

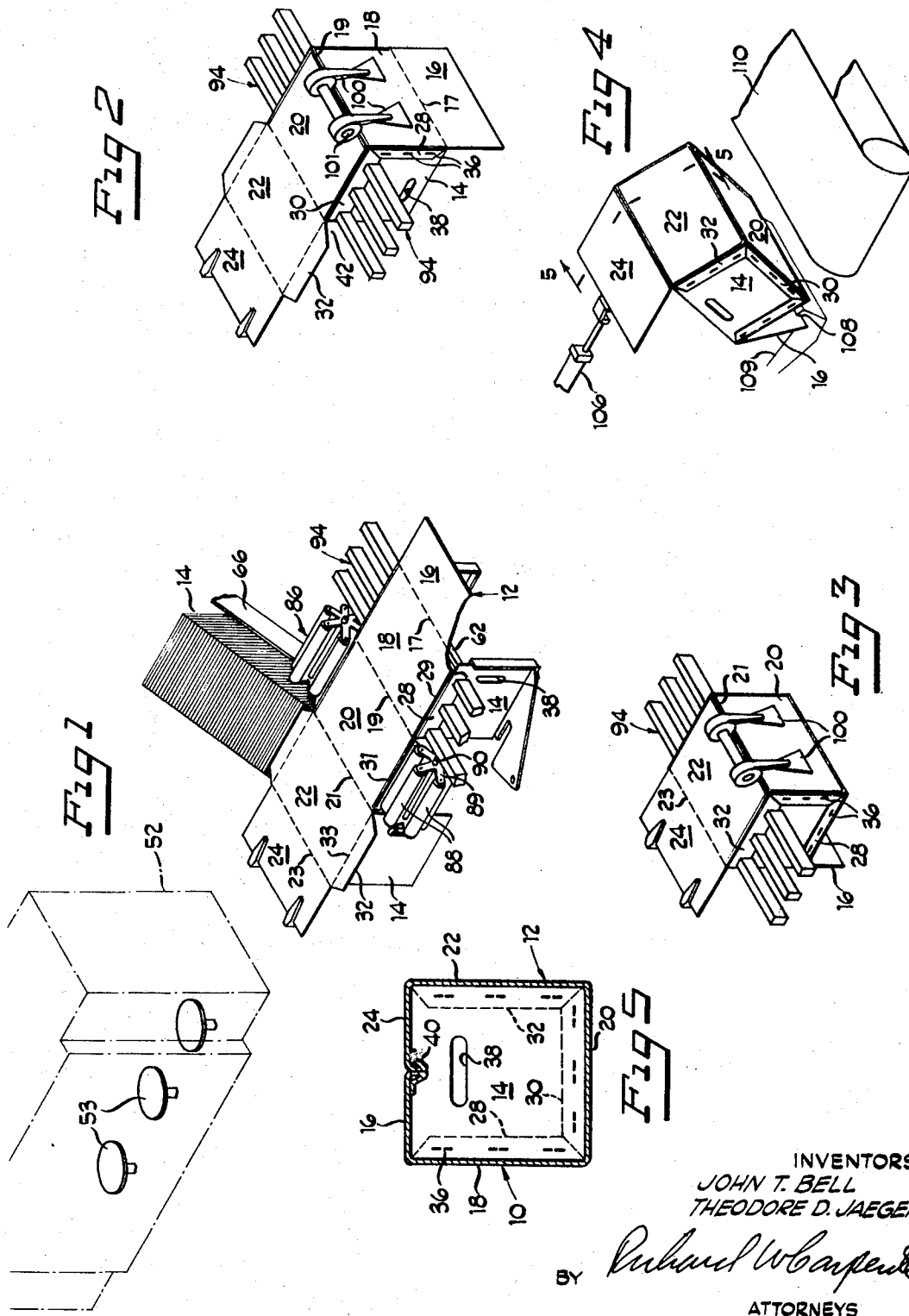
Sept. 9, 1969

J. T. BELL ET AL
APPARATUS FOR AND METHOD OF FORMING A
MULTIPLE-PIECE CONTAINER

3,465,652

Filed Aug. 8, 1967

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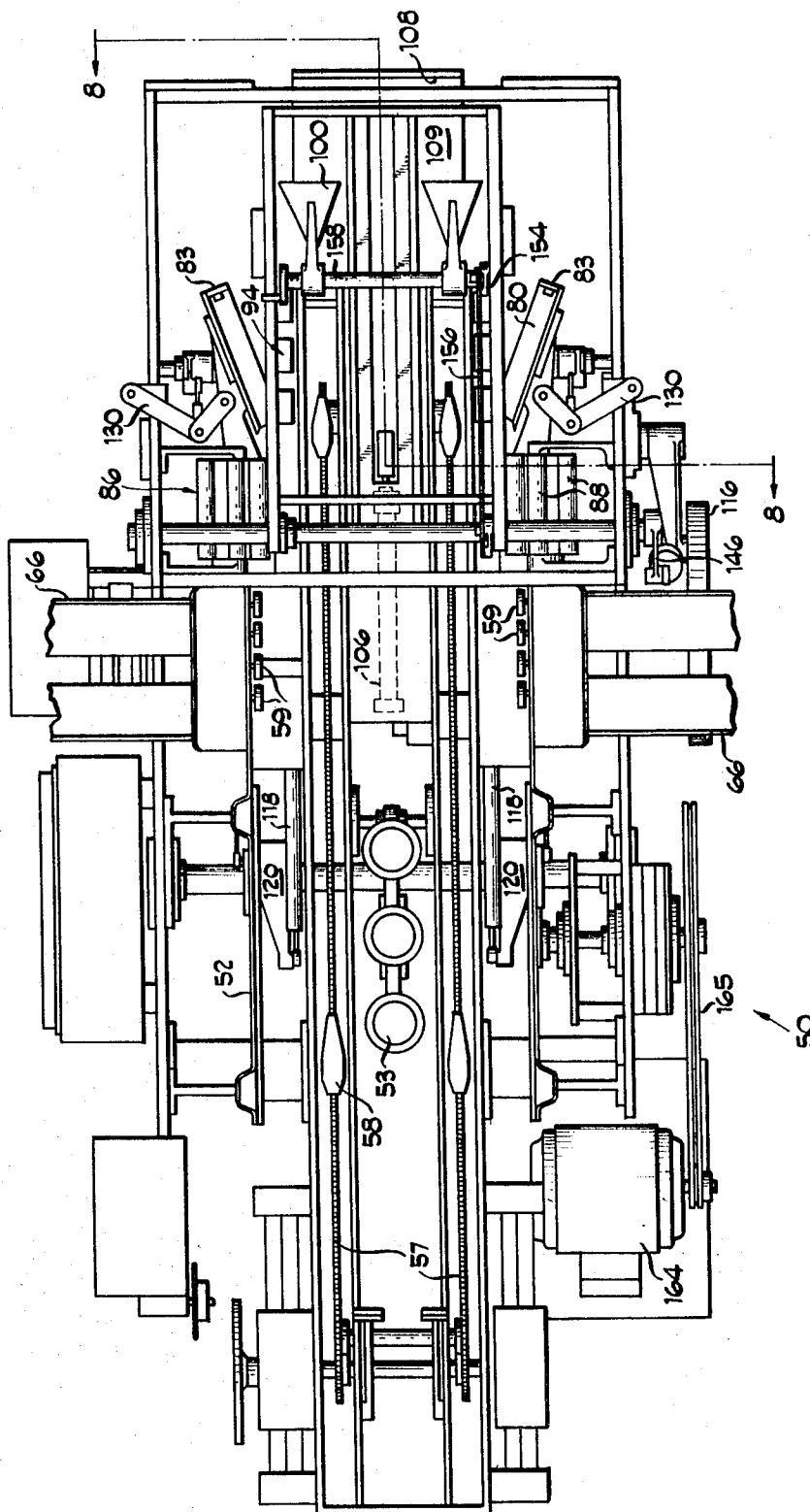


Fig. B

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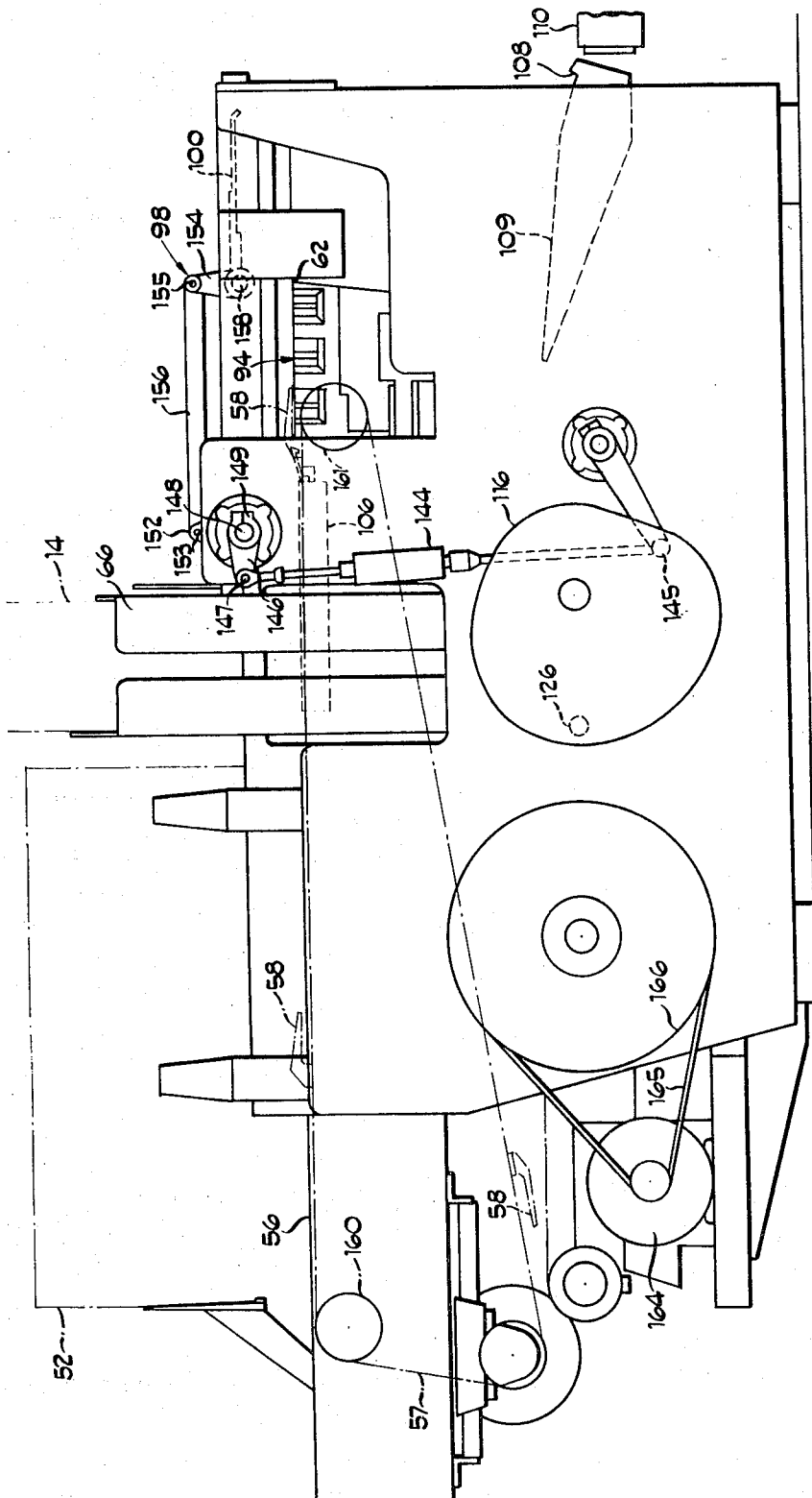


Fig 7

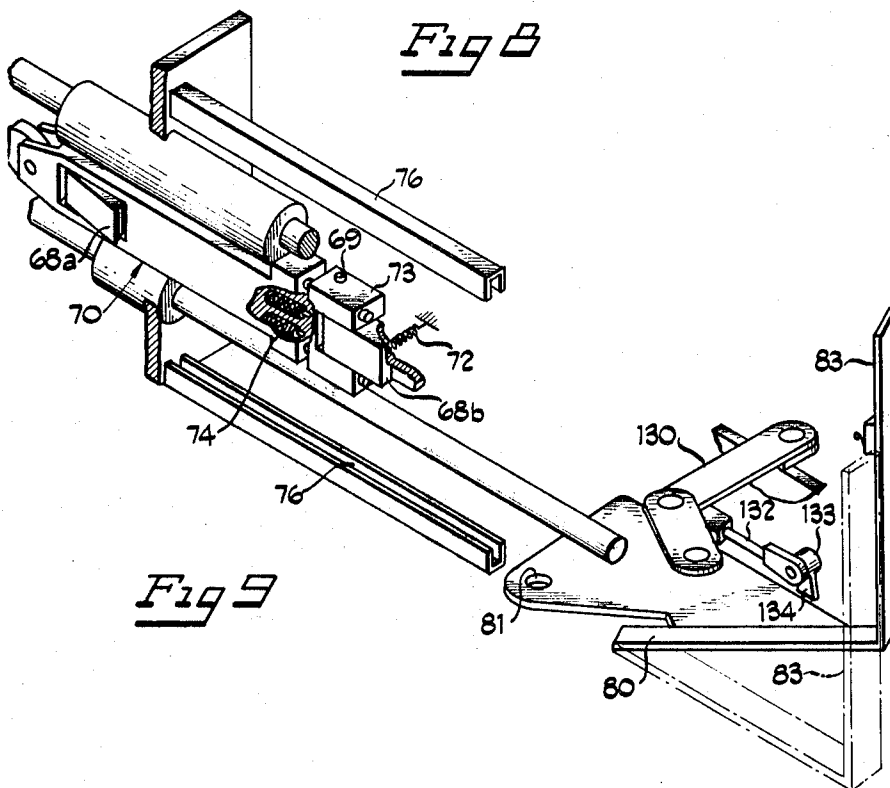
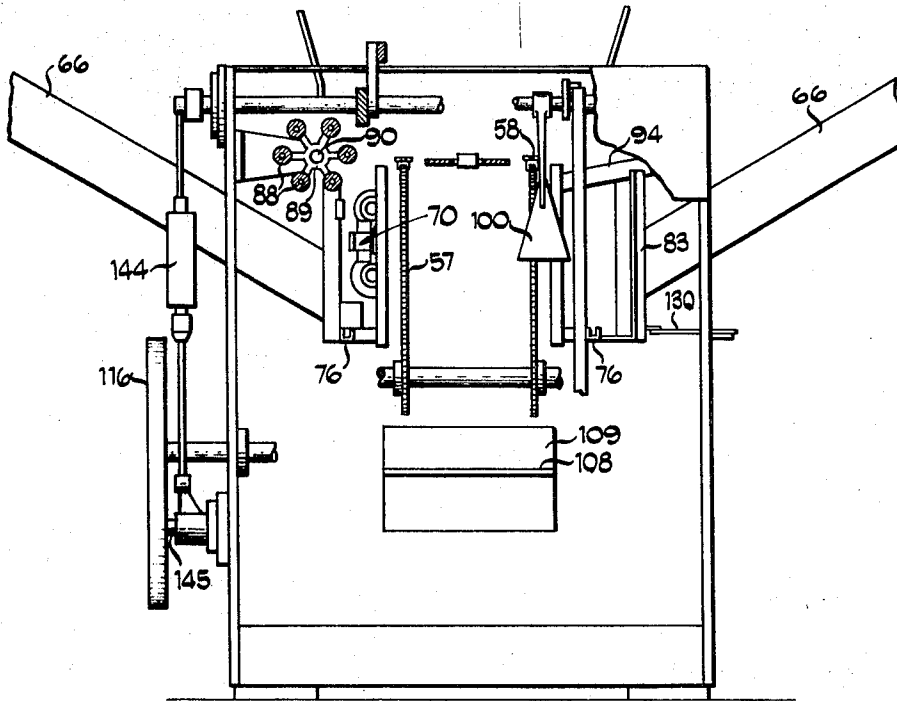
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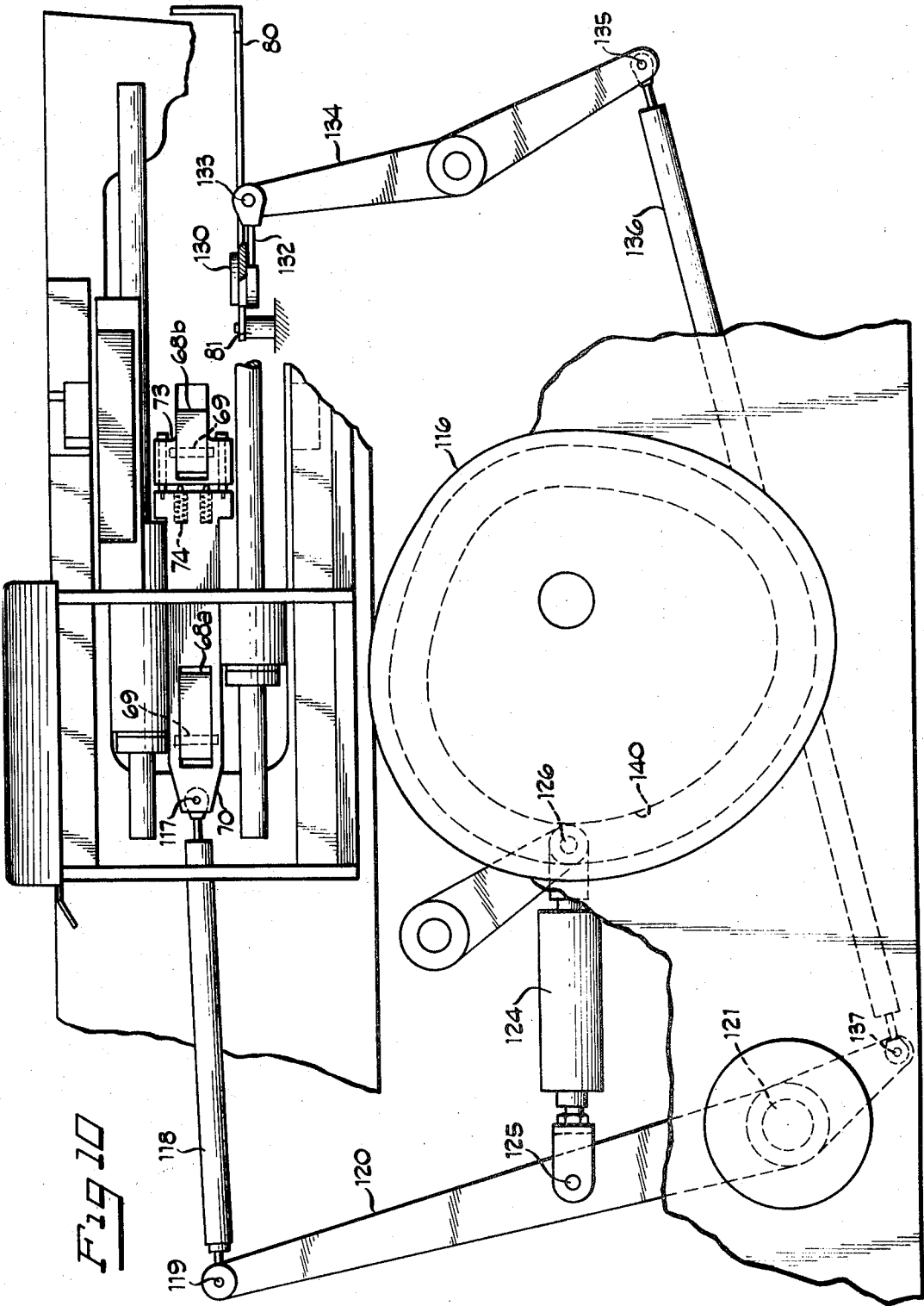
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3,465,652

APPARATUS FOR AND METHOD OF FORMING A MULTIPLE-PIECE CONTAINER

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16 Claims

ABSTRACT OF THE DISCLOSURE

Apparatus for and method of locating and partially securing together separate blanks of paperboard, and thereafter completely securing the separate blanks together to form a multiple-piece container, and for automatically discharging the container when finished.

This invention relates to apparatus for securing separate pieces of paperboard together to form a multiple-piece container, and particularly to a means for and method of forming the container sequentially, in generally similar steps.

Multiple-piece containers commonly include a main body blank folded in a U-shaped manner and separate end pieces secured to the ends of the body blank that close the open ends of the container. Typically, three-piece containers of this construction are used for beer cases.

Existing equipment suitable for securing the main body blank and end piece blanks together is of the mandrel type and generally is quite slow in operation. Generally the main body blank is folded into its U-shaped configuration about the mandrel, and the end pieces are located in place against the ends of the main body blank and are secured to the main body blank by means such as staples or other forms of stitches. Because of space limitations, generally only two stapling mechanisms are used which drive two staples and thereafter separate from one another and drive two additional staples for the bottom connection. Thereafter, the staple heads are moved in line with the side wall connections or flanges and the case is indexed vertically two or three times while the separate staple heads drive staples for the side wall connections. The mandrel then has to be withdrawn from the case or container as thus formed to permit a second case to be formed.

This invention relates to a high speed apparatus for and method of forming a multiple-piece container, and contemplates forming the container in generally similar sequentially steps. In other words, this invention contemplates securing the end piece to the main body blank, sequentially to the various walls of the container. Thus, the end piece is first connected to on side wall, the side wall with its connected end piece is rotated until the end piece lines up with the bottom wall and the bottom wall is then secured to the end piece, and the first side wall and bottom wall of the container and the end piece are thereafter rotated relative to the second side wall until the end piece lines with the second side wall and the end piece is then secured to the second side wall. The entire operation is automatic and fast, and the apparatus required is relatively simple.

Accordingly, an object of this invention is to provide apparatus for and method of sequentially forming a multiple-piece container, wherein the separate pieces are secured together along separate locations sequentially in a generally similar manner.

Another object of this invention is to provide apparatus for and method of forming a multiple-piece container,

wherein means are employed for partially securing a separate end piece to the main body blank of the container and folding the main body blank and the end piece as thus secured about a given axis to bring the end piece into marginal alignment with a different location of the main body blank, and thereafter securing the main body blank and end piece together at this second location.

Another object of this invention is to provide apparatus for and method of forming a multiple-piece container, wherein means are employed for advancing an elongated body blank in a direction normal to score between adjacent first and second side walls defined on the body blank, securing the separate end piece to the first side wall and thereafter folding the first side wall and the end piece about the score to align the end piece with the second side wall, and thereafter securing said second side wall and end piece together.

These and other objects will be more fully understood and appreciated after reviewing the following detailed disclosure of the invention, including as a part thereof the accompanying drawings, wherein:

FIGURE 1 is a schematic perspective view of the various blanks used to form a typical three-piece container, shown in operational relationship with the various working components of the subject apparatus;

FIGURES 2, 3 and 4 are schematic perspective views similar to FIGURE 1, except showing the blanks and the various working components in various stages of completion of the container.

FIGURE 5 is a sectional view as seen generally through line 5—5 in FIGURE 4 of the typical three-piece container, except showing the lid closed;

FIGURE 6 is a top plan view of the subject apparatus; FIGURE 7 is a side elevational view of the subject apparatus;

FIGURE 8 is an end elevational view, partially in section as seen generally from line 8—8 in FIGURE 6;

FIGURE 9 is a schematic perspective view of several working components of the subject apparatus; and

FIGURE 10 is an enlarged side elevational view of linkage used to drive the components shown in FIGURE 9.

A typical case or container 10 to which the subject apparatus and method relates is shown in FIGURE 5. The container 10 is formed from three separate pieces, an elongated main body blank 12 (shown in FIGURE 1) and separate end panel or end pieces 14. The body blank has a plurality of scores 17, 19, 21 and 23 extending completely across the blank which represent fold lines between the lid 16, side wall 18; bottom wall 20, side wall 22 and lid 24, respectively, of the finished container. The side walls 18 and 22 and the bottom wall 20 each has hinged at its end edges a pair of flanges which are adapted to be folded at right angles to its side wall and to lap and be secured to the end piece 14. Thus, scores 29, 31 and 33 at the ends of the side wall 18, bottom wall 20 and side wall 22 define flanges 28, 30 and 32, respectively. Typically, staples 36 are used to secure the overlapped flanges to the end piece. In the finished container, each end piece 14 has formed therein a hand hole 38 which is used as will be readily understood to provide ready means for lifting the container 10. Also, the lids 16 and 24 are shown in a conventional boh-top configuration 40 which forms no part of the subject invention. The various flanges 28, 30 and 32 at their meeting corners are preferably nicked back at 45° angles as at 42 to permit them to nest against rather than overlap one another when folded over.

As can be seen in FIGURES 1—4, the container 10 is formed according to the subject method by initially conveying the main body blank 12 flatwise in a direction normal to the scores 17, 19, etc. between the various walls and lid structure of the container. The flanges 28, 30 and

32 are folded at a sharp angle to the hinging side wall, and the end piece 14 is aligned with the leading or first side wall flange 28 and secured thereto by appropriate staple means. Thereafter, the entire body blank 12 and the end piece 14 secured to the first side wall 18 is advanced until the first side wall and end piece are unsupported by the structure so that they can be folded to nest the end piece with the bottom wall 20 and flanges 30 (FIG. 2). Thereafter, the end piece is secured to the bottom wall end flanges and the entire main body blank and end pieces are indexed again to permit the bottom wall 20, the first side wall 18 and the end piece 14 secured thereto relative to their side wall to bring the end piece into marginal alignment with the second side wall 22 and flanges 32 (FIG. 3). Thereafter, the end piece is secured to the second wall end flanges 32 by the appropriate stapling means and the container as thus formed is discharged from the machine (FIG. 4) onto a conveyor or the like to be conveyed away.

The subject apparatus 50 can thus be seen to include basically a main body blank hopper 52 (FIGS. 1 and 7) suitable for stacking the body blanks 12 on one another in generally horizontal planes, and blank feed means, such as retractable vacuum heads 53 (FIGS. 1 and 6) suitable to be adhered to the lowermost blank and retracted for placing the blank onto a conveyor 56. The conveyor includes a moving chain 57 and pushers 58 attached to the chain which are adapted to ride over the rear edge of the body blank for suitably gripping the blank to convey it in the direction of the conveyor. Rollers 59 (FIG. 6) can be mounted adjacent the ends of the side walls to overlie the flanges and prevent buckling of the main body blank as it is conveyed along the conveyor. The conveyor extends to a sharp folding edge 62 (FIGS. 1 and 7) shown generally adjacent the stapling means, and the body blank is indexed so that the scores 19 and 21 between the bottom wall and the adjacent side walls generally line up over the folding edge 62.

Hoppers 66 are also provided adjacent the conveyor 56 to hold end pieces 14 in general normal relationship to the body blank 12. Since the end pieces are secured initially to the first side wall 18, the end pieces are arranged in the hopper on their side edges so that the hand hole 38 therein can be seen to extend in a vertical direction. The end pieces 14 are fed from the hopper 66 by pusher lugs 68a and 68b (FIG. 9) which are pivoted by means of pins 69, and carried on a reciprocating frame 70. The lugs 68 are biased by spring 72 outwardly toward the end piece to permit each lug to retract and ride past the end piece in the return stroke of the frame 70. The lugs 68 normally engage the periphery of the hand hole 38 on the end pieces. The second lug 68b further is supported within frame 73 that is biased by spring 74 to be free floating and permit true alignment of the end piece 14 relative to the body blank 12 by means of a gate structure to be described now.

The end pieces 14 are thus swept by lug 68a one-by-one from the end piece hopper 66 and biased into guide rails 76 extended parallel to the end edges of the main body blank 12. Gates 80 pivoted about vertical axis 81 move toward and away from the end edges of the main body blank and extended in line with the guide rails 76 receive the end piece from the lug 68a. The gate 80 has provided thereon a vertically extending stop 83 which positions the end piece properly relative to the first side wall 18. Upon the return stroke of frame 70, lugs 68b picks up the end piece and drives it clear against the vertical stop 83, springs 74 taking up any overdrive, to insure proper alignment of the blanks.

While the end piece is being located adjacent the edge of the main body blank 12, the various end flanges of the body blank are being folded by folding mechanism 86 (FIGS. 1, 6 and 8) to approximately a 60° angle below its hinging side wall. The folding mechanism is seen to consist of a plurality of folding bars 88 each

extending in a direction longitudinal of the advance of the conveyor and positioned to engage the flanges. The bars 88 are supported by frame 89 to rotate about a horizontal axis 90 so that upon rotation of the frame 89, the respective bar engages the flange in question and folds it downwardly relative to its side wall to approximately 60° and holds in place. The advance of the main body blank 12 thereafter positions the folded flange in overlying relationship to the end piece positioned by the gate 80 and also locates a second end flange in prefolding relationship to another bar on the folding mechanism 86. The overlapped flange 28 and end piece 14, as seen in FIG. 1, are now stapled together by means of the stapling heads 94 (FIGS. 1, 6 and 7). The stapling heads, upon moving toward its back-up plate (not shown), snugs the appropriate flange and end piece together prior to stapling to insure a tight end piece construction.

After the end piece 14 has been thus secured by means of staples to the first wall flange 28, the end piece locating gate 80 is withdrawn from engagement with the end piece to permit the advance on the conveyor of the main body blank 10 and the end piece 14 secured thereto. The conveyor 56 is designed to advance the body blank until the score 19 between the first side wall and the bottom wall is in vertical alignment over the folding edge 62. The first side wall and end piece are thereafter folded by mechanism 98 including folding arms 100 pivoted about a horizontal axis 101 and disposed over the main body blank conveyor.

Upon folding the first side wall 18, the end piece 14 swings in a vertical plane through 90° to cause its bottom edge to snug against the bottom wall 20 of the body blank. In this position (FIG. 2), the bottom wall end flanges are biased by means of the stapling heads 94 towards the body blank and staples are driven through the overlapped flanges and end piece to establish the bottom wall-end piece connection. After the staples are driven, the folding mechanism 98 is withdrawn so that the arms are located clear of the body blank to permit the conveyor to index one further step to bring the bottom wall score 21 in vertical alignment over the folding edge 62. Thereafter, the folding mechanism 98 is activated and the container as thus far formed is folded about the folding edge to bring the side edge of the end piece snug against the side wall 22. The staple heads 94 are thereafter moved against the side wall flanges and staples are driven to secure the second side wall 22 to the end piece and thereby form the three-piece container. The folding mechanism and staple heads are thereafter withdrawn and a container discharge mechanism 106 is activated to engage the trailing lid 24 and flip the container from the conveyor 56. It will be noted that the container is discharged on its side, and the leading lid 16 is generally folded back toward its hinged side wall 18 to ride down track 109. The container is thus flipped over onto its bottom wall by means of catching the leading lid 16 on catch 108 so that the container falls in its bottom onto the removing conveyor 110.

It will be noted that for the subject main body blank 12, having basically five panels consisting of two lids 16 and 24, two side walls 18 and 22, and the bottom wall 20, will be indexed on the conveyor 56 five times. The particular blank used has comparable distances between the various scores so that each indexing of the blank can be of equal distance and can be roughly equal to the width of the container formed or the distances between the scores 19 and 21. It is because both sides of the bottom wall is folded that this distance becomes critical, since the indexing to the first folding score can be accomplished without too much regard to where the initial indexing sequence began.

The various moving components thus far described are timed basically to either each incremental indexing of the blank, or to the individual blank itself. For example, only one end piece is fed from its hopper 66 for each main

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body blank 12 passing on the conveyor 56. Therefore, mechanism is employed to render such a timed feeding sequence with the passage of a main body blank. Structure suitable for this purpose is disclosed in FIGURE 10, and includes mechanical linkage driven off a cam 116. The frame 70 is shown in the figure with its various end piece feeding lugs 68, and the frame is shown connected at 117 through link 118 to lever 120 on pivot connection 119. The lever 120 in turn is pivoted freely at pin 121, and the lever 120 is connected through power cylinder 124 at pin 125 and cam follower 126 to the cam 116. The gate 80 is connected through a toggle linkage 130 (FIG. 8) to the cam 116 by means of rod 132 connected at pin 133 to lever 134 which in turn is connected at pin 135 through link 136 to the opposite end of lever 120 at pin 137. Thus, the end piece feed mechanism 68 operates in a similar timed relationship to the end piece positioning gates 80, and the same are intended to function once every passing of the main body blank 112. The cam 116 is contoured along the cam surface 140 to cause the cam follower 126 to move in a predetermined manner to actuate the various blank feed and blank positioning blank mechanisms, as required.

The cam 116 is designated to rotate five times for the passage of every main body blank 12, and the power cylinder 124 from the cam follower to the drive linkage is adapted to be energized once every five revolutions in timed sequence with the passage of the main body blank to connect the linkage.

At all other times, a power cylinder 124 is rendered flexible to free, in effect, the operating mechanism from the cam follower. The power cylinder is actuated in the disclosed arrangement during the third indexing phase of the blank along the conveyor 56 by conventional control means such as a Gemco timer, for example, which functions on a repetitive basis as regulated.

Similarly, the folding means 98 is energized after the third and fourth indexing of the conveyor 56 to fold against the first side wall 18 and the bottom wall 20 of the container as it is being formed. Linkage suitable for actuating the folding mechanism is disclosed in FIGURE 7, and is powered off of the same cam 116. The linkage includes a power cylinder 144 connected to cam follower 145 at one end and to a link 146 at pin 147. The link 146 is keyed to shaft 148 guided within bushing 149 to a parallel linkage arrangement including spaced links 152 and 154 connected together by link 156 at their ends 153 and 155. The latter link 154 is connected to the actual folding arms 110 by means of a keyed arrangement as at 156. The power cylinder 144 is similarly energized during the fourth and fifth indexing phases of the conveyor and actuate the folding mechanism 98 after the score in the major body blank has reached the folding edge 62, and thereby folds the side wall and rotates the end piece 90° into indexing registry with the adjacent side wall end flap.

For further details of construction, it may be noted that the pusher chain 57 is guided about the end sprockets 160 and 161 at the appropriate spacing relative to the complete length of the main body blank and the required indexing, and preferably, the end sprocket 160 is located relative to the trailing end of the blank to permit the pusher 58 to travel around the sprocket and descend upon and over the trailing end of the blank. Similarly, the entire apparatus can be driven by motor 164 connected by belt 165 to pulley 166 which in turn is connected to the various mechanisms for advancing the conveyor and powering the other required apparatus, such as cam 116. The conveyor advancing or indexing means can take the form of a cam having one stop thereon co-operating with a five-tooth gear so that for every five revolutions of the cam, the gear will rotate once.

What is claimed is:

1. Method of forming a multiple-piece container having interhinged first, second and third walls each having

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hinged thereto a corresponding first, second and third flange, respectively, and a separate end piece lapped with and secured to the flanges, comprising the steps of:

- (a) advancing an elongated blank die-cut and scored to define said walls and flanges in a direction generally across the scores between the walls;
- (b) folding the first flange to a sharp angle relative to its first wall and positioning a separate blank for the end piece in marginal lapped registry with the first flange;
- (c) securing the lapped first flange and end piece blank together;
- (d) folding the second flange to a sharp angle relative to its second wall and swinging the first wall relative to the second wall, about the score therebetween, to bring the end piece into marginal lapped registry with the second flange and thereafter securing the lapped second flange and end piece together; and

- (e) folding the third flange to a sharp angle relative to its third wall and swinging the second wall relative to the third wall, about the score therebetween to bring the end piece into marginal lapped registry with the third flange and thereafter securing the lapped third flange and end piece together.

2. A method according to claim 1, wherein said blank is advanced in increments equal generally to the distance between the scores between the walls.

3. A method according to claim 2, wherein the flanges are secured to the end piece during a pause between the incremental advancing of the blank.

4. A method according to claim 2, wherein said second and third walls are folded relative to the first and second walls, respectively, during a pause between the incremental advancing of the blank.

5. A method according to claim 2, wherein said flanges are folded relative to their hinging wall during a pause between the incremental advancing of the blank.

6. Apparatus for forming a multiple-piece container having interhinged first, second and third walls having, respectively, corresponding first, second and third flanges hinged thereto, and a separate end piece lapped with and secured to the flanges, comprising:

- (a) means for advancing an elongated blank die-cut and scored to define said walls and flanges in a direction normal to the scores between the walls;
- (b) means for successively folding the first, second and third flanges, respectively, to a sharp angle relative to its wall as the flange moves by said folding means;
- (c) securing means located adjacent the advancing means;
- (d) means for positioning a separate blank for the end piece generally normal to said first wall and into marginal lapped registry with the first flange and said securing means, whereupon said securing means is operable to secure the lapped first flange and end piece blank together;
- (e) means for swinging the first wall relative to the second wall, about the score therebetween, to bring the end piece blank into marginal lapped registry with the second flange after said flange has been folded and into registry with the securing means, whereupon said securing means is operable to secure the lapped second flange and end piece blank together; and

- (f) said swinging means thereafter being operable to swing the second wall relative to the third wall, about the score therebetween, to bring the end piece blank into marginal lapped registry with the third flange after said flange has been folded and into registry with the securing means, whereupon said securing means is operable to secure the lapped third flange and end piece blank together.

7. Apparatus according to claim 6, wherein means are located adjacent the blank advancing means to discharge the container as formed from the advancing means.

8. Apparatus according to claim 6, wherein said flange folding means includes a folding element supported to rotate about an axis extending generally parallel to the score between each flange and its wall, operable to move normal to and against the flange.

9. Apparatus according to claim 6, wherein said securing means includes a stopping mechanism having a head and a base plate located on opposite sides, respectively, of the flanges and end piece.

10. Apparatus according to claim 6, wherein said end piece positioning means includes a frame that has guide surfaces positioned in the plane of the end piece to locate the end piece blank relative to the first flange, and wherein the frame is adapted to be moved out of the plane of the end piece after the end piece is initially secured to the first flange.

11. Apparatus according to claim 10, wherein the end piece positioning means includes an indexing element that is adapted to engage and move the end piece blank against the guide surfaces and hold it there until the end piece is secured to the first flange.

12. Apparatus according to claim 11, wherein said indexing element is biased with a resilient force against the end piece blank, suitable to hold it snug against the guide surfaces.

13. Apparatus according to claim 6, wherein the swinging means include arms supported to rotate about an axis generally parallel to the scores between the walls, operable on the one hand to engage the respective first and second walls and swing them as required, and operable on the other hand to move out of the way of the elongated blank to permit it to be advanced on the advancing means.

14. Apparatus according to claim 6, wherein said advancing means operates intermittently to advance the elongated blank distances corresponding generally to the distances between the scores between the walls.

15. Method of forming a multiple-piece container having a main body blank including interhinged first and second walls each having hinged thereto a corresponding first and second flange, respectively, and a separate end piece lapped with and secured to the flanges, comprising the steps of:

(a) folding the first flange to a sharp angle relative to its first wall and positioning a separate blank for the end piece in marginal lapped registry with the first flange;

(b) securing the lapped first flange and end piece blank together;

(c) folding the second flange to a sharp angle relative to its second wall and swinging the first wall relative to the second wall to bring the end piece into marginal lapped registry with the second flange and thereafter securing the lapped second flange and end piece together.

16. Apparatus for forming a multiple-piece container having a main body blank including first and second walls separated by a score and the walls having respectively, corresponding first and second flanges hinged thereto, and a separate end piece lapped with and secured to the flanges, comprising:

(a) means for folding the first and second flanges, respectively, to a sharp angle relative to its wall;

(b) securing means located adjacent the advancing means;

(c) means for positioning a separate blank for the end piece adjacent said first wall and into marginal lapped registry with the first flange and said securing means, whereupon said securing means is operable to secure the lapped first flange and end piece blank together;

(d) means for swinging the first wall relative to the second wall, about the score therebetween, to bring the end piece blank into marginal lapped registry with the second flange and into registry with the securing means, whereupon said securing means is operable to secure the lapped second flange and end piece blank together.

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