United States Patent [19]

Monaghan

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[45] May 13, 1975

[54] **METHOD AND APPARATUS FOR ERECTING AND FILLING TRAY BLANKS**

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[52] **U.S. Cl.** **53/3;** 53/32; 53/196; 53/209

[51] **Int. Cl.** **B65b 11/08**

[58] **Field of Search** 53/29, 32, 34, 183, 186, 53/192, 194, 207, 209, 3, 196

[56] **References Cited**

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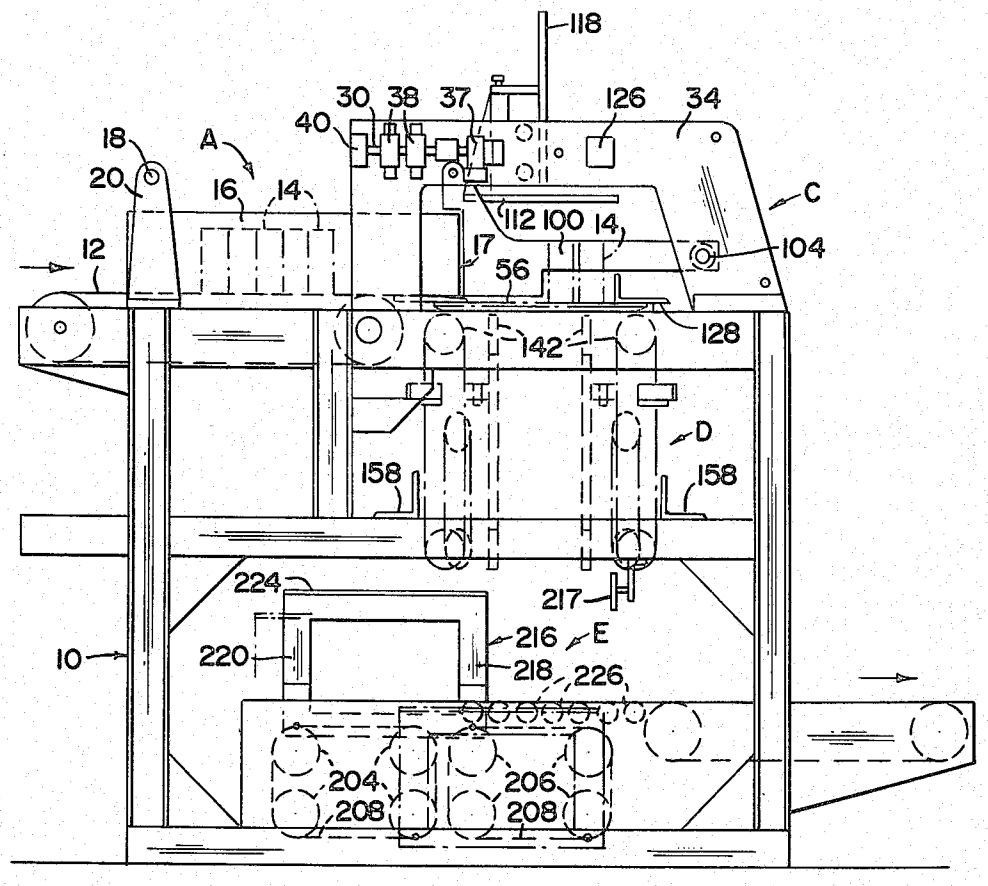
Primary Examiner—Robert L. Spruill

[57] **ABSTRACT**

Apparatus for erecting and filling tray blanks with articles where an article collecting area has individual tray blanks supplied thereto and means feed a group of articles onto a tray blank at the article collecting area. A plurality of endless means having vertical operative courses are provided to engage a tray blank and move edge and end flanges thereon upwardly, and driven pusher means engage the tops of articles at said article collecting area and force them and their supporting tray blank downwardly into engagement with the belt means. A second and lower plurality of endless belt means having vertical operative courses are present to engage corner tabs on the blank and move them up into operative positions when said first belt means are engaging said tray blank, and discharge means below the endless belt means receive trays as released by the endless belts.

11 Claims, 24 Drawing Figures



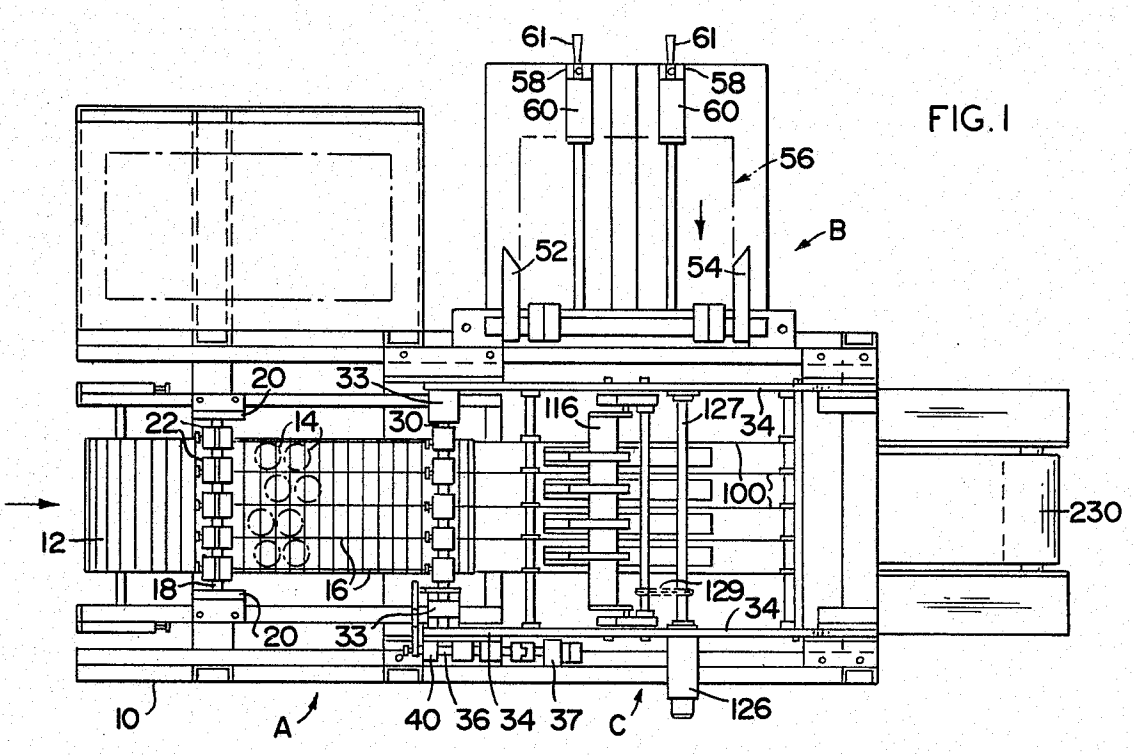

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FIG. 1

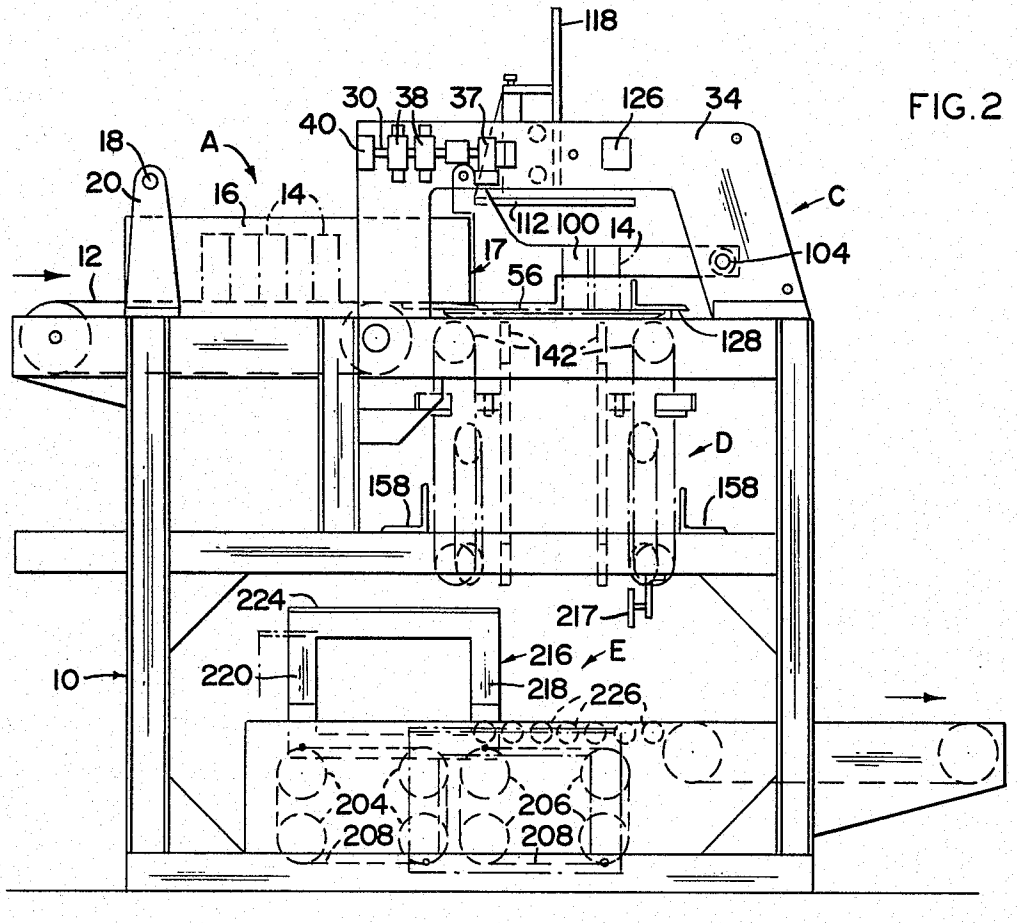
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FIG. 2

FIG. 3

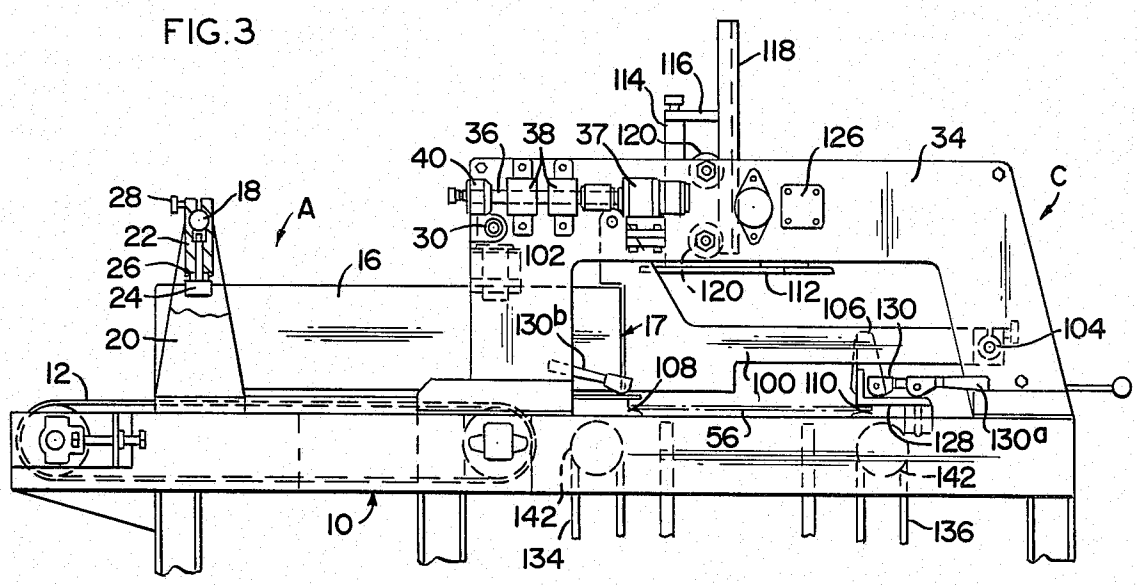


FIG. 4

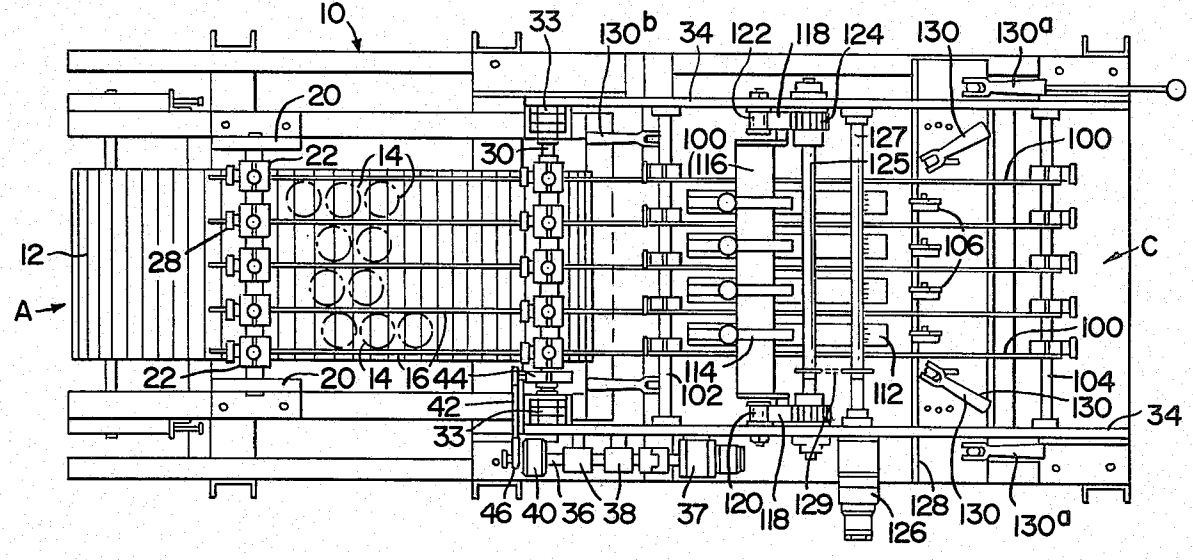
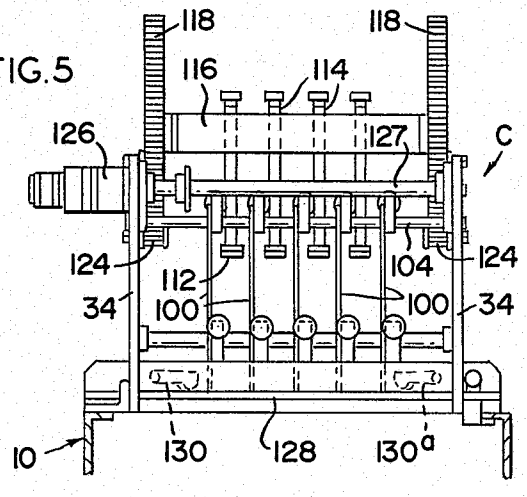


FIG. 5



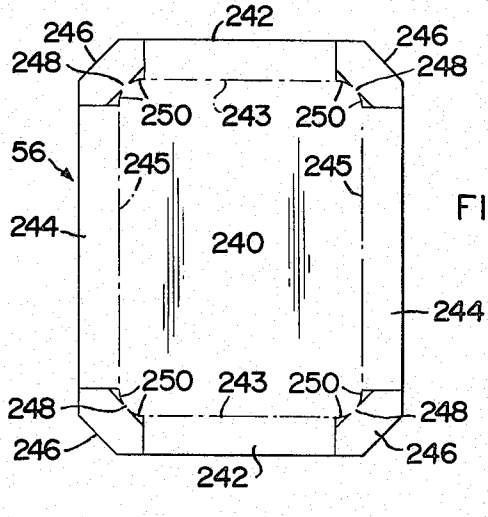
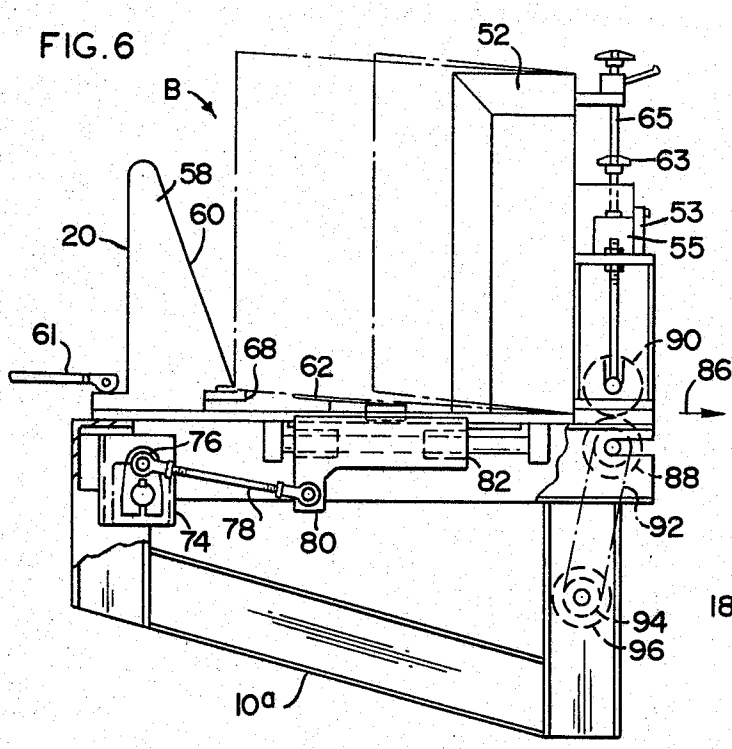


FIG. 15

FIG. 6



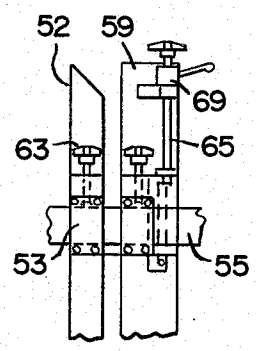
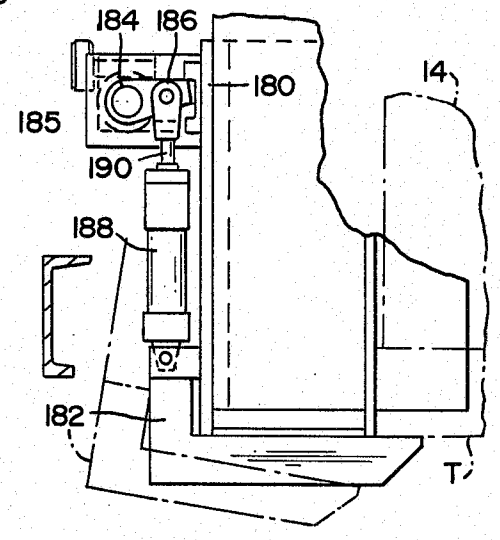


FIG. 17



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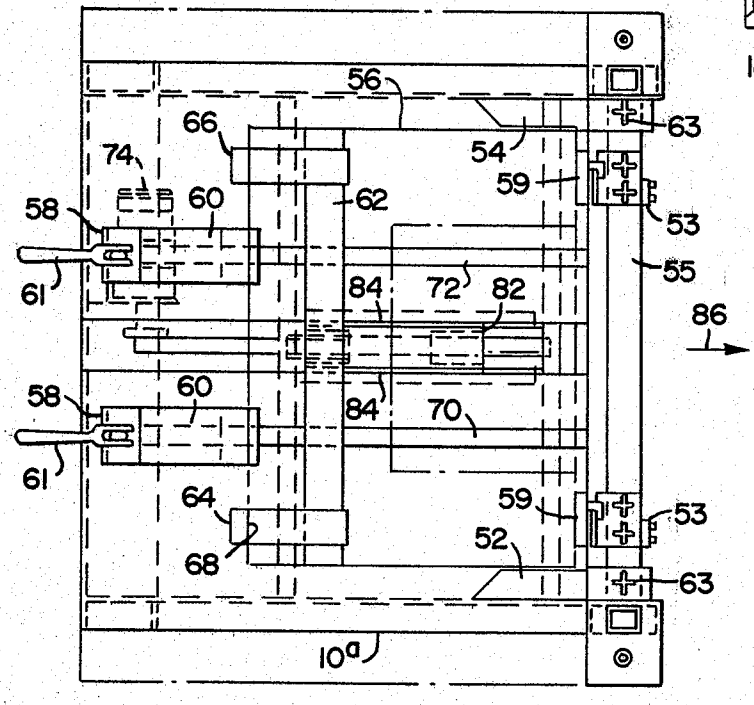

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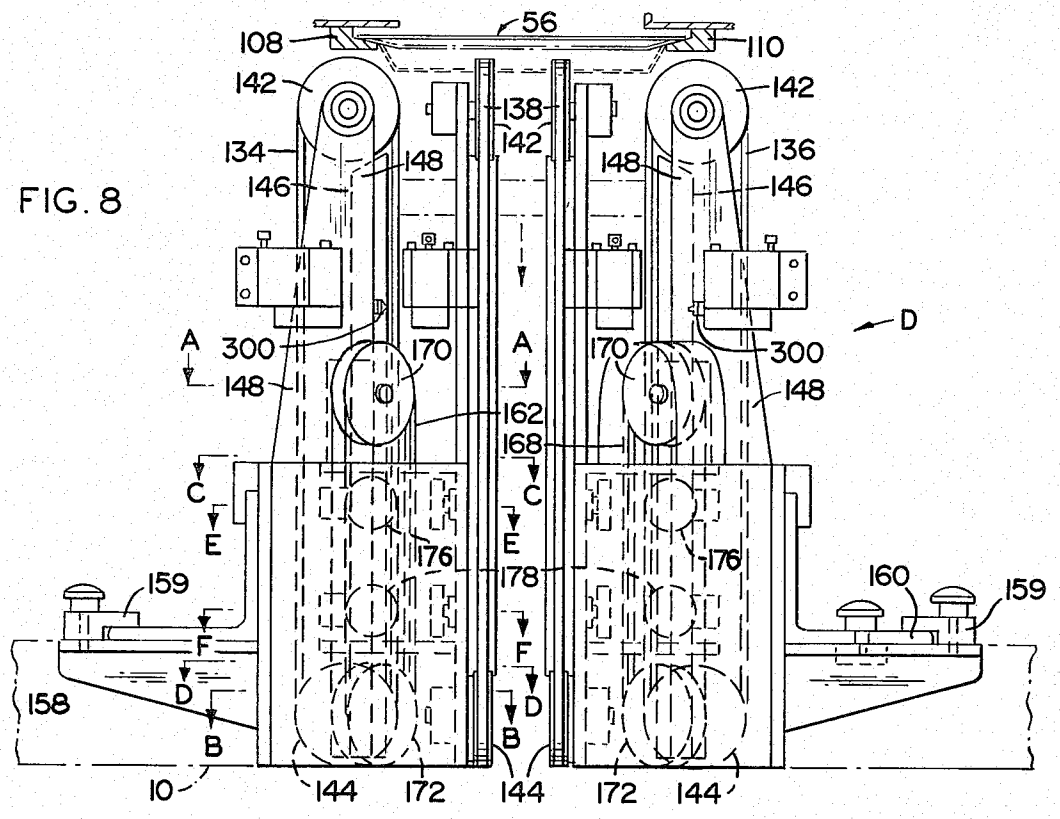
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FIG. 9

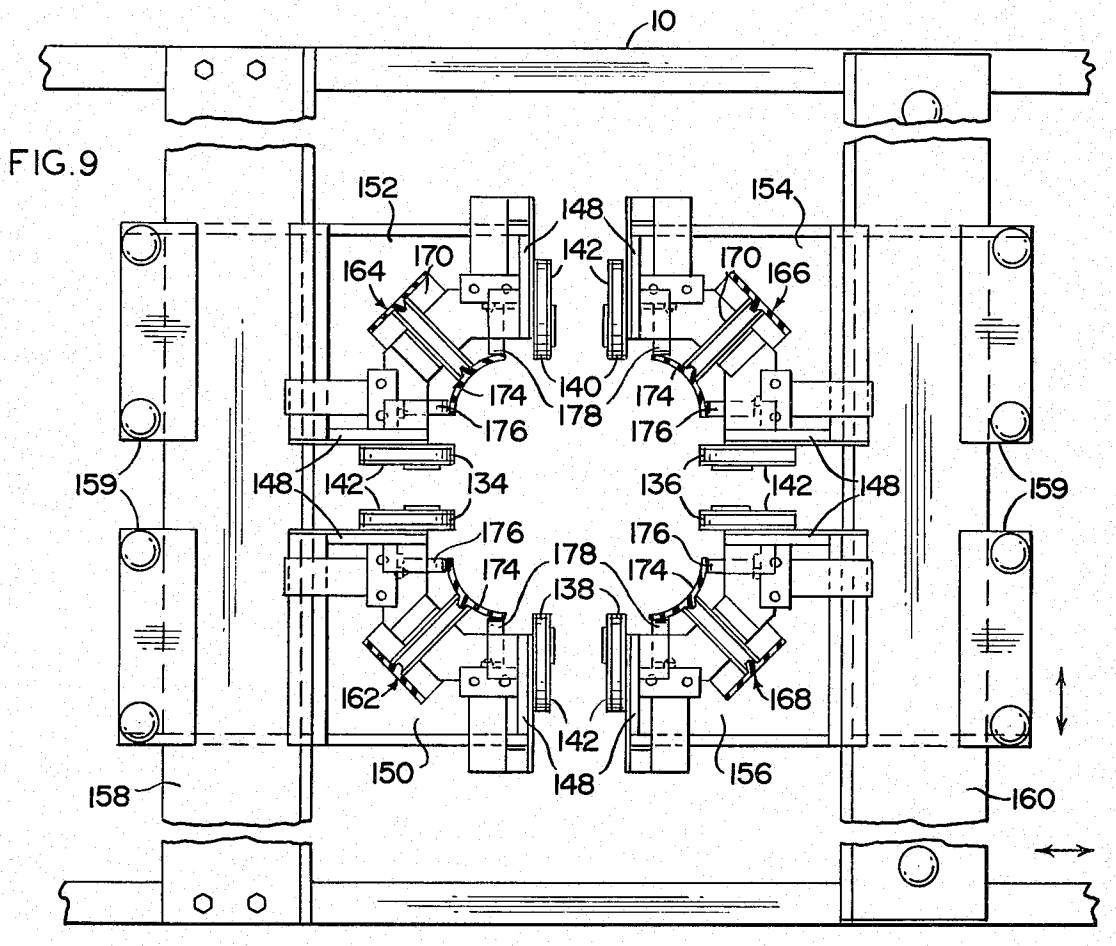
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FIG. 11

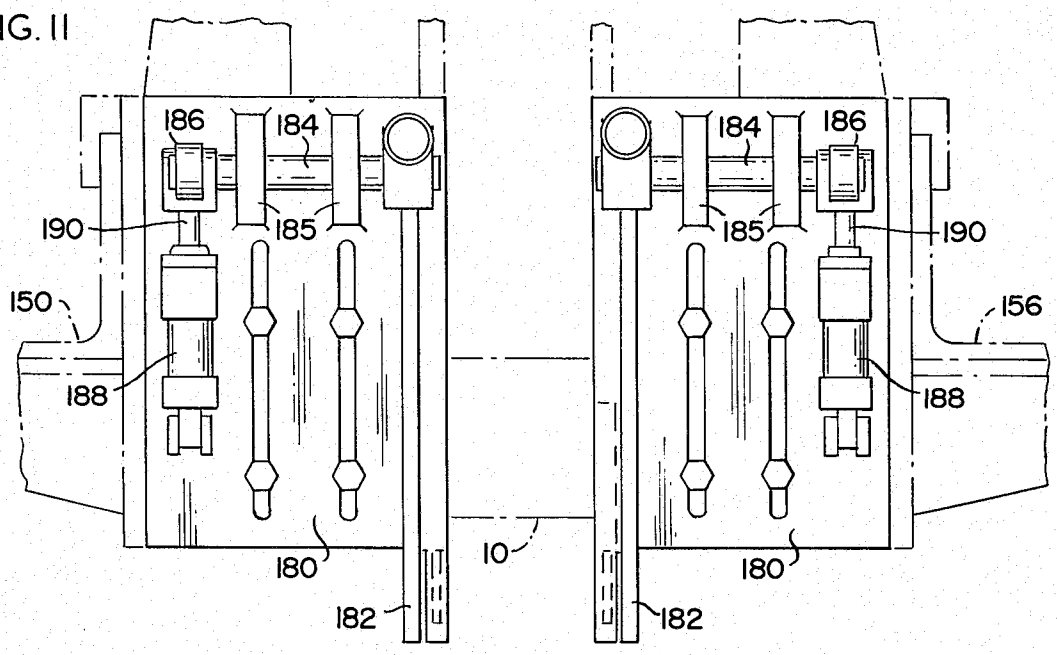
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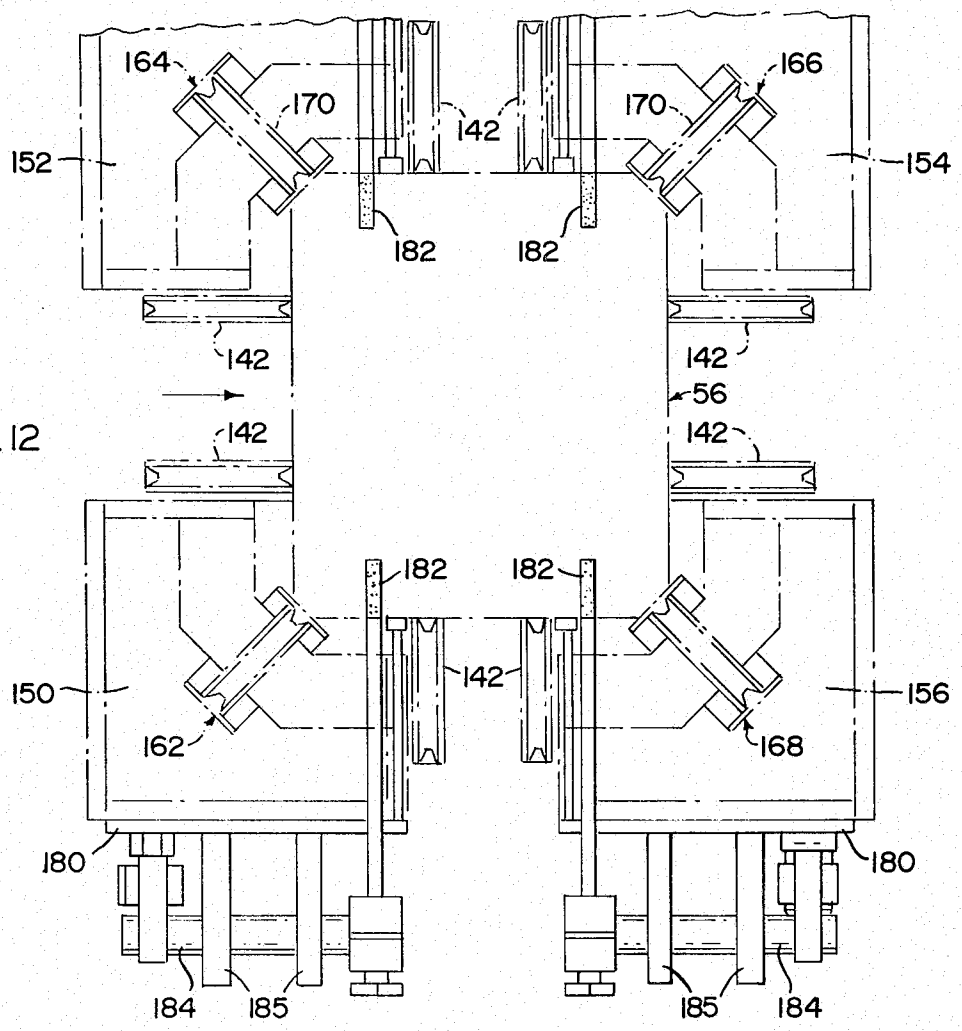
FIG. 12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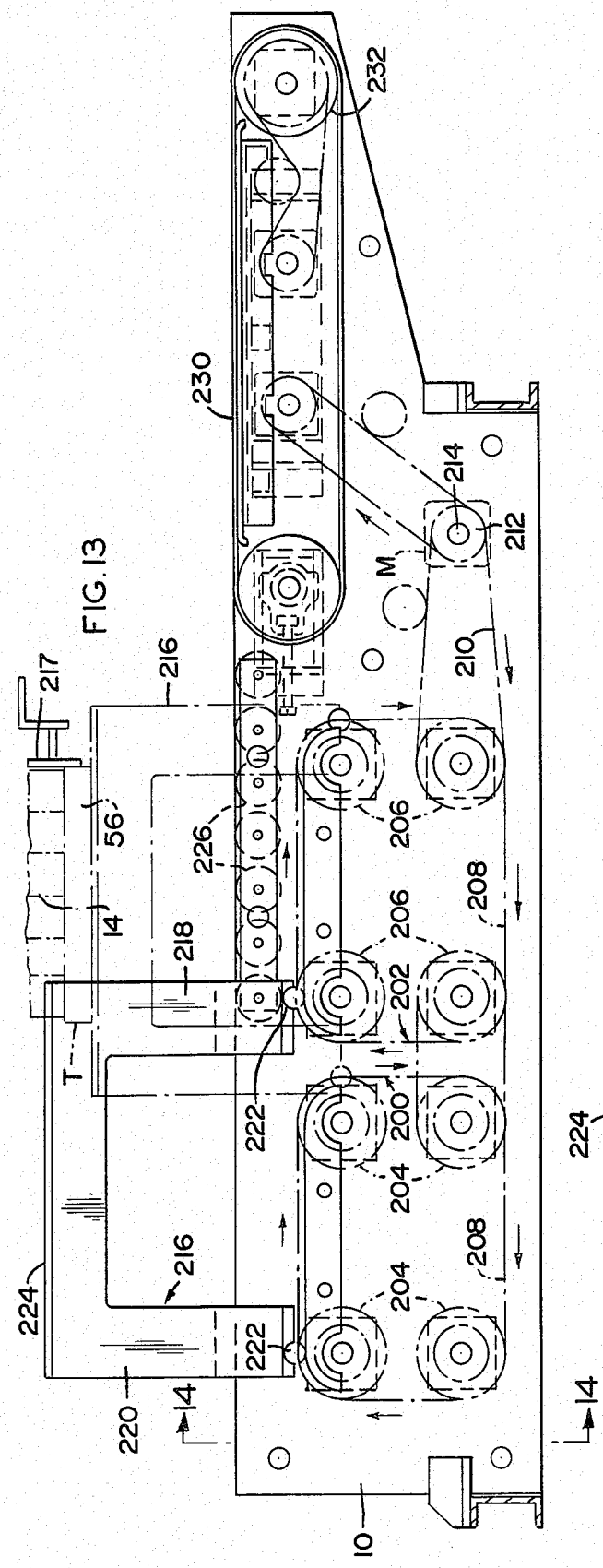


FIG. 13

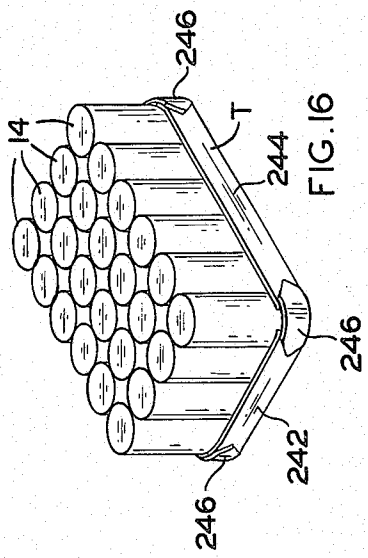


FIG. 16

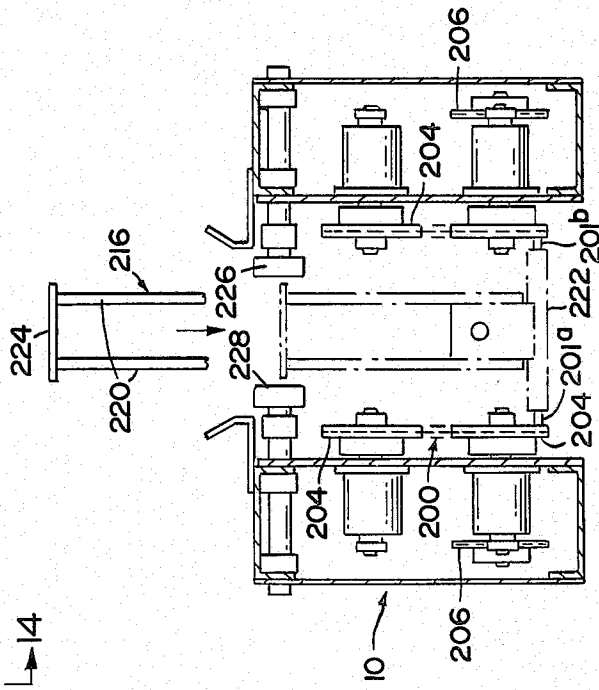


FIG. 14

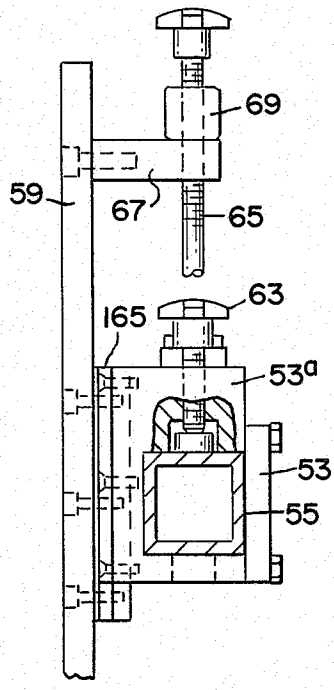


FIG. 18

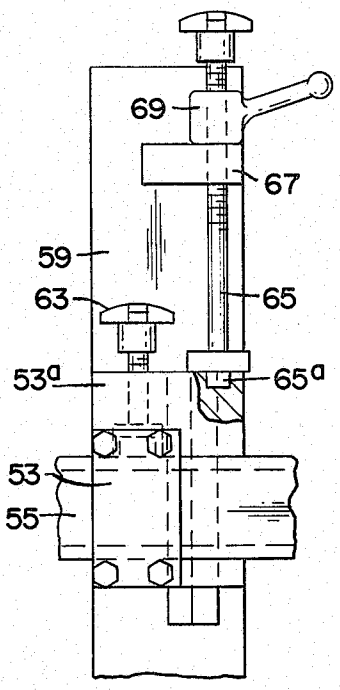
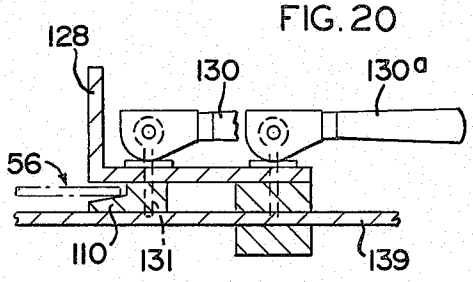


FIG. 19

FIG. 20



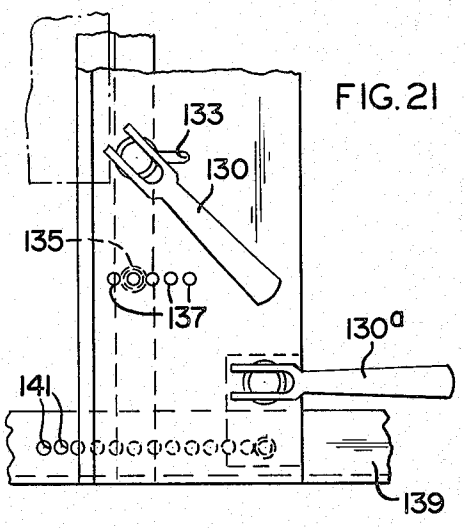


FIG. 21

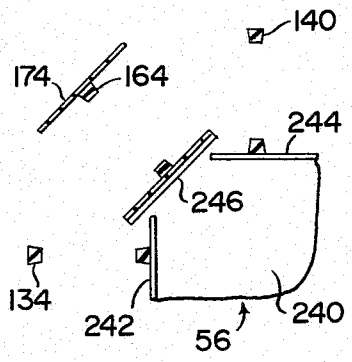


FIG. 22

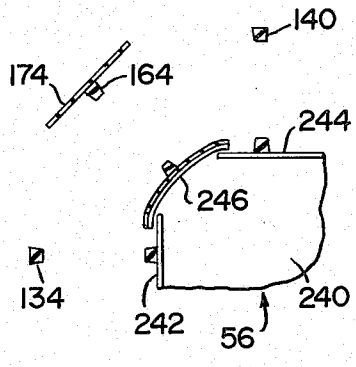


FIG. 23

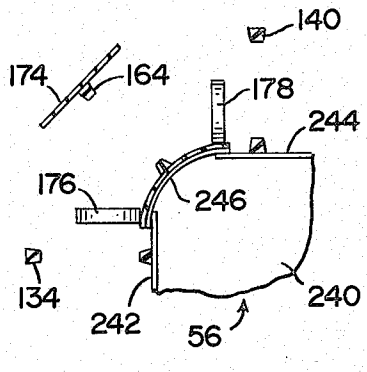


FIG. 24

METHOD AND APPARATUS FOR ERECTING AND FILLING TRAY BLANKS

This invention relates to packaging apparatus, and especially to apparatus for forming trays from tray blanks and for filling the trays with a group or number of articles to be packaged therein.

BACKGROUND OF INVENTION

Heretofore, there have been many different types of packages provided for beverage containers, and especially for a plurality of containers for carbonated drinks and beer. These containers can be bottles or cans and may vary widely in size, and a wide variety of packages of the containers have been used hertofore. Likewise, the number of articles to be packaged into a unit for transportation, storage and sale can vary widely from three or more bottles or containers up to as many as twenty-four for some beverages.

Obviously, these beverage containers are used in great quantities and must be filled rapidly after which the individual containers normally are assembled into groups and then have some unitary packaging means positioned therearound or engaged therewith. Since the filled containers may have from 6 to 8 ounces up to 16 ounces or more of beverage therein, obviously a plurality of such articles, when assembled for unitary packaging and transport purposes, may weigh several pounds.

One type of packaging which has some commercial acceptance at this time is a cardboard tray that engages the lower portions of the containers. The articles usually are secured to or in the tray by wrapping means positioned around the assembly.

Inasmuch as large quantities of the beverage containers must be processed, it likewise follows that the grouping of these filled containers into predetermined quantities of a desired shape must be rapidly and accurately effected. It is necessary that the packaging apparatus must arrange large numbers of the articles into the desired groups after which these groups must be rapidly and efficiently deposited into the carrier means, such as a tray.

It is the general object of the present invention to provide an apparatus characterized by its ability to assemble a tray while the articles to be packaged therein are already positioned on the tray blank whereby the tray is formed up around the bases of the articles to be carried therein.

Another object of the invention is to provide a tray forming apparatus which will function with the articles on the tray blank and which apparatus involves vertical downward movement of the grouped articles and the tray blank, which action is used to fold side and end flanges upwardly of the tray blank to engage the packaged articles.

Another object of the invention is to provide an apparatus for effectively folding and forming a tray from a tray blank and wherein eight marginal portions are provided in the tray blank and with a plurality of endless belt means being used to shape the tray blank as it is moving vertically in the apparatus.

Another important object of the invention is to provide effective discharge means for engaging a packaged, formed tray filled with articles and to release one or more filled trays at a time from the apparatus for convenient deposit onto discharge means in the apparatus.

Other objects of the invention are to provide an effective, positive acting tray blank feeding means for feeding tray blanks into the apparatus in timed sequence to the article grouping action in the apparatus; to provide a positive feed of a tray blank in one area of the apparatus prior to receipt of articles to be packaged into the same area; to deposit adhesive onto predetermined portions of the tray blank to facilitate tray formation in the apparatus; to provide for positive downward discharge of a tray blank having a group of articles thereon from the article grouping portion of the apparatus; to provide appreciable adjustment in the apparatus to permit it to package and process any conventional size articles therein in any conventional number of and types of article groupings, as desired; to provide an article packaging and grouping apparatus which can have streams of filled containers fed thereto by conventional means; to provide safety means in the apparatus whereby only one or a predetermined number of trays will be deposited or released from the tray forming portion of the apparatus at one time; and to provide any desired type of controls and apparatus drive means for timed operations of different portions of the apparatus in correlation with each other.

Reference now is directed to the accompanying drawings, wherein:

FIG. 1 is a diagrammatic view of apparatus embodying the principles of the invention for tray erection and filling;

FIG. 2 is a side elevation, diagrammatic, of the apparatus of FIG. 1;

FIG. 3 is a side elevation of the upper portion of the apparatus of the invention and particularly the can or article input and the tray blank receiving area or portion of the machine;

FIG. 4 is a plan view of just the article receiving and processing section of the apparatus of FIG. 3;

FIG. 5 is a right side elevation of the apparatus of FIG. 3;

FIG. 6 is a left side elevation of tray blank receiving means adapted to be positioned on the left hand side of the apparatus shown in FIG. 3;

FIG. 7 is a plan view of the apparatus of FIG. 6 with an arrow indication indicating the direction of discharge of a tray blank therefrom;

FIG. 8 is a side elevation of tray forming and article receiving processing means of the apparatus and adapted to be positioned below the apparatus of FIG. 3;

FIG. 9 is a plan view of the apparatus portion as shown in FIG. 8;

FIG. 10 is a side elevation of tray engaging and releasing means used in association with the tray forming and lowering apparatus of FIG. 8;

FIG. 11 is a side elevation of the apparatus as shown in FIG. 10;

FIG. 12 is a diagrammatic plan view showing the general orientation of the apparatus of FIGS. 8 and 9 as associated with the apparatus of FIGS. 10 and 11;

FIG. 13 is a side elevation of the tray receiving and discharging means portion of the apparatus;

FIG. 14 is a vertical section taken on line B-B of FIG. 13 of the article receiving and discharge means;

FIG. 15 is a plan of the tray blank used in the apparatus;

FIG. 16 is a perspective view of a filled, formed tray as provided by practice of the invention;

FIGS. 17, 18 and 19 are details of portions of the tray blank feed means;

FIGS. 20 and 21 are details of the tray blank guide means;

FIG. 22 is a diagrammatic section of the corner forming belts as taken on either of lines A—A or B—B of FIG. 8;

FIG. 23 is a diagrammatic section, like FIG. 22, taken on either of lines C—C or D—D of FIG. 8; and

FIG. 24 is a similar diagrammatic section taken on either of lines E—E or F—F of FIG. 8.

For convenience in referring to and describing the details of the apparatus of the invention, it will be broken down into individual sections or portions that cooperate with each other for the article supply, tray provision, tray filling, tray erecting, and tray discharge actions of the apparatus that combine to provide the functions of the apparatus of the invention.

The article infeed portion or section of the apparatus is indicated by A in FIGS. 1 and 2, the tray blank storage and feed section or station of the apparatus is indicated by B, the article grouping and tray blank combination station is indicated by the letter C, the tray erection and grouped article lowering section or portion of the apparatus is indicated at D, and the filled tray receiving and discharge portion or section of the apparatus is indicated at E.

ARTICLE INFEED

The apparatus of the invention includes any suitable frame or frame means indicated as a whole by the numeral 10. This frame means has a conventional driven endless conveyor 12 operatively journalled thereon for receiving a plurality of articles indicated at 14 at the input end thereof. These articles 14 can be cans, bottles or the like and any known type of an article supply means (not shown) is used in combination with the apparatus whereby normally a plurality of streams of the articles are deposited on the conveyor 12 for passage between a plurality of partition plates 16 operatively associated with and positioned above the conveyor 12. The partition plates are positioned parallel to each other and sufficient partition plates are provided, as shown, for example as to form four confining areas extending longitudinally of the conveyor to divide the articles supplied into four abutted rows of cans moving into the apparatus for processing and packaging therein. The upstream ends of these partition plates 16 are positioned by suitable means such as a support bar or rod 18 extending across the conveyor 12 vertically above the same and positioned at its ends by individual support plates 20 carried by the frame means 10. Adjustable positioning means including a clamp member 22 is attached to the support bar 18 and extends downwardly therefrom. This clamp 22 rotatably positions an attachment bracket 24 at its lower end by means of bearings 26 whereby the bracket 24 can be moved through an arc at least, in relation to the longitudinal axis of the clamp 22. These clamps are held in engagement with the support bar 18 as by clamp lock screws 28 so that the lateral spacing of the partitions along the axis of the support bar can be varied, as desired. The downstream ends of the partition plates 16, as indicated at 17, forms the downstream end of the article infeed portion of the apparatus and the article grouping and tray blank combination area C of the apparatus immediately follows in a downstream direction in the apparatus.

The downstream ends or portions of the partition plates 16 are positioned to have unitary movement laterally of the apparatus in order to aid in the control of articles moving downstream through the apparatus. Such action is obtained as by the use of a support bar 30 which is engaged with the downstream ends of the partition plates and the plates are transversely adjustable thereon. The support rod 30 extends across the apparatus and is suitably journalled on upper frame plates 34 on opposed lateral portions of the frame 10 at the article grouping and tray blank combination portion of the apparatus. The support rod 32 is carried by bearings 33 or equivalent members on the frame plates 34 for limited axial movement transversely of the apparatus. Also, a short stub drive shaft 36 is journalled in bearings 38, 38 operatively carried by a frame plate 34 and which shaft has suitable drive means 37 such as a motor for correlated drive of such stub shaft 36 through, for example, an arc of 180° in relation to the overall drive of the apparatus and input of articles by the conveyor 12. An eccentric means 40 is secured to one portion of this shaft 36 and it is connected by a link 42 to a clamp member 44 secured to the support rod 32 and extending therefrom longitudinally of the apparatus. The link 42 has a suitable eye 46 or equivalent means providing a rotary connection to the eccentric 40 whereby the link 42 will reciprocate on its axis with rotation of the shaft 36. Hence, this will oscillate the support rod 32 axially in its brackets and in turn move the downstream ends of the partition plates transversely through a short arc. Obviously, the plates 16 are normally spaced apart the required distance to receive the articles 14 snugly therebetween and guide them accurately into the apparatus. By any lateral movement of the partition plates 16 then these input streams of articles are likewise moved laterally. The motor 37 likewise is actuated at proper times in the apparatus cycle of operation, such as promptly after a tray blank has been fed to station C, to move the partitions back for article flow action.

TRAY BLANK STORAGE AND FEED

FIGS. 6 and 7 show the tray blank feed means of the apparatus positioned laterally of the longitudinal axis of the conveyor 12 on a sub-frame 10*a* and with such means being positioned laterally of the article grouping and tray blank combination area C. Such means and its sub-frame 10*a* are suitably secured to the frame 10 of the apparatus and it includes a pair of laterally spaced uprights 52 and 54 that are adapted to receive a vertically extending stack of tray blanks 56 therebetween by engaging opposed sides thereof. These blanks are shown in FIG. 15 and are provided in flat and properly scored and cut to blank form. In addition, usually two plate-like uprights 58 are carried by spaced portions of the sub-frame means and they have inwardly slanted edges 60 which engage edges of the tray blanks to urge the blanks into predetermined positions sliding against vertical guide plates 59. Clamp arms 61 operatively secure the uprights 58 to the sub-frame 10*a* to provide adjustment of the uprights toward and away from the uprights 52 and 54. The uprights 52 and 54 are supported by brackets 53 slidably engaging a cross bar 55 secured to the sub-frame 10*a*. Lock screws 63 carried

by the brackets **53** engage the cross bar **55** to fix the uprights **52** and **54** in position. The guide plates **59** are positioned by vertically adjustable guide clamps **165** to brackets **53***a* slidably engaging the cross bar **55.** The guide plates **59** are adjusted vertically by conventional means such as an adjustment screw **65** threadably engaging a bracket **67** secured to the plate **59.** The screw **65** engages a socket **65***a* or bears on the bracket **53***a* so that rotation of the screw **65** moves the plate **59** up or down. A lock collar **69** engages the screw **65** and bears on the bracket **67** to secure the plate **59** in a given position.

A substantially conventional type of a blank feed mechanism is provided at station B, and it comprises a transversely extending bar **62** that has a pair of laterally spaced spring fingers **64** and **66** secured thereto with upwardly extending shoulders **68** formed thereon. A pair of parallel support rods **70** and **72** are suitably secured to the sub-frame means and the actuator bar **62** is supported thereby to slide thereon.

To provide feed of an individual blank to the station C of the apparatus, a suitable drive means which may comprise an individual motor indicated at **74** or other drive means coupled to the overall drive of the apparatus is provided and it has a crank or an eccentric member **76** connected to its ouput shaft. This crank **76** pivotally connects to an adjustable length link **78** that extends to and is pivotally secured to a bracket **80** that extends from a slide means **82** engaged in suitable guide means **84** on the apparatus. Thus the slide **82,** which is secured to the cross bar **62,** can be reciprocated in the apparatus. The spring fingers **64** and **66** are adapted to engage with the lowermost one of the tray blanks **56** and, for each revolution of the drive means or motor **74,** one tray blank will be forced to move under the guides **59** in the direction of the arrow **86** (FIG. **6**). The tray blanks **56** are moved between a pair of associated rollers **88** and **90** journalled on the frame and suitably positioned therein at the connection of the tray blank storage and feed section B of the apparatus to station or portion C of the apparatus. The blanks are slid into station C of the apparatus. The length of movement of the cross bar **62** is sufficient to move a tray blank into the rollers **88** and **90.** Preferably the upper roller **90** is free to float vertically in the apparatus and positioned in gravity engagement with the roller **88,** which is suitably journalled in its support means, and has a drive means, such as a chain **92,** connecting thereto. This chain **92** connects to a driven sprocket **94** connected to the drive of the apparatus or which may connect to an individual drive motor **96** therefor. When the motor **74** is driven, then the motor **96** is likewise actuated so that a tray blank **56** will be moved from station B into station C for further processing therein.

ARTICLE GROUPING AND TRAY BLANK COMBINATION

Reference again is directed to FIGS. **3** and **4** of the drawings, and this article grouping and tray blank combination portion C of the apparatus includes a plurality of partition plates **100.** These plates **100** are suitably secured to and laterally adjustably positioned on shafts or members such as **102** and **104** extending transversely of the apparatus and suitably attached to the frame means therefor. These partition plates **100** would obviously be provided in the same numbers and with the same lateral spacing therebetween as the partition plates **16** in the article infeed portion of the apparatus. Hence, streams of abutted articles will flow into this portion of the apparatus by drive of the conveyor **12** and conventional types of control means **106** such as the article stop or contact members as shown in U.S. Pat. No. 3,421,285 are provided at the downstream end of the spaces provided between each of the adjacent pairs of partition plates **100.** These stop members **106** would be suitably coupled together electrically or in other manners as described in said patent whereby drive can be provided for the stub shaft **36** whenever the articles have been fed to this station C in sufficient quantities as to provide the desired number, such as **12** or **24** articles or other quantities of articles such as would fill one of the tray blanks **56** when shaped to operative form. Hence, at that time, the downstream portions of the initial set of partition plates **16** would be moved laterally and this causes the following articles to abut against the upstream edges of the second set of partition plates **100.** This removes the longitudinally directed pressure otherwise applied to the abutted articles **14** then positioned at station C and halts any further downstream flow of the lead articles being packaged.

FIG. **3** of the drawings best shows that a pair of longitudinally spaced and opposed guides **108** and **110** are provided in horizontal alignment with the rolls **88** and **90** so as to receive one of the tray blanks **56** from the portion B of the apparatus and position it downstream in the apparatus from the conveyor **12** whereby the articles moving into the station C are supported on such blank **56.** The blanks obviously are of suitable strength and composition as to support the articles positioned thereon.

In the apparatus of the invention, the articles **14** being processed, and the tray blanks **56** as a unit, are adapted to be forced vertically downwardly at the station C to erect the tray and at the same time have it filled with the desired number of the articles **14.** To aid in obtaining this downward pressure on the articles grouped at the station C, a longitudinally extending shoe or pressure plate **112** is positioned between each one of the sets of adjacent pairs of partition plates **100.** Each such shoe is supported on or positioned by a vertically extending support rod or member **114** which is secured in vertically and laterally adjustable engagement with a cross bar **116** by suitable screw and/or clamp means. Hence, the positions of the shoes **112** in the apparatus can be adjusted for operating with different height and size or number of containers or articles being processed. This bar **116** has a pair of vertically positioned rack gears **118** thereon, one of which is engaged with the bar **116** at each end thereof. These rack gears **118** are positioned for vertical reciprocation by a pair of backup rollers **120** and **122** and with the rack gears **118** themselves engaging drive pinions **124** provided at each lateral margin of the apparatus. The pinions **124** are secured to a shaft **125** which is journalled on and extends laterally of the apparatus and has any desired drive means or motor **126** suitably connected thereto. The motor **126** drives a shaft **127** journalled on the plates **34** and such shaft **127** engages and drives the shaft **125** as by sprockets and a chain means **129** connecting such shafts. Hence, when the apparatus has a tray blank positioned at station C and articles have been fed thereinto to form the proper group of articles for filling the tray, then the drive means **126** would be

actuated and the shoes 112 would be forced downwardly a predetermined length stroke to engage the upper ends of the articles 14 and force them downwardly in the apparatus, which action at the same time folds up pairs of opposed edge portions of the tray blank 56.

Normally, at least the guide 110 that is positioned on a carrier or support plate or angle 128 has members, such as a cam operated lock arm 130 operatively positioned thereon adjacent each end thereof for locking the guide in a given position but permitting adjustment of the guide 110 in relation to the plate 128. Release of the arm 130 permits relative vertical movement of the members engaged thereby to permit position adjustment.

The carrier plate 128 extends transversely of the apparatus and the guide 110 is movable longitudinally of the apparatus when the lock arm 130 is released to vary the size of the tray blank and especially its flange height which can be engaged by the guides. The lock arm 130 has a threaded center pin 131 engaging the guide 110. A slot 133 in the plate 128 receives the pin 131 therein so that the guide can be adjusted for size change of the tray flanges. Suitable spring detents 135 or other locators are present on the guide 110 to engage one of a series of spaced holes 137 in the plate 128 to position the guide 110 accurately. Preferably a similar lock arm 130*a* secures the carrier plate and lock arm assembly to an angle 139 extending longitudinally of the frame for adjustments of the guide plate to accommodate variations in the size of the tray blank. A series of holes 141 are formed in the angle 139 to receive detents or other locator means for the carrier plate. The guide 108 may also be adjustably positioned by a clamp arm 130*b* or other means.

TRAY ERECTION AND GROUPED ARTICLE LOWERING

Reference is made to FIGS. 8 and 9 of the drawings that indicate the portions of the apparatus below station C thereof and which apparatus is adapted to take the tray blank 56 and form it to operative tray shape and simultaneously fill the same as it is shaped. To achieve this result, four sets of one pair of endless belts each are provided in 90° spaced relationship around the periphery of the tray and with the pairs of endless belts each being spaced slightly from the center of one of the margins of the tray to be formed. Hence, a pair of endless belts 134, 134 are positioned in opposed relationship to a second pair of belts 136, 136 and with all of the pairs of belts being positioned on vertical axes for vertical operation courses or movement. The further set of opposed pairs of belts 138, 138 and 140, 140 are adapted to engage with other lateral margins of the tray blank to aid in the formation thereof. These belts are positioned as by means of upper pulleys 142 and lower pulleys 144. Any desired number of backup means can be provided intermediate the upper and lower pulleys 142 and 144 and such backup means may comprise members such as vertically directed backup guides or bars 146. The pulleys 142 and the backup guides 146 are secured to means such as vertically upwardly extending support plates 148 which are operatively carried by members such as brackets 150, 152, 154 and 156. These brackets 150 through 156 are adjustably operably positioned, as by cross bars 158 and 160 suitably secured to the frame 10 and extending therebetween. The brackets 150 and 152 carried by one of the bars 158 are positioned to be adjusted laterally with relationship to each other and likewise the brackets 154 and 156 can be adjusted laterally on their support bar 160 to provide for varied spacing of the sets of belts in the apparatus. Clamps 159 engage the brackets to secure them in position on the support bars. Likewise, the bar 160 has suitable adjustable engagement with the frame 10 as by bolts or clamps whereby such bar can be adjusted longitudinally of the apparatus to provide further adjustment in the positioning of the sets of belts in the apparatus for flexibility in the size of tray being processed. At ths same time, the belts and brackets are vertically aligned with the article grouping station C.

Conventional types of adhesive applying means including output rollers, wipers, sprayers or the like are provided in association with the apparatus shown in FIGS. 8 and 9. This apparatus applies adhesive to flange portions of the tray blanks 56 as they move downwardly through the apparatus for final tray forming action and it is described in detail hereinafter.

Adjacent the lower reaches of the sets of belts 134 through 140 the apparatus provides a second series of associated vertically operative belt means to aid in tray formation. Thus, FIG. 9 best shows that corner forming belts 162, 164, 166 and 168 are provided in the apparatus and are carried individually on the brackets 150 through 156. The belts are positioned on upper pulleys 170 and lower pulleys 172. All of the belts have vertically extending inner operative courses at peripheral portions of the tray as operative.

Normally the belts 134 through 140 are any conventional type of a V-belt or the like, whereas the belts 162 through 168 are typical V-belts but they have laterally enlarged or widened face tapes or edge portions 174 suitably secured to the inner edge of each of these belts to aid in obtaining more contact area with corner tabs on the tray blank for shaping the same. Thus, supplemental vertically spaced guide means or rolls 176 and 178 are operatively positioned on the brackets 150 to 156 to engage the relatively wide face tapes 174 and progressively form the tapes to substantially V-form and fold the corners into overlapped engagement with side and end flanges on the trays. The corner tabs initially are moved vertically upwardly with relation to the base or center portion of the tray.

The apparatus of the invention is particularly adapted to be used in association with tray blanks having eight sides or substantially flat edge portions thereon. Hence, eight different roller means and belts or sets of belts have been provided for continued association with the tray blank as it is being formed to shape by wiping or moving edge and corner portions thereof vertically combined with downward movement of the center portion of the tray and the articles positioned thereon and filling the tray.

It will be appreciated that for each actuation of the drive means 126, the articles grouped and the tray blank combined therewith at station C have been moved vertically downwardly in the apparatus one index or unitary step. Such step would be equal to the height of the articles 14 and the tray blank 56. Thus, a plurality of the formed trays complete with a group of articles 14 thereon would be positioned in vertical abutting relationship in and be engaged by the pairs of

belts 134 through 140 to occupy the station D portion of the apparatus.

In order to prevent undesired discharge of a formed tray with articles therein from the lower portion of the station D apparatus, the brackets 150 through 156 also each have mounted thereon an individual carrier plate 180. Each of these carrier plates, as indicated in FIGS. 10, 11 and 12 is individually secured to one of the brackets and each has mounted thereon a substantially L-shaped hook 182 for movement inwardly of a tray to engage the same. These hooks 182 are pivotally positioned at their upper ends as by being carried by support shafts 184 journalled on members 185 on the plates 180. Each of these shafts 184 has a crank arm 186 extending therefrom and a power operated member, such as an air cylinder 188 or the like mounted on a plate 180, has its piston rod 190 connected to this crank arm 186 whereby when the piston-cylinder means is actuated, the L-shaped hook 182 can be moved from its operative position as shown to an inoperative position shown in dotted lines. In operative position, the L-shaped members 182 engage opposed portions of the bottom of the lowermost formed tray in the apparatus and retain the tray and its contents in a fixed vertical position, but on release movement of the hooks 182, then the hooks disengage the tray and permit it to be forced down, outwardly of, and be discharged from the station D. At the same time, a further assembled tray has been pushed downwardly from station C of the apparatus to enter station D. The hooks 182 are positioned to move between the upper ends of the grouped articles received in the tray that has just been released from station D, as hereinafter described in detail. Obviously, the cylinder 188 is actuated for only a few seconds to retract the hooks 182 to release a tray, permit the trays engaged by the endless belts to move downwardly several inches and then advance the hooks to engage the next tray before it has moved downwardly past the hooks.

FILLED TRAY RECEIVING AND DISCHARGE

The details of the filled tray receiving and discharge portion E of the apparatus are best shown in FIGS. 13 and 14 of the drawings, and it will be seen that the frame 10 has two endless conveyors 200 and 202 journalled thereon in tandem as by sets of rollers 204 and 206, respectively, for the different conveyors. These rollers or equivalent means are provided to position each of the conveyors for an advance movement in a horizontal plane on their upper courses and a lower horizontally directed return course connected by vertically extending intermediate courses. Drive is provided for the conveyors as by a drive chain 210 connecting to and operatively engaging and driving one of the sprockets or rollers 206. This drive chain connects to a drive sprocket 212 on a drive shaft 214 that extends from a motor M or other drive means present in the apparatus to provide timed drive of the conveyors 200 and 202 in relation to the other functioning of the apparatus. Each of the conveyors 200 and 202 comprises a pair of endless chain members or equivalent means indicated at 201*a* and 201*b* in FIG. 14 with each endless chain means being positioned in laterally spaced balanced relation to the longitudinal center line of the apparatus. These chain members suitably engage with sprockets or carrier means provided on the shafts of the rollers 204 or 206, respectively.

A tray receiving member, in this instance a substantially inverted U-shaped table or frame means 216, has a pair of vertically extending support legs 218 at one end thereof and a pair of trailing support legs 220 provided at the opposite end of this frame member 216. The support legs 220 are suitably pivotally connected to support shafts or suitable support means 222 secured to and extending between the chains 201*a* and 201*b* whereby pivotal support and engagement of the pair of the support legs by the conveyor is provided. Equivalent means connect the support legs 218 to the second conveyor 202. Thus, the frame member 216, which has an upper support shelf 224 thereon, is adapted to be moved through an advancing motion in a horizontal plane when in its elevated position as shown in the drawings but with the conveyors 200 and 202 being adapted to lower this shelf 224 at the end of its advance movement and retract the lowered frame member horizontally for its next course of movement which is up vertically in the apparatus and horizontally to a position immediately below the tray erection and grouped article lowering station D in the apparatus.

The drawing in FIG. 14 further shows that laterally opposed sets of roller means 226 and 228 are provided at longitudinally spaced and laterally opposed portions of the frame for the apparatus. These rollers or equivalent means are provided above the upper horizontal course of the conveyor 202 and they are so positioned as to engage laterally opposed portions of the tray T on the shelf 224. This tray is deposited on the support shelf 224 so as to overhang the shelf on both lateral margins thereof. Hence, the tray will automatically engage the sets of rollers 226 and 228 when lowered down into the plane thereof by the orbital movement provided for the frame 216.

The next advance cycle of the support shelf 224 on its upper horizontal course causes the support legs 218 to engage the tray on the rollers 226 and 228 and move it onto a discharge belt 230. This discharge belt or conveyor 230 is journalled on the frame 10 by conventional members, such as end support rollers 232. One or more of these support rollers can be driven for positive discharge of the formed and filled trays porcessed in the apparatus.

TRAY BLANK

The tray blank 56 for which the apparatus is designed comprises a tray center protion 240 which has a pair of end flanges 242 formed thereon by score lines 243 and a pair of opposed side flanges 244 that are primarily defined by pairs of opposed score lines 245. In addition, corner tabs 246 are provided at each end or corner of the tray blank and are cut free from the remainder of the blank except at a center base section 248 thereof. Normally the base portions of the tabs 246 are freed from the tray blank at opposed margins thereof by cutting small substantially triangularly shaped openings 250 in the tray blank. Hence, when this tray blank 56 is fed into the article grouping and tray blank combination station C, a pair of the side flanges 244 are engaged in the guides 108 and 110 so that when the tray blank is forced downwardly, these side flanges are started to be pressed upwardly with relation to the flat center section 240 of the blank. Then the sets of opposed belts 134 through 140 engage spaced portions of the side and end flanges to fold such flanges upwardly with relation to the tray center as the tray blank moves

downwardly in the apparatus. The apparatus is normally filled with trays being processed and in the vertically extending tray erection and grouped article lowering section of the apparatus D, these stacked trays are positioned on top of each other and rest upon the lowermost tray and articles supported thereon. Upon further downward movement of the trays as they are being formed, the corner tabs **246** are engaged by the belts **162** to **168** and the corner portions of the tray are folded up vertically and progressively folded to corner shape. The belts **162** to **168** and the enlarged face strips **174** thereon bring the corner tabs into engagement with end portions of the side and end flanges of the tray and usually press the tabs **246** against containers in the corners of the tray.

The tray blank is of the type shown in U.S. Pat. Application Ser. No. 193,025, filed October 27, 1971 and now U.S. Pat. No. 3,774,835.

If desired, the tray blank need not have the openings **250** formed therein. Such portions of the tray blank may remain attached to the corner tabs **246** to project downwardly therefrom when the tray is assembled. The projections on a formed tray can engage with a loaded tray below it to interlock with articles thereon.

The hooks **182** just protrude, when operative, a short distance into the tray support area of the vertically extending support belts. The hook ends are positioned to extend between pairs of abutted containers into the space between radially outer portions of such containers without contacting or moving them appreciably. The hooks engage the lowermost tray engaged by the belts but to not interfere with the released tray or the containers thereon. A suitable stop **217** is secured to the frame **10** to engage the tray released onto the table **216** and prevent forward movement thereof as the table conveyors move around the forward support sprockets therefor. The table **216** then is lowered and this clears the tray and the containers therein from the hooks.

Prior to the vertical upward folding of the corner tabs **246**, the conventional adhesive spray means **300** at station D are actuated. These spray means are provided with any known type of an adhesive for spray deposit onto the outer surface of end portions of the end flanges **242** and/or of the side flanges **244**, as desired. Such spray means **300** are suitably positioned in and carried by the frame **10** of the apparatus for spraying adhesive or glue onto the flanges of the tray blank, after they have been moved to vertical relationship with reference to the tray center **240**. This is shown in FIG. **8** of the drawings and naturally this spraying occurs before the lower sets of vertically extending belts engage with the end tabs **246**. The trays are retained in engagement with the positioning belts for a short time after the trays have been erected whereby the adhesive can set or dry sufficiently to retain the tray in operative form.

In the drawings of the apparatus, various parts have been eliminated or are shown somewhat diagrammatically in a number of the views to clarify the showing of the various components of the apparatus but the relationship of the individual sections of the apparatus is believed to be indicated clearly.

It will be realized that correlated drive and control means are provided to actuate various portions of the apparatus in timed relationship to each other for proper automatic functioning of the apparatus. Naturally, a plurality of stacked, filled trays normally are received in the tray forming section D of the apparatus and with one tray being discharged as each new tray blank is moved into the apparatus. If desired, the discharge means can be set up in such a manner that one filled tray is discharged onto the table **216** as it is ready for downward movement and then it can be lowered a distance sufficient to enable a second filled tray to be deposited upon the first tray. Next the apparatus would be actuated for delivery of the two stacked trays onto the discharge members of the apparatus whereby the discharge package in this instance would comprise a pair of the filled trays.

Control lines, leads and pressure or other supply lines or tubes have been omitted for clarity and drawing simplification as for the spray means **300**, cylinders **188**, etc. The rollers **204** and **206** mounting the conveyors **200** and **202** may be sprockets or similar means. Obviously the sets of endless belts have only friction engagement with the trays and are not driven but are mounted for rotary movement as provided by the trays and their forced movement.

A novel and improved tray forming and filling packaging apparatus has been provided and it is submitted that the objects of the invention have been achieved.

While one complete embodiment of the invention has been disclosed herein, it will be appreciated that modification of this particular embodiment of the invention may be resorted to without departing from the scope of the invention.

I claim:

1. Apparatus for erecting and filling tray blanks with articles comprising:

a frame having an article collecting area,

means for feeding a tray blank to said article collecting area,

means on said frame to slide or feed articles onto a tray blank at said article collecting area,

a plurality of endless means having vertical operative courses to engage a tray blank and move edge and end flanges thereon upwardly,

driven pusher means on said frame to engage the tops of articles at said article collecting area and force them and their supporting tray blank downwardly into engagement with said belt means,

a second plurality of endless belt means having vertical operative courses to engage corner tabs on said blank and move them up into operative positions when said first belt means are engaging said tray blank, and

discharge means below said endless belt means to receive trays as released thereby.

2. Apparatus as in claim **1** and comprising retaining means positioned at the lower end of said belt courses to engage trays and release them one at a time for gravity deposit onto said discharge means.

3. Apparatus as in claim **1** and including means to apply an adhesive to flange portions of said tray blank prior to complete formation of the tray, said second endless belt means having flexible face members thereon wider than the body of the belt, and guide means engaging said face members to force them into engagement with the corner tabs of said tray blank to bring them into operative positions engaging adhesive coated flange portions of the tray.

4. Apparatus as in claim **1** and wherein said tray blank feed means include a pair of rolls for engaging a blank to move it into guide means at said collecting

area, and driven slide means to move one blank at a time to said rolls.

5. Apparatus as in claim 1 where said discharge means comprise:

a pair of endless driven conveyors positioned in tandem sad having horizontally positioned upper operative courses,

a carrier table with front and back support legs thereon, and means pivotally securing said front legs to said front conveyor and said back legs to said second conveyor to move said table through an upper operative path to receive a tray as released by said retaining means.

6. Apparatus as in claim 5 where said discharge means further comprise:

roller tray support means positioned above said front conveyor on each side thereof to engage an erected tray and strip it from said table as said table is moved downwardly by said conveyors.

7. Apparatus as in claim 1 and comprising:

a plurality of vertically positioned axially extending partition plates forming a part of said article feed means,

means positioning downstream ends of said partition plates for lateral movement to aid in stopping feed of said articles, and

means to actuate said positioning means to move said partition plates and articles received between said plates laterally to bring the articles into engagement with a stop member.

8. Apparatus for erecting and filling tray blanks with articles wherein a plurality of streams of abutted articles are fed into the apparatus, comprising:

a frame having an article collecting area and tray blank positioning means,

means for feeding a tray blank to said positioning means at said article collecting area,

means on said frame to slide articles onto the tray blank at said article collecting area,

a plurality of endless means having vertical operative courses positioned below and centered with relation to said area to engage a tray blank and move edge and end flanges thereon upwardly, and

driven pusher means on said frame to engage the tops of articles at said article collecting area and force them and their supporting tray blank downwardly into engagement with said belt means for tray formation.

9. Apparatus for erecting and filling tray blanks with articles as in claim 8 and comprising a second plurality of endless belt means having vertical operative courses to engage corner tabs on said tray blank and move them up into operative positions when said first belt means are engaging said tray blank, and

discharge means below said retaining means to receive trays as released by said belt means.

10. Apparatus as in claim 9 and including

means to apply an adhesive to edge flange portions of said tray blank prior to complete erection thereof, said second endless belt means having flexible face members thereon wider than the body of the belt, and guide means engaging said face members to aid in bringing the corner tabs of said tray blank into full operative position engaging portions of the side and end flanges of the tray.

11. A method for erecting and filling tray blanks with articles comprising the steps of:

feeding streams of abutted articles to an article collecting area,

feeding a tray blank to said article collecting area prior to the feed of articles thereto and supporting the articles on a said tray blank,

supporting said tray blank at only a pair of opposed margins thereof,

forcing the articles at said article collecting area and their supporting tray blank downwardly,

moving flange portions of the tray blank to upright operative positions as it with said articles thereon are moved downwardly including initially moving opposed side and end flanges of the blank upwardly, applying adhesive to portions of said side and end flanges, and moving corner flanges up to operative engagement with said side and end flanges,

supporting a plurality of the trays with articles thereon in vertical alignment, and

releasing and discharging the trays individually from the bottom of the stack of trays.

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