

April 23, 1963

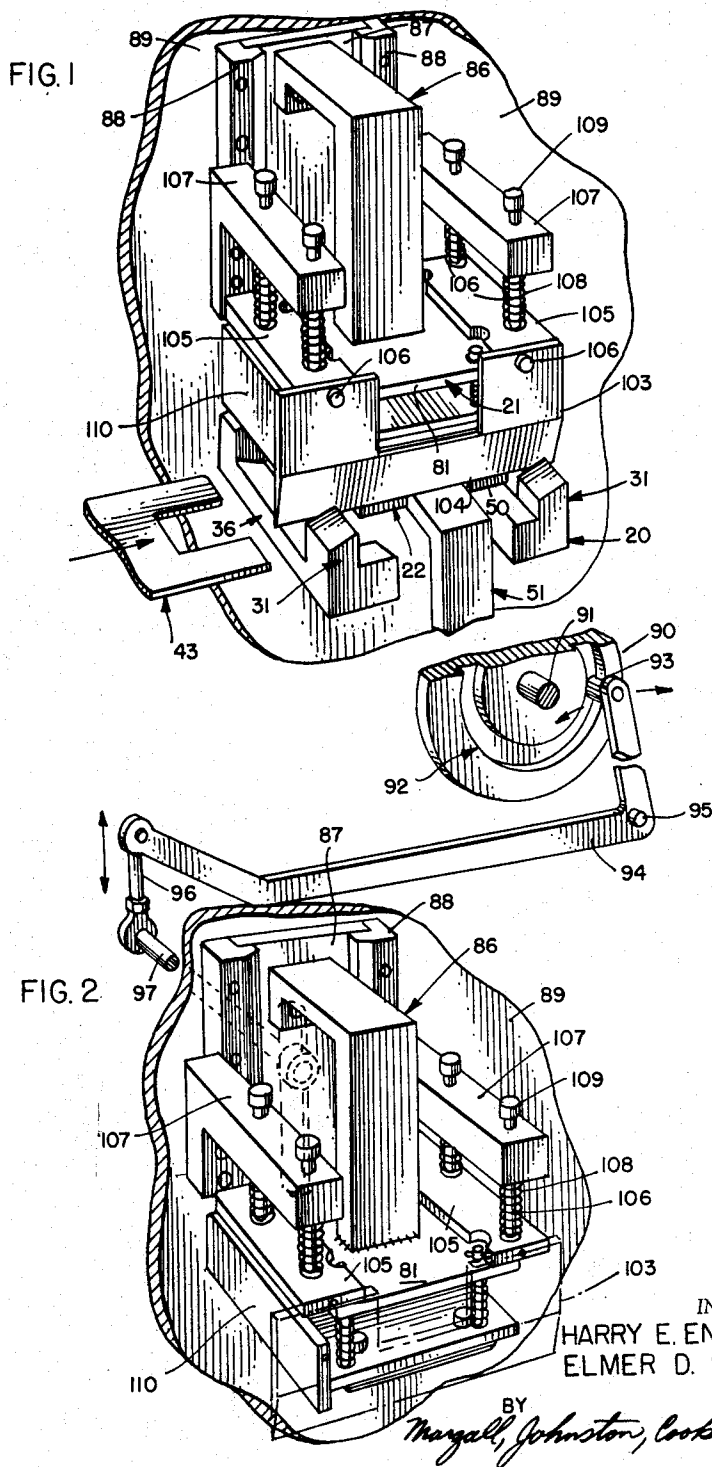
H. E. ENGLESON ET AL

3,086,337

TRAY FORMING FRAME FOR TRAY FILLING AND FORMING APPARATUS

Original Filed Oct. 29, 1959

5 Sheets-Sheet 1



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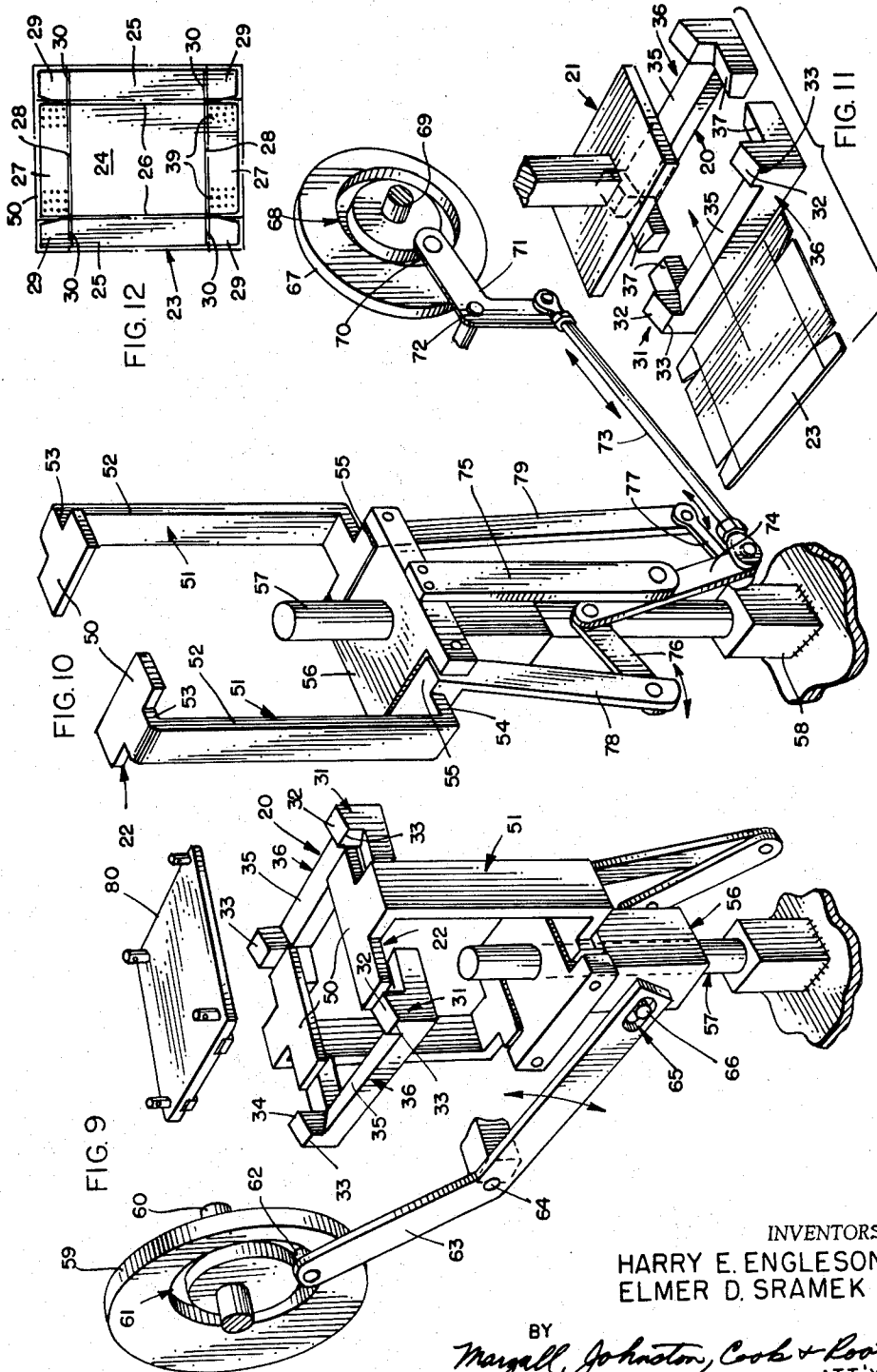
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5 Sheets-Sheet 3



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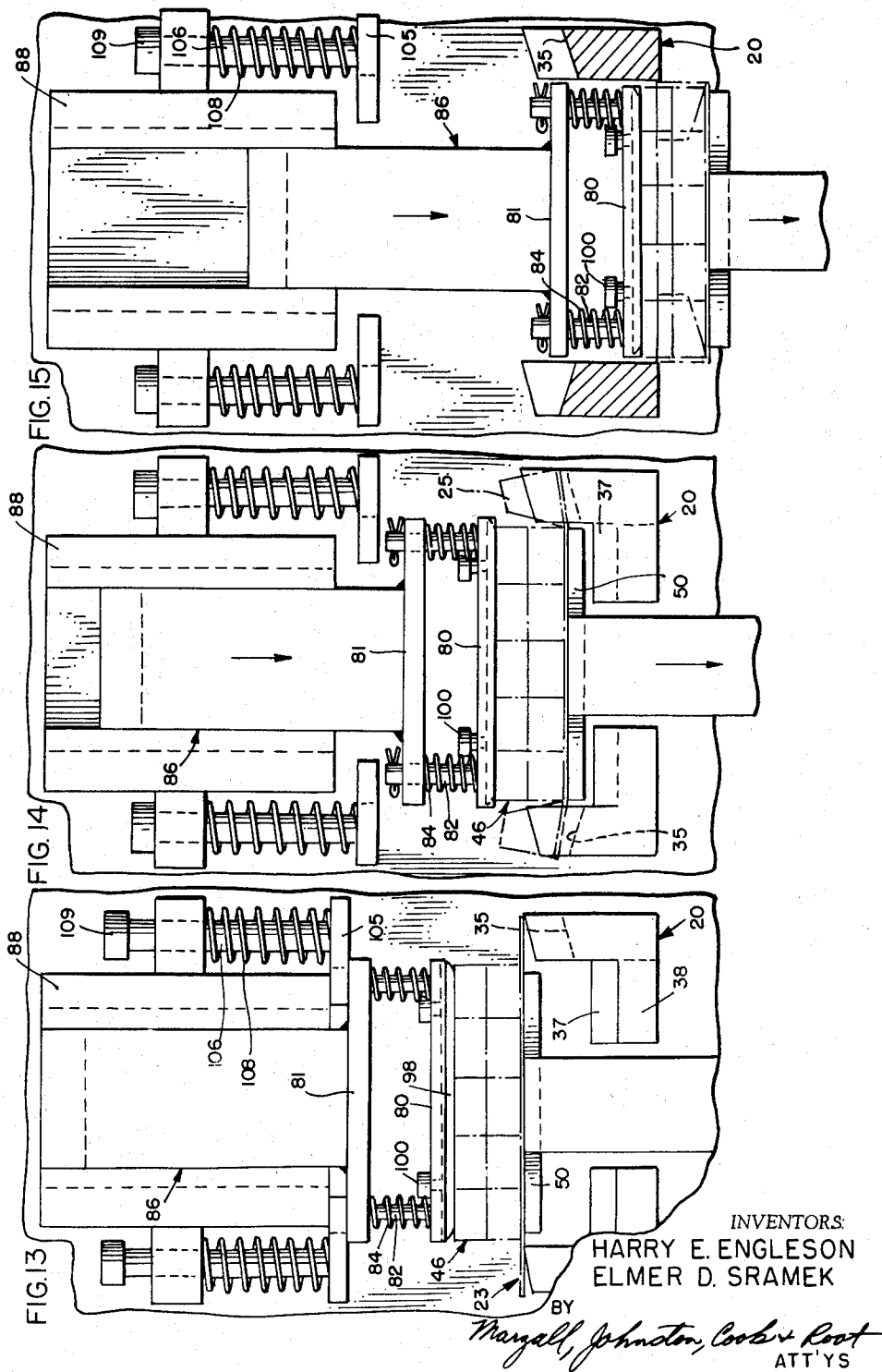
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5 Sheets-Sheet 4



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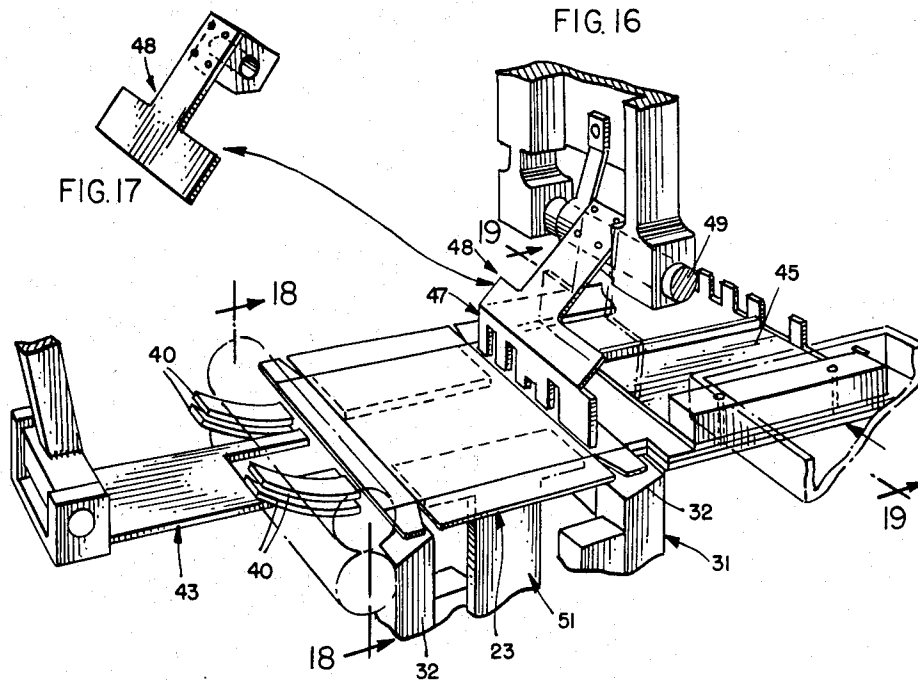
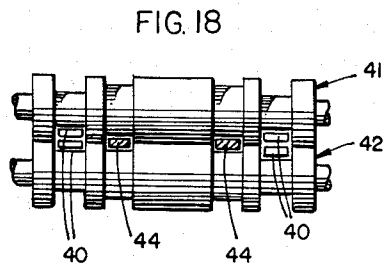
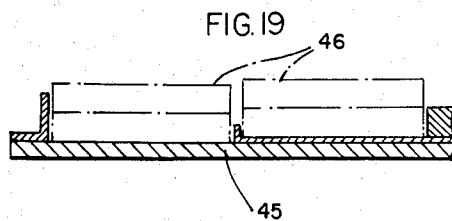
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TRAY FORMING FRAME FOR TRAY FILLING AND FORMING APPARATUS

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5 Sheets-Sheet 5



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TRAY FORMING FRAME FOR TRAY FILLING AND FORMING APPARATUS

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Original application Oct. 29, 1959, Ser. No. 849,670, now Patent No. 3,016,670, dated Jan. 16, 1962. Divided and this application Apr. 5, 1961, Ser. No. 100,987 4 Claims. (Cl. 53—194)

This invention relates in general to a packaging machine, and more particularly to a tray filling and forming apparatus.

The apparatus of the present invention receives a tray blank and an article or articles on the tray blank, and then forms the tray blank about the article or articles. The tray blank utilized includes a bottom, side and end walls, and flaps extending from the ends of the side walls which engage the end walls when the tray blank has been formed about an article or articles. The apparatus includes generally a tray forming frame, a pusher adjacent one side of the frame for positioning a tray blank thereon, a pusher adjacent another side of the frame for positioning an article or group of articles on the tray blank, means for clamping the article or articles to the tray blank and plunging same through the tray forming frame to thereby form the side and end walls about the article or articles. Glue having been imprinted upon the end walls prior to positioning of the tray blank upon the tray forming frame adhesively secures the flaps to the end walls to maintain the tray in formed shape. Thus, forming of the tray blank and filling of the tray is accomplished by a single and compact apparatus.

Accordingly, it is an object of this invention to provide a single apparatus for forming and filling trays.

Another object of this invention is in the provision of filling and forming tray blanks by an apparatus which eliminates certain stations, yet is simple in overall structure.

Still another object of this invention resides in the provision of a tray filling and forming apparatus which is extremely compact in size and suitable for use in a machine broader in scope and operation.

A further object of this invention is to provide an apparatus capable of plunging goods into a tray frame, thereby combining the functions of forming the tray blank and filling same into a single apparatus.

A still further object of this invention resides in the provision of a tray filling and forming apparatus capable of combining the operations of forming a tray blank and filling same, whereby the speed of accomplishing these functions is greatly increased to thereby increase the unit production of the apparatus.

Another object of this invention is to provide an improved tray forming frame for forming a tray blank about an article.

Still another object of this invention is in the provision of a tray forming frame for forming tray blanks about articles, wherein each tray blank includes a bottom, side and end walls, and flaps secured to the end walls, wherein the frame functions to first fold in the flaps, then the side and end walls.

Other objects, features, and advantages of the invention will be apparent from the following detailed disclosure, taken in conjunction with the accompanying sheets of drawings, wherein like reference numerals refer to like parts, in which:

2

FIG. 1 is a perspective view of the tray filling and forming apparatus of the present invention;

FIG. 2 is a partial perspective view of the apparatus of the present invention, and illustrating the mechanism for reciprocating the plunger;

FIG. 3 is an enlarged bottom perspective view of the plunger of the apparatus;

FIG. 4 is a transverse sectional view, taken substantially along line 4—4 of FIG. 3, and illustrating the first step in plunging the goods through the tray blank;

FIGS. 5, 6, 7 and 8 are perspective views of a tray blank, illustrating the steps involved in formation of the tray blank when it is plunged with the goods through the tray forming frame;

FIG. 9 is a perspective view, with many parts broken away for purposes of clarity, of the apparatus illustrating the tray forming frame and the mechanism for operating the lower clamping members through their vertical reciprocal movement;

FIG. 10 is a perspective view of the lower clamping members taken from the opposite side from that shown in FIG. 9 and illustrating the mechanism for simultaneously moving the lower clamping members toward and away from each other;

FIG. 11 is an exploded view, partially diagrammatic, of the tray forming frame and the plunger, and illustrating the manner in which a tray blank is fed toward the frame;

FIG. 12 is a top plan view of a tray blank positioned over the tray forming frame;

FIGS. 13, 14 and 15 are front elevational views of the apparatus of the present invention, with some parts in section for purposes of clarity, and illustrating the steps involved in plunging the goods and tray blank through the tray forming frame;

FIG. 16 is a perspective view illustrating the manner in which goods are transferred onto the tray blanks positioned on the tray forming frame and illustrating other components mounted adjacent the apparatus;

FIG. 17 is a perspective view of the gravity actuated guide illustrated in position in FIG. 16;

FIG. 18 is an elevational view of the feed rollers mounted ahead of the tray forming frame for feeding tray blanks thereto, and looking in the direction of the arrows along line 18—18 of FIG. 16; and

FIG. 19 is a transverse sectional view taken substantially along line 19—19 of FIG. 16 illustrating the positioning of articles on the group forming table.

Referring now to the drawings, and particularly to FIGS. 1 and 2, the tray filling and forming apparatus of the present invention generally includes a tray forming frame 20 and means for clamping the article or articles and tray blank together and plunging same through the tray forming frame including an upper clamping member and plunger 21 and a lower clamping member 22.

The tray forming frame 20, seen more clearly in FIGS. 9, 11, and 13 to 15, may be sized to accommodate any type of tray blank, but in the present instance is sized to properly form the tray blank, generally designated by the numeral 23 as seen most clearly in FIGS. 5 to 8, 12 and 16.

The tray blank 23 includes a bottom 24, side walls 25 separated from opposite edges of the bottom by means of score lines 26, end walls 27 separated from the other opposite edges of the bottom by score lines 28, and flaps 29 separated from and extending from the opposite ends of the side walls 25 by score lines 30 which are extensions of the score lines 28.

When plunging the article and tray blank through the tray forming frame, the flaps 29 are bent upwardly as shown in FIG. 6 by engagement with the upstanding flap

folding bars 31 arranged at the four corners of the rectangular tray forming frame 20. The upper ends of the flap folding bars 31 are provided with beveled faces 32 for facilitating movement thereon of the tray blanks 23, wherein the lower edges of the beveled faces as indicated at 33 face against the direction of travel of the tray blanks. The upper edges 34 of the flap folding bars serve to properly position the tray blanks height-wise for subsequently receiving an article or articles. Thus, beveled surfaces 32 of the flap folding bars preclude any sharp edges against which tray blanks may engage and be stopped.

As the article or group of articles on the tray blank are further plunger through the tray forming frame 20, the side walls 25 are next engaged by the downwardly and inwardly inclined surfaces 35 of the horizontally extending side wall folding bars 36 that extend between the flap folding bars 31, thereby bending the side walls 25 upwardly along the score lines 26 and against the article as shown in FIG. 7.

Finally, the end walls 27 are bent upwardly along the score lines 28 by engagement with the downwardly and inwardly inclined surfaces 37 of the opposed end wall folding bars 38 extending between the flap folding bars 31. These end wall folding bars are also arranged horizontally, and complete the forming of the tray blank to the shape as shown in FIG. 8, wherein the end walls are folded against the flaps 29. Prior to the positioning of the tray blanks 23 on the tray forming frame, glue or any suitable adhesive is applied to the end walls as indicated at 39, FIG. 12, whereby the flaps 29 will become adhesively secured to the end walls and thereby retain the formed shape of the tray blank.

It may be noted in FIGS. 13 and 14 that the inclined surfaces 35 of the side wall folding bars 36 are at a higher elevation than the inclined surfaces 37 of the end wall folding bars 38 in order to assure upward folding of the side walls 25 prior to the upward folding of the end walls 27 and the proper positioning of the flaps 29 within the end walls. After the tray blank has been completely formed about the article or articles, means not shown is provided in order to maintain the proper form of the tray blank until the glue or adhesive has been cured or dried.

The tray blanks are delivered from a glue applying mechanism between arcuate guides 40, FIG. 16, and into upper and lower coacting feed rollers 41 and 42. The feed rollers deliver the tray blanks one at a time onto the tray forming frame 20, and the tray blank is then properly positioned or oriented on the frame by means of a pusher 43, FIG. 16. The pusher includes a pair of fingers 44 which engage the trailing edge of the tray blanks after the trailing edge has left the bite of the feed rollers 41 and 42 to properly orient the tray blank on the tray forming frame. Suitable mechanism, not shown, synchronizes the operation of the feed rollers and the pusher. As shown in FIG. 18, the feed rollers 41 and 42 are provided with annular grooves to accommodate the guides 40 and the pusher fingers 44. Thus, the pusher 43 is arranged adjacent one side of the tray forming frame 20 for properly positioning a tray blank thereon.

Although the present invention is illustrated for use in filling and forming trays about a group of articles, it may be readily appreciated that the trays may also be formed about a single article.

As seen particularly in FIG. 16, a stacking table 45 is arranged adjacent the tray forming frame opposite the pusher 43. Noting also FIG. 19, a group of articles 46 have been stacked on the stacking table 45 for transfer onto the tray blank positioned on the tray forming frame. A pusher 47 is arranged to transfer the group of articles 46 from the stacking table 45 to the tray blank 23 as shown particularly in FIG. 16. The drive for the pusher 47 will also be synchronized with the operation of other parts of the apparatus.

A gravity actuated guide plate 48, having the form of

an inverted T, is freely pivotal on a shaft 49 mounted above the stacking table 45 and at the discharge end thereof. The guide serves, in its downward position as shown in dotted lines in FIG. 16, to maintain the left hand edges of the article in alignment and also to prevent the articles from being upset as they are being transferred to the position on the tray blank by the pusher 47. The guide takes the position as shown in solid lines in FIG. 16 at the end of the transfer operation. Inasmuch as the weight of the articles on the tray blank over the tray forming frame would probably excessively bow the tray blank, the tray blank with the articles thereon is primarily supported by the lower clamping member 22 which includes front and rear spaced plates 50, FIGS. 9 and 10, which are positioned at the front and rear edges of the tray blank but inside of the tray forming frame. The plates 50 are supported by upstanding arms 51 which include upstanding portions 52, upper inwardly extending portions 53 integral with the portions 52 and the plates 50 and lower inwardly extending portions 54 integral with the lower ends of the portions 52 and bosses 55. The bosses 55 are pivotally carried on the upper end of a common slide block 56 slidable on a vertically extending slide bar 57 fixed at its lower end to a frame part 58.

The slide block 56 is reciprocated on the slide bar 57 to thereby reciprocate the plates 50 of the lower clamping member 22 by means of a cam wheel 59 rotatably driven on a shaft 60 and having a cam track 61 for engagement with a cam follower 62 carried on one end of a crankarm 63. The crankarm 63 is pivotally mounted intermediate its ends to a frame part at 64 and is provided with a slot 65 at its other end engageable with a pin 66 carried by the slide block 56. Thus, rotation of the cam wheel 59 reciprocates the slide block 56 and the lower clamping member 22.

The plates 50 of the lower clamping member 22 are moved toward and away from each other for the purpose of disengaging from the bottom of a formed tray blank and repositioning as shown in FIGS. 9 and 16 for supporting the next tray blank and articles. This movement is accomplished by a cam wheel 67, FIG. 10, having a cam track 68 and being rotatably driven on a shaft 69. A cam follower 70 is received in the cam track 68 and mounted on one end of a bellcrank 71 that is intermediately pivotal on a stationary part 72 of the frame of the apparatus. A push-pull link 73 is pivotally connected at one end to the bellcrank 71 and at the other end to an oscillating bar 74 of a toggle linkage. The oscillating bar 74 is pivoted at its central area to a stationary bracket 75 secured to the slide block 56. A pair of connecting links 76 and 77 are pivotally connected to opposite ends of the bar 74 and in turn pivotally connected to levers 78 and 79. The lever 78 is integral with the boss 55 of one of the plates 50, while the lever 79 is integral with the boss of the other plate 50. The lever 79 is longer than the lever 78 in order to balance the toggle linkage arrangement, whereby operation of the cam wheel 67 and oscillation of the bar 74 moves the plates 50 toward and away from each other. Rotation of the cam wheel 67 is synchronized with the wheel 59 and the other parts of the machine.

The upper clamping member and plunger 21 includes a rectangular plate 80, FIG. 3, sized substantially equal to the upper surface of a group of articles transferred onto the tray blank. The plate 80 is resiliently mounted on a supporting member 81, wherein four studs 82 extend upwardly from the four corners of the plate 80 through apertures 83 formed in the supporting member 81. The apertures 83 are of a size somewhat larger than the studs 82 in order to permit the studs to freely move therethrough. Coil springs 84 embrace the studs 82 and bottom at the lower end against the upper surface of the plate 80, and at the upper ends against the under surface of the bracket 81. Pins 85 extend through the upper ends of the studs 82 above the supporting member 81 in

order to retain the studs on the supporting member 81. Thus, downward movement of the upper clamping member 21 applies a resilient force against the upper surfaces of the articles during the plunging of the articles through the tray blank.

The supporting member 81 is secured to the lower end of an inverted hook-shaped arm 86 which is in turn mounted on a slide bar 87 vertically reciprocable between guides 88 secured to a stationary mounting plate 89, FIG. 1.

Vertical reciprocation of the slide bar 87 and the lower clamping and plunging member 21 is accomplished by a cam wheel 90 rotatably driven on the shaft 91. A cam track 92 is formed in the cam wheel 90 and receives a cam follower 93 mounted on one end of a bellcrank 94. The bellcrank 94 is pivoted to a stationary part of the frame at 95 and is pivotally connected to one end of a push-pull link 96 at the end opposite the cam follower end. The push-pull link 96 is in turn pivotally connected to a horizontally extending rod 97 that is directly connected through a slot in the mounting plate 89 to the slide bar 87. Thus, vertical reciprocation of the upper clamping member 21 is accomplished by the cam wheel 90, which is synchronously driven with the other cam wheels operating the lower clamping member and the other parts of the apparatus.

Gravity actuated article retarders 98 are carried by the rectangular plate 80 of the lower clamping member and plunger 21, as seen most clearly in FIGS. 3 and 4. Each retarder includes an elongated bar having its longitudinal axis parallel to the reciprocable axis of the article transferring pusher 47, and has its opposite ends rounded. The retarders are provided with spaced studs 99 having enlarged heads 100, wherein the studs 99 are freely received in bores 101 provided in the rectangular plate 80. Thus, the enlarged heads 100 are greater in size than the bores 101 and arranged on the upper side of the plate 82 to thereby limit the downward movement of the retarders 98. The plate 80 is also longitudinally recessed at 102 to fully receive the elongated bar of the retarder and permit the entire lower surface of the plate 80 to contact the upper surface of the articles 46, as seen in FIG. 4. The retarders serve to retard the movement of the articles as they are being pushed onto the tray blank which is held in position on the frame by the pusher 43, and thereby prevent over-movement of the articles beyond the point where they can be plunged into the tray blank. Thus, side-to-side alignment of the articles on the tray blank is assured by operation of the retarders 98.

In order to assure proper front and back alignment of articles on the tray blank during transfer thereon by the pusher 47 and to obtain a proper break of the tray blank flaps 29 on the score lines 30, front and back article guide and flap score line breaking plates 103 are provided, as seen most clearly in FIGS. 1, 2 and 4. Each plate is substantially U-shaped, having an elongated relatively sharp lower edge 104 which engages along the score lines 30. A pair of transversely extending supporting bars 105 are arranged between the plates 103 and secured at opposite ends thereto by means of stud bolts 106, FIGS. 1 and 4. Thus, securing the plates 103 to the supporting bar 105 effectively forms a rigid frame. A stop plate 110 is secured between the plates 103 and extends transversely thereto for the purpose of positively stopping the movement of the articles in a precise location on the tray blank as they are transferred from the stacking table. Each supporting bar 105 is provided with a pair of upwardly extending studs 106 freely received in apertures formed in cantileverly extending brackets 107. The brackets 107 are secured to the stationary guides 88. A coil spring 108 embraces each of the studs 106 and bottoms at its lower end on the upper surface of a supporting bar 105 and at its upper end on the upper surface of a bracket 107 to thereby resiliently mount the frame-

work of the plates 103 and the supporting bars 105 to the brackets 107. Enlarged heads 109 are provided on the upper ends of the studs 106 in order to prevent withdrawal of the studs through the apertures formed in the brackets 107.

In the normal up position of the lower clamping member and plunger 21, the upper surface of the supporting member 81 engages the under surface of the supporting bars 105 to thereby urge the supporting bars and plates 103 upwardly whereby the lower edges 104 of the plates 103 are just above the upper surface of the tray blank as it is received on the tray forming frame. Accordingly, in this position the front and back plates 103 define precise guides for properly aligning the front and back edges of the group of articles 46 as they are transferred onto the tray blank 23. During the initial downward movement of the upper clamping member and plunger 21 and the lower clamping member 22, the plates 103 are also permitted to move downwardly and thereby break the flaps 29 at the score lines 30, as seen in FIG. 4. When the enlarged heads 109 of the studs 106 engage the upper surface of the brackets 107, further downward movement of the upper clamping member and plunger 21 will not effect any further downward movement of the plates 103. It will be appreciated that downward movement of the plates 103 is effected by gravity and the action of the coil springs 108. Thus, proper breaking of the flaps 29 is assured by action of the plates 103 to further insure that the flaps will be properly folded inside of the end walls 27 during formation of the tray blank 23. When the plates 50 of the lower clamping member 22 reach the down position, the cam wheel 67 will function to move the plates away from each other so that upon upward movement they will clear the tray which is formed and subsequently move inwardly after reaching the upward position.

This application is a division of our copending application, Serial No. 849,670, filed October 29, 1959, and entitled "Tray Filling and Forming Apparatus," now U.S. Patent No. 3,016,670.

It will be understood that modifications and variations may be effected without departing from the scope of the novel concepts of the present invention, but it is understood that this application is to be limited only by the scope of the appended claims.

The invention is hereby claimed as follows:

1. In a tray filling and forming apparatus, a tray forming frame for forming a tray blank about an article wherein the tray blank includes a bottom, side and end walls, and flaps attached to the opposite ends of the side walls and adapted to engage the end walls upon formation of the tray blank, said frame comprising four upstanding bars rectangularly spaced and adapted to engage the flaps of said tray blank, and opposed horizontally arranged folding bars between said upstanding bars adapted to engage said side and end walls, said horizontally arranged bars adapted to engage said end walls being at a lower elevation than said bars adapted to engage said side walls, means coacting with said flap engaging bars for breaking said flaps prior to engagement between said side walls and corresponding horizontal bars, means for plunging an article and tray blank through said frame, and means controlled by said plunging means for moving said flap breaking plates ahead of the plunger until the flaps are broken.

2. In a tray filling and forming apparatus, a tray forming frame for forming a tray blank about an article wherein the tray blank includes a bottom, side and end walls, and flaps attached to the opposite ends of the side walls and adapted to engage the end walls upon formation of the tray blank, said frame comprising four upstanding bars rectangularly spaced and adapted to engage the flaps of said tray blank, and opposed horizontally arranged folding bars between said upstanding bars adapted to

7

engage said side and end walls, said horizontally arranged bars adapted to engage said end walls being at a lower elevation than said bars adapted to engage said side walls, elongated parallel spaced plates coacting with said flap engaging bars for breaking said flaps prior to engagement between said side walls and corresponding horizontal bars, means for plunging an article and tray blank through said frame, and means controlled by said plunging means for moving said flap breaking plates ahead of the plunger until the flaps are broken.

3. In a tray filling and forming apparatus, a tray forming frame for forming a tray blank about an article wherein the tray blank includes a bottom, side and end walls, and flaps attached to the opposite ends of the side walls and adapted to engage the end walls upon formation of the tray blank, said frame comprising four upstanding bars rectangularly spaced and adapted to engage the flaps of said tray blank, and opposed horizontally arranged folding bars between said upstanding bars adapted to engage said side and end walls, said horizontally arranged bars adapted to engage said end walls being at a lower elevation than said bars adapted to engage said side walls, elongated parallel spaced plates coacting with said flap engaging bars for breaking said flaps prior to engagement between said side walls and corresponding horizontal bars, said horizontally arranged bars having inwardly and downwardly inclined surfaces, means for plunging an article and tray blank through said frame, and means controlled by said plunging means for moving

8

ing said flap breaking plates ahead of the plunger until the flaps are broken.

4. In a tray filling and forming apparatus, a tray forming frame for forming a tray blank about an article wherein the tray blank includes a bottom, side and end walls, and flaps attached to the opposite ends of the side walls and adapted to engage the end walls upon formation of the tray blank, said frame comprising four upstanding bars rectangularly spaced and adapted to engage the flaps of said tray blank, the upper ends of said upstanding bars being beveled in one direction and opposed horizontally arranged folding bars between said upstanding bars adapted to engage said side and end walls, said horizontally arranged bars adapted to engage said end walls being at a lower elevation than said bars adapted to engage said side walls, elongated parallel spaced plates coacting with said flap engaging bars for breaking said flaps prior to engagement between said side walls and corresponding horizontal bars, means for plunging an article and tray blank through said frame, and means controlled by said plunging means for moving said flap breaking plates ahead of the plunger until the flaps are broken.

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