released. In doing this, it depresses the upper edge of the front body wall 3 of the carton. The carton may have its cover opened and closed indefinitely and the click-top construction and operation is such that the cover, when closed, will always be held in closed position against accidental opening.

As hereinabove indicated, the cartons in the condition shown in Figure 2 are delivered to the machine of our invention and are placed in a feeder in stacked relationship. This feeder comprises a hopper 19 and a pusher plate 21 which is caused to oscillate in a base or bed 23 fastened to the frame of the machine, or forming part of it. The mounting of the pusher plate 21 may be any suitable one. It may, as shown in Figs. 12, 13 and 14, be mounted in a cutout in the bed 23, on rollers which ride in grooves in the sides of the cutout. The thickness of the pusher is not greater than the normal thickness of the folded blank of Figure 2. Pusher feeders as such are known in the art, and it will be readily understood that as the pusher is withdrawn to the left in Figure 12, so as to come out from beneath the stack of collapsed cartons, the stack will descend until the lowermost carton lies in the plane of the pusher. We prefer to attach to its forward end stop means 25 to prevent the trailing end of the carton blank from descending too far and possibly fouling on the fingers hereinafter described. Upon movement of the pusher to the right in Figure 12, the lowermost carton will be moved forwardly and thereby taken out of the

stack. The hopper 19 will keep the remainder of the cartons in the stack.

The cartons are moved through the machine in erected condition on a conveyor comprising belts, chains or other flexible moving means, with blocks spaced on the conveyor to accept the erected cartons in the spaces between. These blocks not only insure movement of the cartons through the machine, but also maintain them in erected condition. In Figures 12 and 13 we have shown a conveyor comprising a flight of chains 26 passing over sprockets 27 on a shaft 28. On the chains are affixed the series of blocks 29. It will be seen in the figures that erected cartons 30 are engaged between the blocks on the straight flight of the conveyor. As a collapsed carton 31 comes out of the stack under the influence of the pusher 21, the timing and the distance of travel of the pusher with respect to the blocks on the conveyor may be made such (by means of the shape of the operating cams hereinafter to be described) that it not only brings the carton 31 against the trailing edge of a block 29, but also pushes the carton ahead faster than the travel of the conveyor so as to accomplish a partial erection of the carton. In this way, the erection of the carton may be carried on by the combined action of the pusher and the block to such a degree that the leading edge of the next succeeding block, which at this time is traveling in an arcuate path about the sprockets 27, can engage the carton and, as it swings into the straight flight of the conveyor, can fully erect it and hold it against the preceding block.

As the erected cartons move along the conveyor, an overhead guide or hold down 32 maintains the cartons between the blocks.

While the operation just described is a mechanically simple one, various factors may affect it. One of these is the matter of change of dimensions of parts of the machine with humidity conditions, especially where such parts are made of wood. At a time when metals are largely unobtainable, we have been making our machines with the use of as much wood as possible, and have illustrated in our drawings a machine with large numbers of wooden parts. In the type of erecting operation just described dimensional changes in the blocks 29 tend to affect it in considerable measure, and we prefer the more positive action of erecting fingers and attendant mechanism which we will now describe. In suitable bearings 33 on uprights 34 of the machine frame we mount a shaft 35 and to this shaft we non-rotatably affix erecting fingers 36. The length of the blocks 29 is somewhat less than the length of the carton bodies so that the fingers 36 may contact the carton bodies off the ends of the blocks. In Figure 12, as the carton 31 is delivered into position to be engaged by the blocks, the spreader fingers 36 move upwardly from a position shown in dotted lines to the position shown in full lines. During the reverse movement of the pusher plate 21, as shown in Figure 3, the fingers 36 engage the carton 31 and by moving the trailing edge of it forwardly at a greater speed than the speed of travel of the blocks, erect the carton as indicated. During this operation the trailing edge of the carton is engaged in notches near the ends of the erecting fingers. On the end of the hold down 32 we prefer to mount a roller 37 in a resilient fashion so as to prevent the erected or partially erected cartons from moving upwardly so as to come out of engagement with the blocks and with the con-

veyor, and so as to insure that the erected cartons will ride properly under the end of the hold down 32. The roller 37 is pivoted on arms 38 which in turn are pivoted in bracket boxes 39 on the end of the hold down structure. Within the bracket box the arms 38 may be provided with a projection upon which a spring acts as shown, and may also be provided with another projection which, coming against an abutment prevents too great a descent of the roller 37. The hold down proper, 32, is held in position by a bracket or arm 32a, and the hold down roller may be mounted on a forward extension of this bracket as at 40. This extension, as indicated in Figure 14, may have projecting portions extending up to or beyond the roller 37 which also assist in introducing the cartons beneath the hold down 32.

The hold down 32, with some interruptions for the passage of shafts, extends substantially throughout the machine to the delivery end thereof, as can be seen from a consideration of Figures 15 to 17 inclusive.

For the operation of instrumentalities thus far described we attach certain cams to the driven shaft 28. The character of these cams will be best understood from Figure 19. A 3-pronged cam 41 acts upon a cam follower 42 on a lever 43 which is pivoted on a bracket 44 to the machine upright 34. The upper end of the lever 43 is connected by a linkage 45 to an arm 46 (for the arm see Figure 14) which is fastened to the pusher plate 21. To cause the cam follower 42 to follow the cam we may employ a spring 47 (shown in Figures 12 and 13) which connects the pusher plate with the end of the bed 23. We could of course employ a spring directly upon the lever 43, and in some instances we have employed, in addition to the pusher plate spring, a coil spring at the pivot 44. For the operation of the erecting fingers 36 we provide another cam 48 on the shaft 28. A cam follower 49 for this cam is affixed to a lever 50 which in turn is non-rotatably fastened to the erector finger shaft 35. Another lever 51 also non-rotatably mounted on the shaft 35 is connected to the upright 34 by a tension spring 52 so as to cause the cam follower 49 to follow the cam 48.

The main conveyor chain or chains 26 extend to the exit end of the machine and return over a sprocket or sprockets on a shaft 53 mounted on the frame of the machine (see Figure 17). A motor 54, through a gear box 55 drives the conveyor. The conveyor chain 26, of course, drives the shaft 28 at the entering end of the machine.

As the cartons pass along the conveyor between the blocks, and beneath the hold down 32, the bottom end closure flaps are bent outwardly out of the way, as shown in Figure 4. A kicker 56 (Figure 14) is employed to knock forwardly the leading short bottom sealing flap 7. This kicker is mounted on one end of a lever 57, pivoted as at 58 on the machine frame, and having at its other end a depending arm 59. A cam follower roller 60 is mounted on the end of the arm, and coacts with a cam 61 mounted on the shaft 28. The lever 57 will be provided with spring means (not shown) to hold the cam follower against the cam. The kicker 56 has beveled sides as shown. The timing is such that the kicker rapidly moves toward the carton and its beveled front edge bends flap 7 forward. The kicker then stays between flaps 6 and 8 while the carton moves forwardly on the conveyor so

that its rear beveled edge can move backwardly the sealing flap 9.

Curved stationary sweeps move flaps 6 and 8 outwardly. The sweep for flap 8 is indicated at 62 in Figures 14 and 20, the latter figure showing how it may be supported from the central hold down 32. In this figure also the stationary sweep for flap 6 is indicated at 63. Sweep 62 is continued and configured until, as indicated in Figure 14 at 62a, it has bent flap 8 over onto the top wall 3 of the carton.

For filling the cartons, we provide in connection with the bed 23, another conveyor 64 (Figures 14 and 18) consisting of a chain or chains (or other flexible members) passing over a sprocket on shaft 28 and another spaced sprocket (not shown). This second conveyor bears spacers or blocks 65 between which the charges 18 may be engaged. A feeder having a hopper 66 is provided for these charges. Since there is in connection with this feeder no problem of erecting a carton, and since the charges 18 are of ample thickness, the blocks 65 themselves can act as pushers to withdraw the charges from the stack. The conveyor 64 moves with conveyor 26 so that the charges are maintained opposite the cartons into which they are to be introduced, while both are in motion.

As the charges 18 move along opposite the cartons, they are driven transversely to the conveyor 64 so as to introduce and push them into the cartons. This is preferably accomplished by providing pushers on a flight of chain 67 which runs diagonally of and above the conveyor 64. The chain 67 passes over sprockets 68 and 69. The stub shaft of sprocket 68 is journaled in a bearing 70 (Figure 18) on the bed 23. The shaft bears a bevel gear 71 meshing with another bevel gear 72 affixed to shaft 28. Thus the chain 67 is driven synchronously with chains 26 and 64. The stub shaft of sprocket 69 is provided with a similar bearing on the bed 23.

At intervals along the length of the chain 67, are depending arms 73 (Figures 14, 18 and 20) which carry rollers or flat pusher members 74, the latter being so disposed that they extend down between the blocks 65 so as to engage the charges 18. The charges are thus gradually introduced into the erected cartons while both are moving. If necessary the chain 67 may be supported throughout its working length.

We prefer to introduce the charges into the containers by the means and procedure just described. Other mechanisms may, however, be employed. We have, by way of example, employed a stepped pusher plate operating transversely to the conveyor 64 and so timed in its movements that the several steps of the plate effect successive movements of the charges 18 transversely to the conveyor 64 and into the cartons. As shown, the spaced relationship of conveyors 26 and 64 is such that when the blocks 65 no longer engage the charges 18 so as to move them longitudinally of the machine, the charges will have been introduced far enough into the cartons so that the cartons themselves will carry along the charges.

When the charge has been fully inserted into the carton, the operation of folding and gluing the bottom sealing flaps of the carton is begun. A stationary sweep 75 may be used to fold in the leading short sealing flap 7, as shown in Figures 14 and 15. We employ a kicker to fold forwardly the trailing short sealing flap 9 until

it can be engaged and folded to its final position by the same stationary sweep 75. An exemplary form of this mechanism comprises a notched, rotating disc 76. This is mounted on a stub shaft journaled as at 77 in bearing means which may be fastened to a side frame member of the machine. This shaft also bears a sprocket 78 which is driven by means of a chain 79 from a sprocket 80 on the stub shaft of sprocket 69 for conveyor 67. The notched parts of the disc 76 act as forward kickers on the trailing flap 9. To this end they must move faster than the travel of the cartons. The size of sprockets 78 and 80 and the spacing of the notches on the disc 76 as well as its size are apportioned to effect the desired speed of operation while maintaining the necessary timing.

In Figures 15 and 21 it may be seen how, just after the sweep 75 completes the folding in of the flaps 7 and 9, a sweep 81 folds the bottom sealing flap upwardly. A continuation of this sweep as at 81a maintains the folded condition of flaps 6, 7 and 9 to and through a point at which glue is applied to flap 8. In the travel of the carton as it approaches the glue application point, an overhead sweep or stationary folder (Figure 15) indicated at 82 folds the flap 8 down into vertical position so that it may receive the glue.

Meanwhile, a series of folding operations have been conducted on the top structure of the carton. From Figure 21 it will be clear how the top portion of the carton moves along over the bed 23 of the machine. A member 83 fastened to the machine bed may overlie the unfolded top construction of the carton and serve as an abutment to prevent endwise displacement of the cartons between the blocks 29 on the conveyor 23. A stationary sweep 84 may be employed to turn over the click-flap 19 onto the wall 3, and a suitable continuation of this sweep in the form of a hold down strip 85 may maintain the folded condition of flap 19 substantially throughout the length of the machine.

A stationary sweep 86 is next employed to fold over the cover front wall 12 onto the cover top wall 11 while folding over the cover side walls 14 and 15 onto the cover glue tabs 16 and 17 as heretofore explained in connection with Figures 6 and 7. Displacement of the glue tabs 16 and 17 is prevented because these tabs are riding along on the bed 23. A sword (not shown in the drawings) may be employed in order to enforce the bending of the boxboard along the line of articulation between cover walls 12 and 11 and between the cover side walls and their attached sealing tabs.

The action illustrated in Figure 8, we find, is facilitated by pressing the blank along the line of articulation just mentioned. To this end, at a point where the machine bed is interrupted, we mount a pressing roller 87 on the side frame of the machine, so that it may engage the blank from beneath, and in a bracket 88 we journal an upper pressing roller 89. One or both of these rollers may be spring pressed or, as detailed in Figures 15 and 22, the upper roller may be mounted eccentrically on a shaft 90 bolted into the bracket 88, while a handle 91 permits an adjustment of the position of the roller 89 which then can be fixed by means of the bolt.

At the glue application point a transverse shaft 92 is journaled. This shaft bears a glue applicator 93 with fixed or adjustable teeth so positioned as to apply glue to the glue tabs 16 and

17 without applying it to the intervening cover top wall 11. The shaft 92 also bears a glue applicator disc 95 positioned to apply a stripe of glue to the under side of the bottom sealing flap 8. Thus the application of glue is localized at one point in the machine.

A glue transfer roll 96 on a shaft 97 turns in a glue pot 98. This pot may have any suitable mounting together with any suitable heating means. It is convenient to mount the pot on pivoted arms 99 on a sub-base 100 supported on the machine frame. This permits swinging the pot to a position in which the glue transfer roll 96 contacts the glue applicators 93 and 95, and also to an open position as shown in dotted lines. An adjustable stop means 101 may be employed to determine the contact of the applicators and the transfer roll. Instead of a solid roll we may employ transfer discs, as will be clear, either in the same or in separate glue pots. In either event, we prefer to drive the shaft 97 from shaft 92 by means of a chain 103 or other suitable drive. The shaft 92 is itself driven by means of a chain 104 and suitable sprockets from another transverse shaft 105 (Figure 16) about which more will be said later.

In order to insure contact of the carton parts to which glue is to be applied and the glue applicators, we prefer to provide overhead hold down or presser rollers 106 at both ends of the carton. When the carton has left the glue application point in Figure 15 a stationary sweep 107 is employed to fold downwardly the bottom sealing flap 8 into final position. The package has now been filled and the bottom closure is complete except for pressing and holding it until the glue has set. A continuation of the sweep 107, as at 107a in Figure 16, maintains the final position of flap 8 until pressing means can be brought against it.

Considering these pressing means, they preferably comprise, first, a presser belt 108 (Figures 16 and 17). This belt passes over a tail sheave 109 journaled on the machine frame and a forward sheave 110 affixed to a stub shaft 111 journaled as at 112 on the frame of the machine. A sheave 113 also affixed to the stub shaft is driven by a belt 114 from a sheave 115 affixed to a transverse shaft 116 about which more will be said hereinafter. A belt tightener is preferably employed and may comprise a roller 117 mounted on an arm or arms 118 pivoted as at 119 on the frame of the machine and either acted on by a spring (not shown) or fixed in a belt tightening position by a set screw 119a.

The forward moving flight of belt 108 parallels the movement of the carton ends as the cartons are carried along by the blocks 29 on the conveyor 26. We prefer to provide throughout a portion at least of this flight of the belt a series of pressing elements. As shown, these may comprise small rollers 120 journaled in frames 121 which in turn are centrally pivoted to an angle iron or the like 122. This angle iron forms an abutment on the machine frame, and compression springs 123 engage between it and the frames 121. This gives a presser construction which nevertheless is flexible and is capable of accommodating itself to irregularities of travel in the operating flight of belt 108.

The remaining operations to be performed on the top part of the carton are those operations illustrated in Figures 8 to 11 inclusive. In the first of these operations the cover front wall 12 and its associated cover side walls 14 and 15 are folded

back again into a position coplanar with the cover top wall 11. This is accomplished by means of a stationary sweep indicated at 125 at the right hand end of Figure 15. This sweep has, of course, an outward and downward configuration as respects the cartons and the result of the folding operation is to bring the carton top into the condition shown in Figure 8 where the glue tabs 16 and 17 on the cover side walls 14 and 15 are caused to extend upwardly, although they have not been contacted by folding instrumentalities. The next operation will be that of bringing about the condition shown in Figure 9, for which purpose we employ a series of instrumentalities next to be described. As shown in Figures 16 and 23 on the transverse shaft 105 we mount a sprocket 126 which is the tail sprocket for another longitudinal chain 127, the upper flight of which rides along in a groove on the machine bed 23 in a position underlying the cover parts of the cartons. The chain 127 returns over a sprocket affixed to a shaft 130 (Figure 16). This shaft bears a sprocket 128 engaging a chain 129 passing over a sprocket 130b (Figure 17) on the main drive shaft 53 of the machine. It will be clear that the chain 127 is thus driven from the motor 54.

The chain 127 carries spaced blocks 131 arranged to travel synchronously with blocks 29 of the main conveyor 26. The blocks 131 are arranged to lie between the top portions of successive cartons on the conveyor. The blocks have beveled edges and their movement around the sprocket 126 as well as their positioning on the straight flight of the chain 127 is such as to cause an upward bending of the cover side walls 14 and 15 if the cover front wall 12 is depressed between the blocks. This action will be clear from Figure 23. For depressing the cover front wall 12 between the blocks 131 we provide an appropriately shaped and appropriately timed rotating star wheel 132. This wheel is mounted on a shaft 133 which may be journaled as at 134 (Figure 16) in a bearing member affixed to a bracket on the machine frame or affixed to a supported end of the hold down 32. The shaft 133 has a chain and sprocket drive (including the chain 135) from a shaft 136 which will hereinafter be described.

The result of depressing the cover front wall 12 between the blocks 131 is to turn up the cover side walls 14 and 15. This produces an inward disposition of the glue tabs 16 and 17 (as shown in Figure 9), still without the necessity of contacting these glue tabs with folding instrumentalities. The next step is the bringing of the carton top into the condition shown in Figure 10. This is accomplished by folding upwardly the cover front wall 12. A stationary sweep 137 performs this action. The sweep preferably has a ledge or overhang 138 (Figure 24) which prevents the cover top wall 11 from rising upwardly, and obviates the use of a sword. The bending of the cover front wall 12 upwardly, as in Figure 10, results in positioning the glue tabs 16 and 17 on top of and against the cover top wall 11 while the blocks 131 still act to prevent spreading of the cover end walls 14 and 15. To insure adherence of the glue tabs to the cover top wall they must now be pressed and held thereagainst. This is accomplished by means coming down from above and traveling with the cartons, engaging glue tabs 16 and 17 and pressing them against the cover top wall 11 which in turn is supported from beneath by the chain 127.

A shaft 136 is mounted in bearing members 139 and 140 which rise considerably above the

plane of the machine bed. The shaft 136 bears a sprocket 141 about which travels a longitudinal chain 142 paralleling the chain 127. This chain 142 returns over a sprocket 141a (Figure 17) near the forward end of the machine, the sprocket 141a being secured to a shaft 116. The chain 129 passes partially around the underside of a sprocket 130c, mounted on the outer end of shaft 116, the chain being held in driving contact with the sprocket 130c by an idler sprocket 130d, the axial center of this idler sprocket being on or near the horizontal axial plane of shaft 116, the chain 129 passing over the upper periphery of sprocket 130d and passing onto sprocket 128 and thence returning to sprocket 130b, furnishing driving power to shafts 130, 136, 105, 116 and 92.

The chain 142 bears presser blocks 145. When the carton tops have been brought into the condition shown in Figure 10 these presser blocks swing into position within the carton tops and, gradually descending, press glue tabs 16 and 17 against the wall 11. The gradual descend of the blocks 145 after they have swung around the sprocket 141 is accomplished by the provision of a pressure trackway 146 for the chain 142. The trailing end of this trackway tapers upwardly as shown in Figure 23. We have found it preferable to relieve the presser blocks 145 centrally as at 147 so as to confine their pressure to the glue tabs 16 and 17. Also we prefer, where the presser blocks are made of wood to line the operating surfaces thereof with metal as at 148. The length of travel of chain 142 in the machine is chosen in such manner that positive adhesion between the glue tabs 16 and 17 and the cover top wall 11 will have been achieved by the time the chain 142 returns around its forward sprocket 141a.

The final operation is the closing of the lid of the package. This may be accomplished by means of a final stationary sweep 149.

While other forms of delivery or stacking means may be employed, we have devised a simple and advantageous one the characteristics of which will be apparent from Figures 17, 25 and 26. On the end of the machine frame we have fastened a pair of carton engagement means or trackways 150 which are thin panel-like members, one on each side of the blocks 29 of the main conveyor and so shaped as to remove the filled and closed cartons from between the blocks and deliver them on edge at a slightly lower level than the top flight of the main conveyor 26. The members 150 are enabled to exert this action on the cartons because, as hereinabove explained, the blocks 29 are slightly shorter than the cartons themselves. The cartons are delivered in an on-edge position to a slide hopper 151 extending from the end of the machine. In order to move the stack of cartons forwardly so that a space will be provided at its rear into which the next carton can drop, we employ a pusher member 152 which is fixed on a shaft 153, which permits pivotal movement of the pusher. The shaft is journaled in uprights at the end of the machine. Urging the shaft counterclockwise so that the pusher can assume the position shown in solid lines in Figure 25, we provide the shaft 153 with a rigid arm 154, extending rearwardly of the machine, on which a weight 155 is preferably adjustably mounted. The upper end of the pusher is given a cam shaped contour at 156 as shown in Figure 25. When the pusher is in the position shown in solid lines, the delivery trackways 150 deliver the carton to the slide beyond the pusher. But as the block 29 on the main con-

veyor swings around the sprocket 53a, it contacts the cam surface 156 thereby moving the pusher into the position shown in dotted lines in Figure 25. This is a position in which the block 29 can clear the pusher; but it is also a position requiring forward movement of the stack of cartons in the slide or hopper by at least the thickness of one of the cartons. We also provide on the uprights a pair of thin, steel spring fingers 162 and 163. These are shaped and positioned to be deflected by a filled carton during the forward movement of the stack as pushed by the pusher 152 and then to spring into position behind the last carton to prevent retrograde movement of the stack.

As soon as the block has cleared the cam surface, the weight 155 returns the pusher to the position shown in solid lines. In order to maintain the forward end of the stack we provide abutment means 157 which are slidable in a rabbeted groove 158 in the bottom of the slide. When a sufficient number of filled and closed cartons accumulates in the slide, the operator removes them or a portion of them, thereafter moving the abutment 157 to the left in Figure 17.

The guide 146 on the overhead chain 142 may be given a resilient mounting whereby it is spring pressed downwardly. The under chain 127 which bears the blocks operating to erect the cover side walls may be terminated before the presser chain 142 and the carton top wall 11 may thereafter be supported for pressing by means of a belt 159 overlying and sliding along the bed 23. This belt may be driven by a pulley 164 fixed on the shaft 53 and may return over another pulley on a stub shaft as at 160 in Figure 16. In place of the pressing members 121 we may in instances employ wooden blocks or strips 161 (Figure 24) either solidly mounted on the machine bed or resiliently mounted thereon. We have illustrated our machine in the form in which it is currently being made by us with available materials; but in the light of our teachings herein there may obviously be changes in design in the adaptation of more suitable metal members.

Modifications may be made in our invention without departing from the spirit of it.

Having thus described our invention, what we claim as new and desire to secure by Letters Patent, is:

1. A method of forming end closures on cartons having a tubular body and an end closure having a top wall, a front wall articulated to the top wall, side walls articulated to the ends of the front wall and glue tabs articulated to the side walls, said method comprising folding through a substantial angle said front and side walls with respect to the remainder of said parts, then folding them back substantially to original position whereby said glue tabs are brought upwardly with respect to said top wall, then folding said side walls with respect to said front wall whereby said glue tabs are brought inwardly toward each other, and folding said front wall with respect to said top wall, whereby to position said glue tabs flatwise against said top wall.

2. The process claimed in claim 1 including the step of applying adhesive to said glue tabs prior to moving said glue tabs with respect to said top wall.

3. The process claimed in claim 1 in which said steps are carried on while the cartons are in continuous motion.

4. A method of forming end closures on cartons having a tubular body and an end closure having a

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top wall, a front wall articulated to the top wall, side walls articulated to the ends of the front wall and glue tabs articulated to the side walls, said method comprising folding through a substantial angle said front and side walls with respect to the remainder of said parts, then folding them back substantially to original position whereby said glue tabs are brought upwardly with respect to said top wall, then folding said side walls with respect to said front wall whereby said glue tabs are brought inwardly toward each other, and folding said front wall with respect to said top wall, whereby to position said glue tabs flatwise against said top wall, adhesive having been applied between said top wall and said glue tabs, and pressing said glue tabs against said top wall, afterward folding said top wall over with respect to said tubular body whereby to move said end closure to closed position.

5. A method of forming and filling cartons of a type having a tubular body, an end closure at one end having a top wall, a front wall articulated to said top wall, side walls articulated to the ends of said front wall, and glue tabs articulated to said side walls, and seal end flaps on the other end of said body, said method comprising squaring up the tubular body, moving it in a path, folding through a substantial angle said front and side walls with respect to the remainder of said parts, applying adhesive to said glue tabs, bending said front and side walls back through a substantial angle whereby said glue tabs are caused to be angularly related to said top wall, bending said side walls with respect to said front wall whereby said glue tabs are brought inwardly toward each other, folding said front wall with respect to said side walls whereby to position said glue tabs flatwise against said top wall, and pressing said glue tabs against said top wall, and concurrently with some at least of the aforesaid operations on the carton conducting another series of operations thereon comprising spreading said seal end flaps, introducing contents into said body, folding and sealing said seal end flaps, an adhesive being applied to at least one of them, and pressing the end seal.

6. The method of claim 5 in which the said steps are so correlated that the application of adhesive at both ends of the carton occurs at the same point of the carton's path of travel.

7. The method of forming a three dimensional structure from a carton blank part in which two main walls are articulated to each other, side walls are articulated to one of said main walls, and tabs are articulated to said side walls, and in which said tabs must be positioned by a two-directional movement against one of said main walls, said method comprising folding said main walls relative to each other in one direction, then in another, then again in the first direction, with an intermediate folding of the side walls, whereby to position said tabs as aforesaid without folding them, and solely by the folding of other parts.

8. A method of folding carton blanks which includes the steps of folding in one direction certain parts which are articulated together, with respect to other parts articulated to the first mentioned parts but not to each other, and then reversing the folding of said first mentioned parts with respect to less than all of said other parts whereby to produce differences in the angularity of said other parts to said first mentioned parts.

9. In a machine for folding cartons which have main walls articulated together, side walls articulated to the ends of one of said main walls, and

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tabs articulated to said side walls, means for folding over through a substantial angle one of said main walls and the side walls articulated thereto with reference to the others of said parts, means for reversing the said fold through a substantial angle whereby to change the angularity of said tabs to said unfolded main wall, means for folding said side walls to a substantially normal relationship with the main wall to which they are articulated, and means for folding said main wall to substantially a right angular relationship with the other main wall, whereby to position said tabs substantially in face to face relationship with said other main wall.

10. The apparatus claimed in claim 9 including means to apply adhesive to said tabs, and means for pressing said tabs against said other main wall.

11. Apparatus for forming and filling cartons of a type having a tubular body, an end closure at one end having a top wall, a front wall articulated to said top wall, side walls articulated to the ends of said front wall, and glue tabs articulated to said side walls, and seal end flaps on the other end of said body, said apparatus comprising means for moving a carton in a path with its body in squared-up condition, means for folding through a substantial angle said front and side walls with respect to the remainder of said parts, means for applying adhesive to said glue tabs, means for bending said front and side walls back through a substantial angle whereby said glue tabs are caused to be angularly related to said top wall, means for bending said side walls with respect to said front wall whereby said glue tabs are brought inwardly toward each other, means for folding said front wall with respect to said side walls whereby to position said glue tabs flatwise against said top wall, means for spreading said seal end flaps, means for introducing contents into said body, means for applying adhesive to one of said seal end flaps, and means for folding and pressing said seal end flaps.

12. Apparatus claimed in claim 11 wherein the means for moving the carton comprises a flexible conveyor, and abutment means on said conveyor between which said carton body is held, the carton being positioned on said conveyor with its body transverse thereto so that the end closures on said body project at each side of said conveyor.

13. Apparatus claimed in claim 11 wherein the means for moving the carton comprises a flexible conveyor, and abutment means on said conveyor between which said carton body is held, the carton being positioned on said conveyor with its body transverse thereto so that the end closures on said body project at each side of said conveyor, and wherein the means for pressing said glue tabs is means borne by a traveling conveyor and brought thereby into active position, in which said means for folding said side walls comprises means traveling on a conveyor and brought thereby into active position, and in which the means for folding the leading and trailing seal end flaps is a moving means, the remainder of the folding means in said apparatus being stationary folding means.

14. In a machine for forming cartons of a type having a tubular body, an end closure having a top wall, a front wall articulated to said top wall, side walls articulated to the ends of said front wall and glue tabs articulated to said side walls, means for moving the carton in a path with its body in squared-up condition, means for fold-

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ing said front and side walls with respect to the remainder of said parts, means for applying adhesive to said glue tabs, means for bending said front and side walls back through a substantial angle whereby said glue tabs are caused to be angularly related to said top wall, means for bending said side walls with respect to said front wall whereby said glue tabs are brought inwardly toward each other, means for folding said front wall with respect to said side walls whereby to position said glue tabs flatwise against said top wall, and means for pressing said glue tabs against said top wall.

15. In a machine for forming cartons of a type having a tubular body, an end closure having a top wall, a front wall articulated to the top wall, side walls articulated to the front wall and glue tabs articulated to the side walls, a conveyor, means on said conveyor to engage erected carton bodies and move them in spaced relation, said bodies extending transversely to said conveyor, stationary folding means for folding over said front wall and the associated side walls, means for applying glue to said glue tabs, stationary means for folding said front wall and side walls back, means for folding said side walls with respect to said front wall, said means comprising a conveyor paralleling said first conveyor, and abutment means on said second conveyor for rising between adjacent cartons and folding a closure side wall of each, stationary means for folding said front wall with respect to said top wall, and means for pressing said glue tabs against said top wall, said last mentioned means comprising a third conveyor paralleling the first, and bearing blocks adapted to enter between said side walls and accomplish said pressing against an opposed support.

16. Apparatus claimed in claim 15 including means acting to depress said closure front wall respecting said abutment means, and being movable to permit the passage of said abutment means.

17. Apparatus claimed in claim 15 including stationary means for folding said top wall with respect to said body whereby to close the completed closure.

18. Apparatus claimed in claim 15 including

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stationary means for folding said top wall with respect to said body whereby to close the completed closure, and including means for filling said carton bodies, said last mentioned means comprising a fourth conveyor paralleling the first, means on said fourth conveyor for moving contents charges parallel to and opposite the bodies of the cartons, and means operating transversely to said fourth conveyor for pushing said charges into said bodies.

19. Apparatus claimed in claim 15 including stationary means for folding said top wall with respect to said body whereby to close the completed closure, and including means for filling said carton bodies, said last mentioned means comprising a fourth conveyor paralleling the first, means on said fourth conveyor for moving contents charges parallel to and opposite the bodies of the cartons, and means operating transversely to said fourth conveyor for pushing said charges into said bodies, said bodies having seal end flaps at the end through which they are filled, and said mechanism including means for spreading said flaps prior to filling, and means for folding and sealing said flaps after the filling operation.

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