United States Patent [19]

Monaghan

[11] **3,842,570**

[45] **Oct. 22, 1974**

[54] **HIGH SPEED TRAY FORMER AND LOADER**

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[73] Assignee: **Monaghan Automated Systems Inc.,** Green Brook, N.J.

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[21] Appl. No.: **325,086**

[52] **U.S. Cl.** ..... **53/26,** 53/32, 53/159, 53/207, 93/51 R

[51] **Int. Cl.** **B65b 11/08,** B65b 35/30

[58] **Field of Search** ..... 53/26, 32, 34, 48, 159, 53/160, 192, 194, 195, 207, 230; 93/44, 49 R, 51 R, 51.1, 52

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Primary Examiner—Travis S. McGehee
Assistant Examiner—John Sipos
Attorney, Agent, or Firm—Arthur A. March, Esq.

[57] **ABSTRACT**

Apparatus for erecting tray blanks and filling the trays with articles as groups of articles spaced longitudinally from each other are moved on a fixed course including an endless conveyor having tray erecting form means thereon driven at the speed of movement of the articles where the conveyor is positioned below the path of movement of the groups of articles. A tray blank is positioned on the tray blank forming conveyor for each group of articles and the articles are deposited onto the tray blank. Article depressing means are moved longitudinally with the groups of articles, and driven pusher means are carried by the flying shear means and are movable vertically downwardly of the apparatus to engage and force such articles and their supporting tray blank downwardly into the tray erecting form means to erect the tray and fill it with articles. The method of moving articles as groups and forcing the articles downwardly to shape and fill a tray as the tray blank and grouped articles are moving.

11 Claims, 18 Drawing Figures

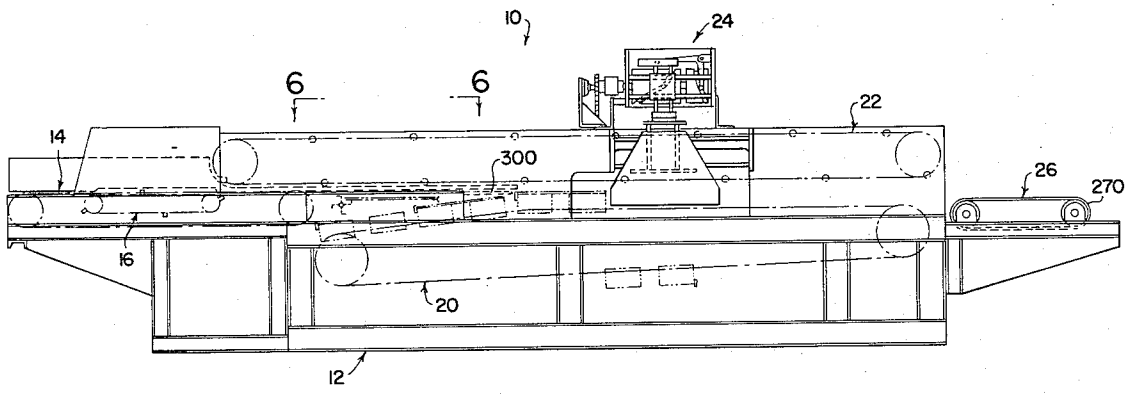

FIG. 1

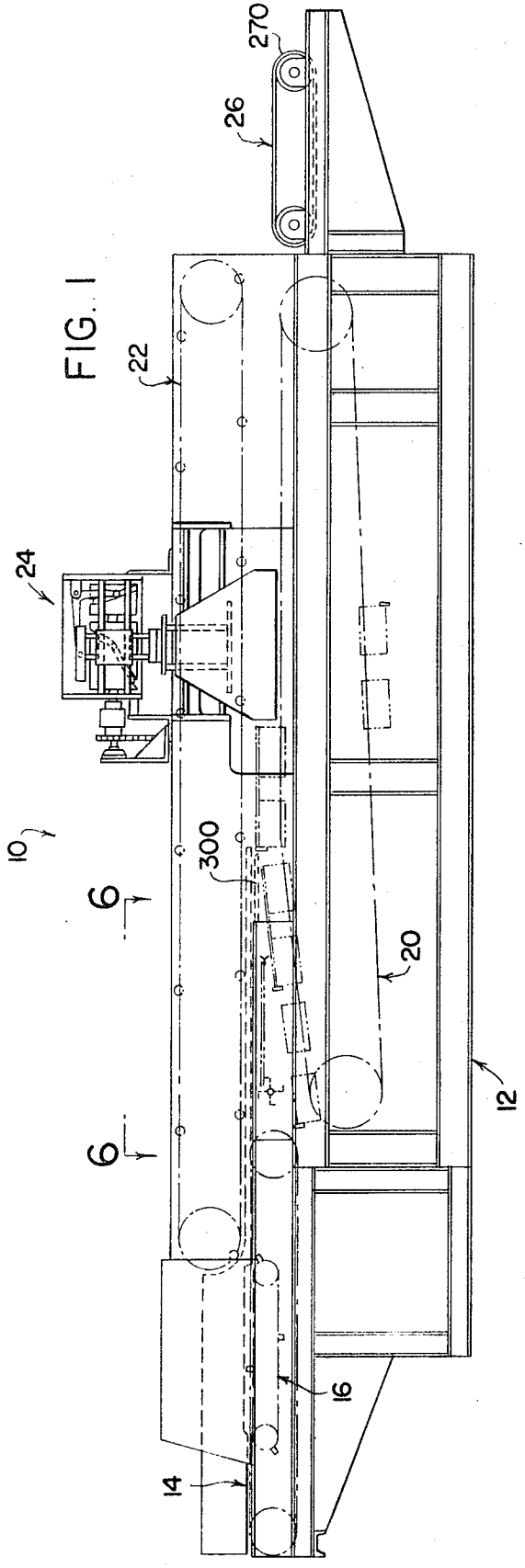
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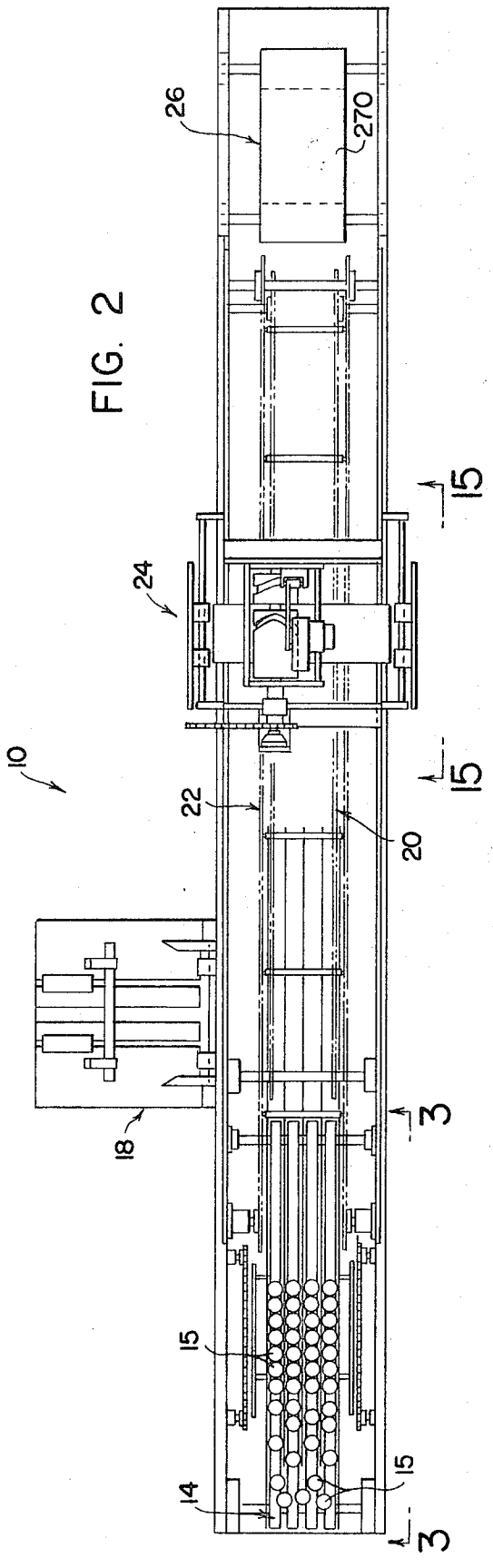
FIG. 2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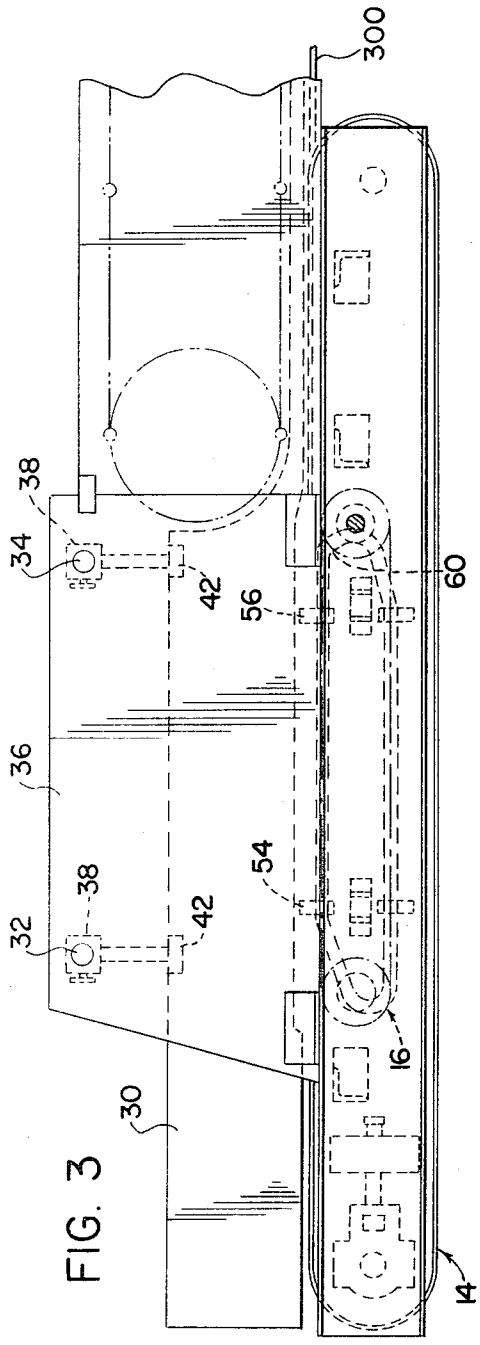
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FIG. 3

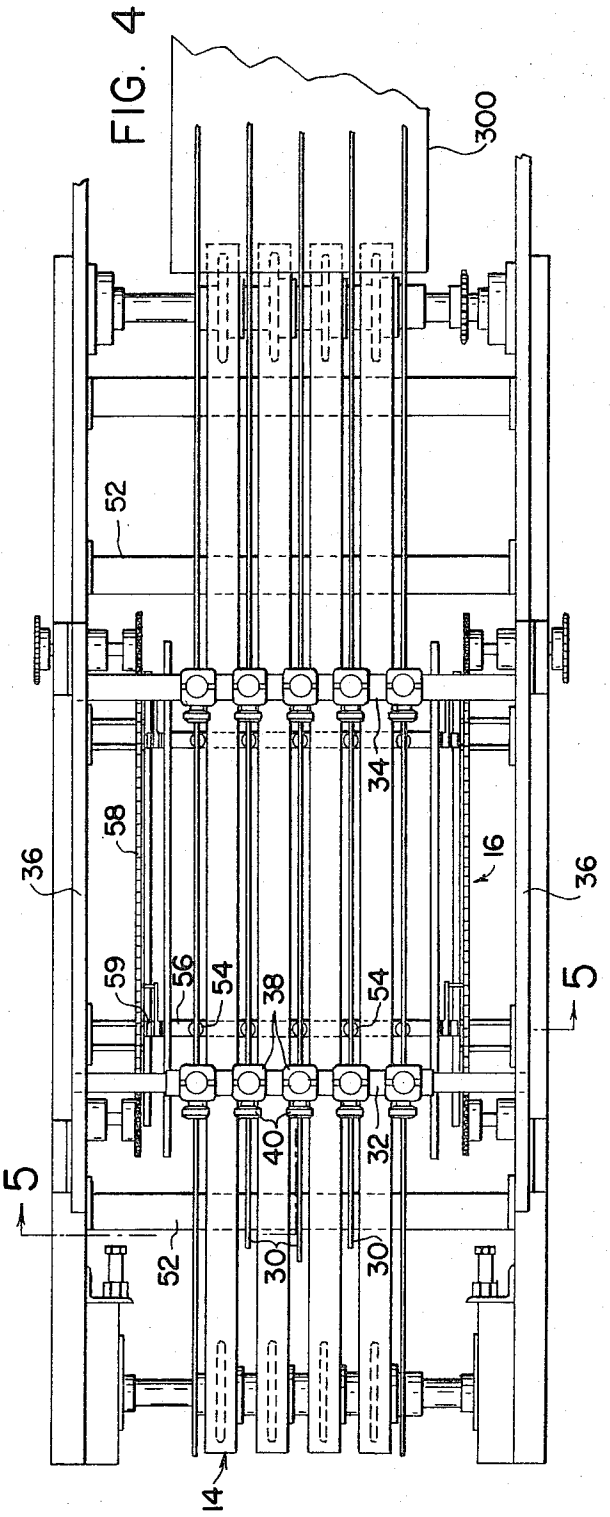
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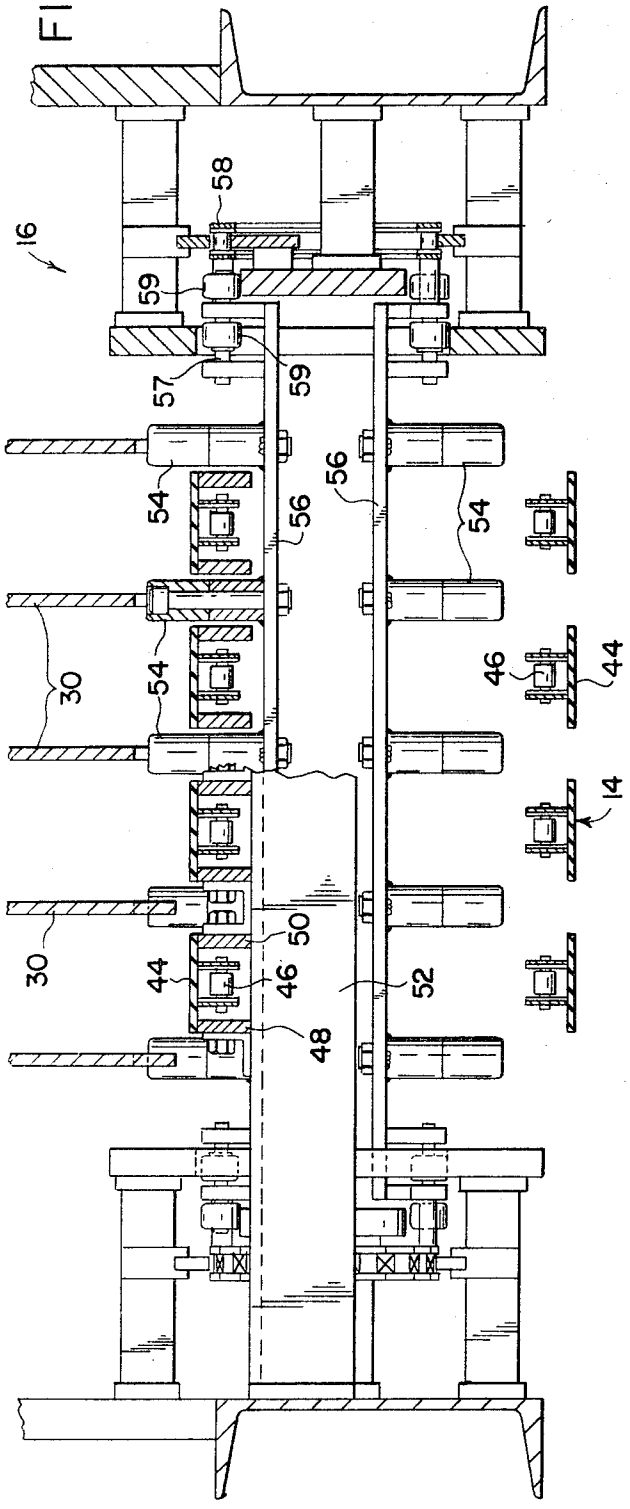
FIG. 4

FIG. 5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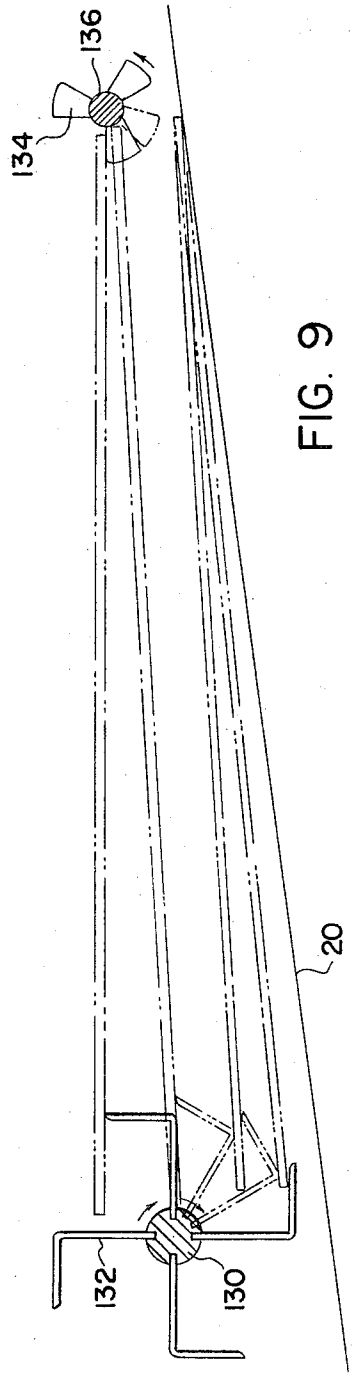
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FIG. 9

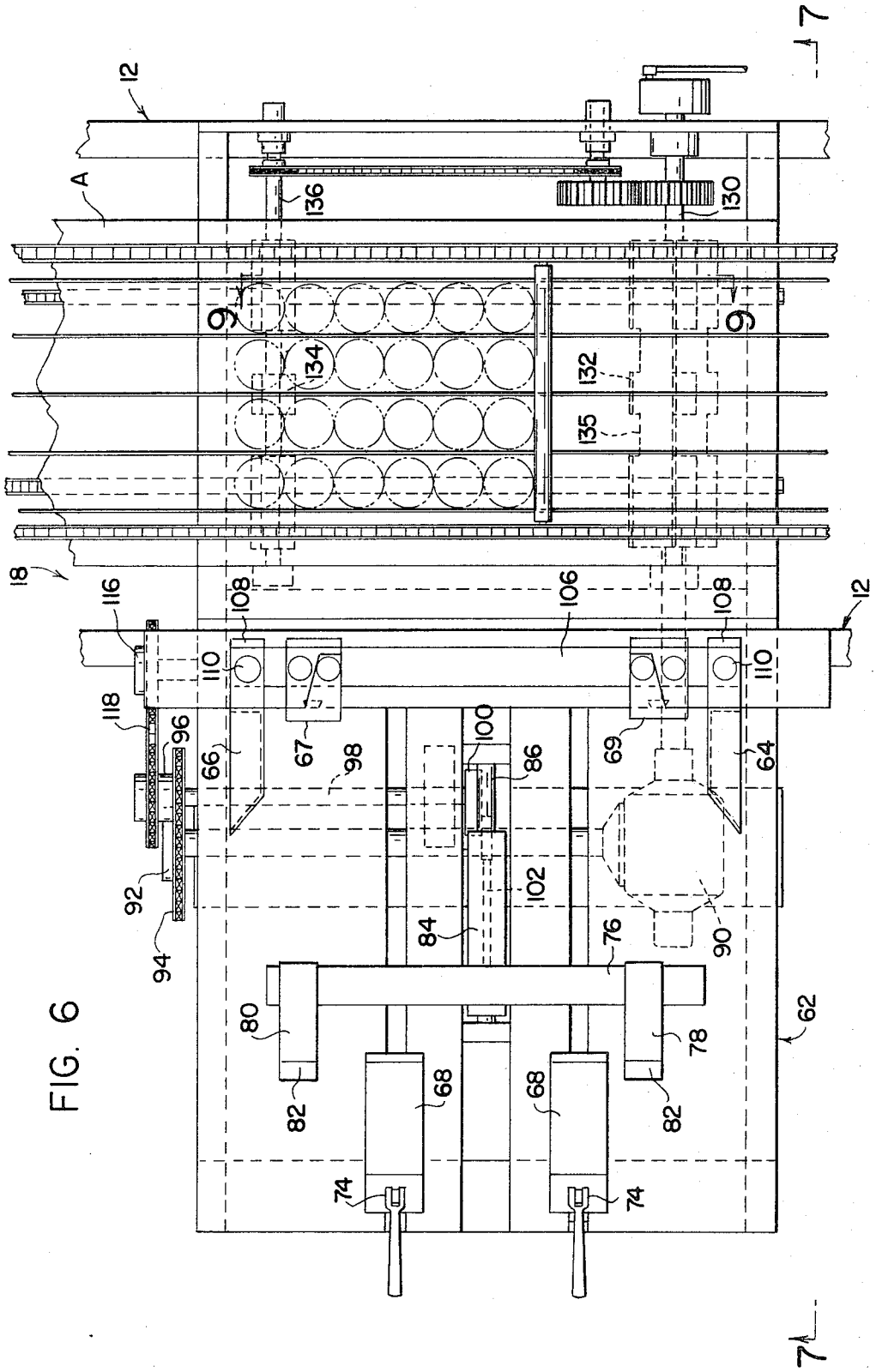
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FIG. 6

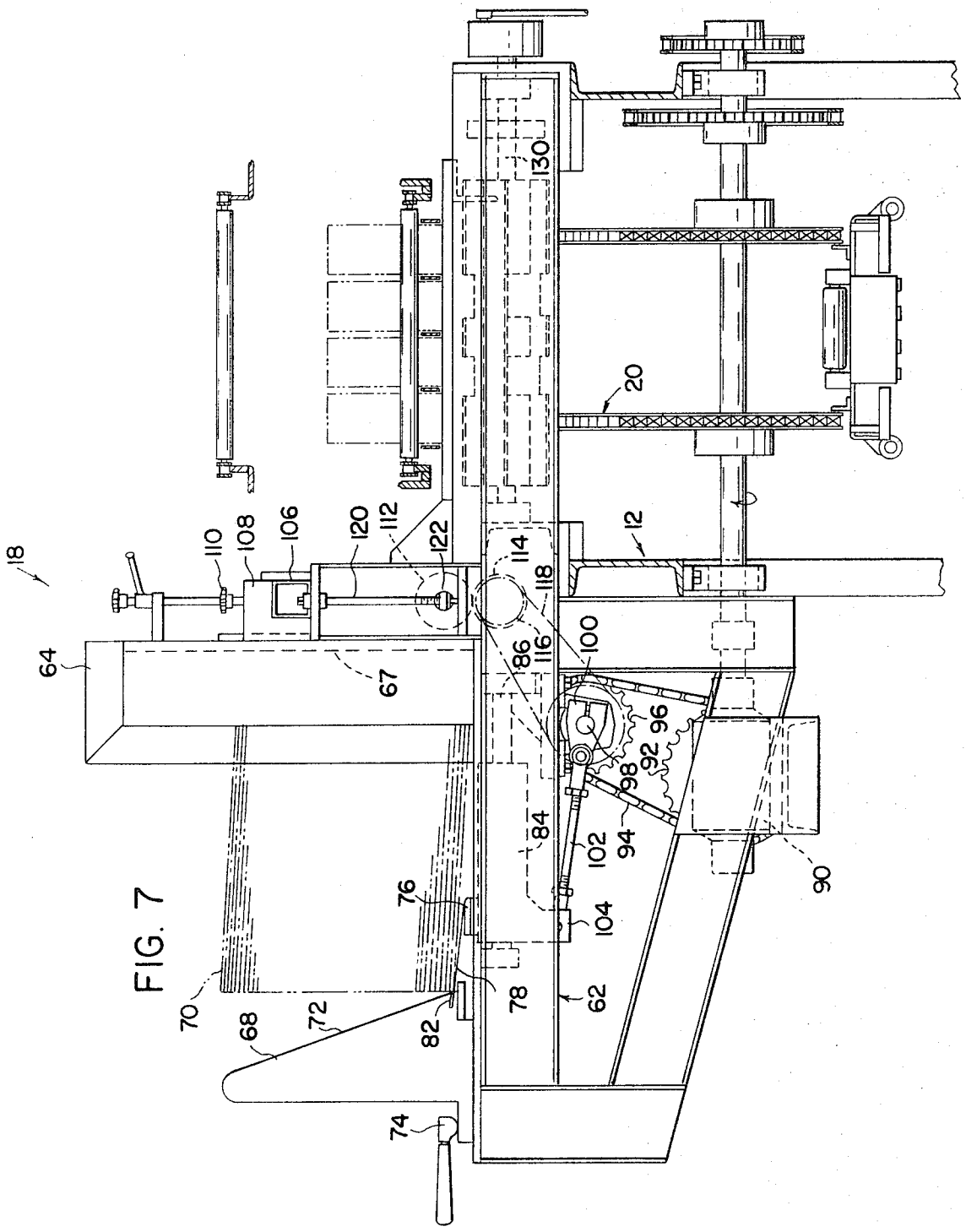
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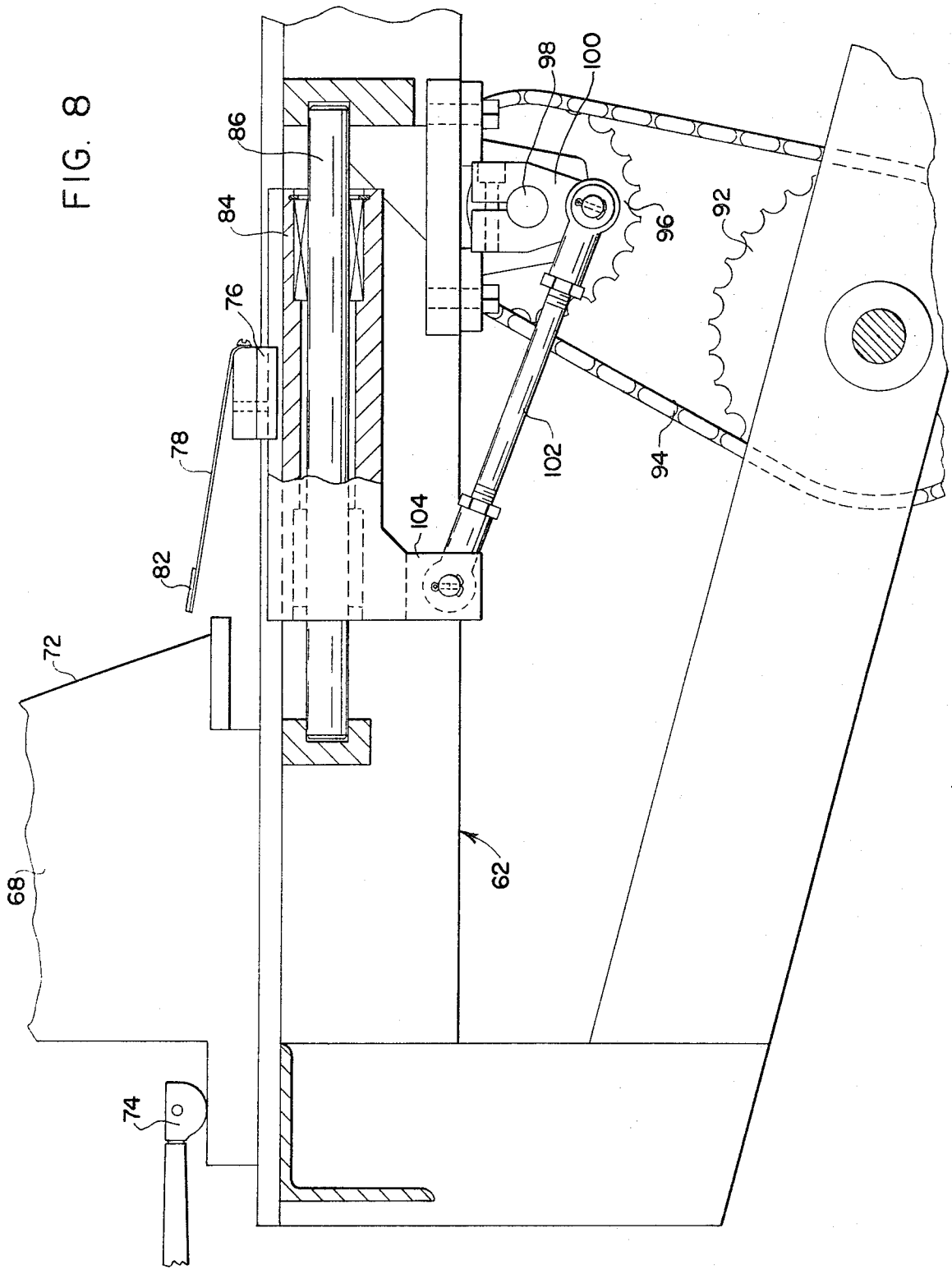
FIG. 7

FIG. 8



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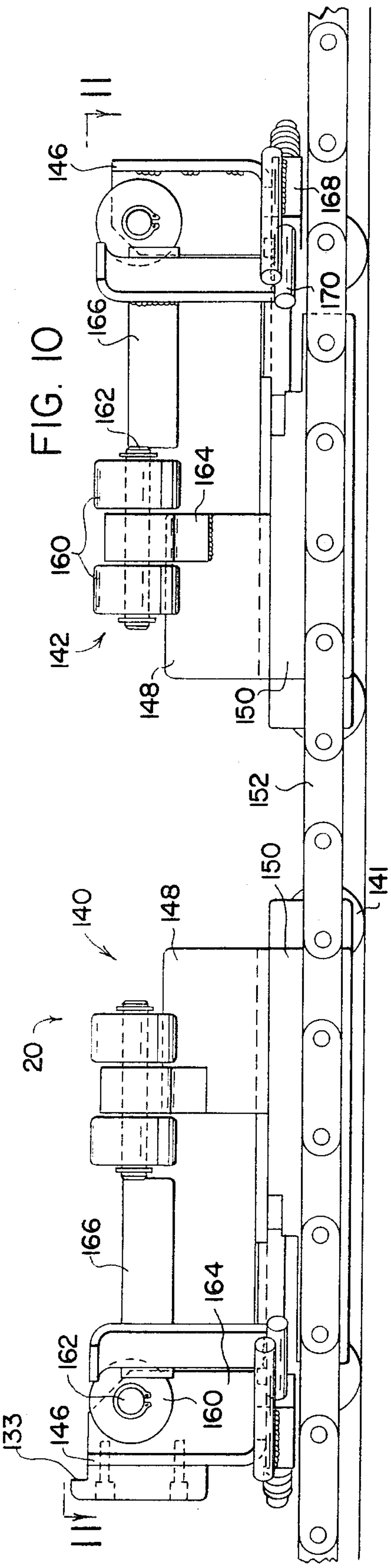
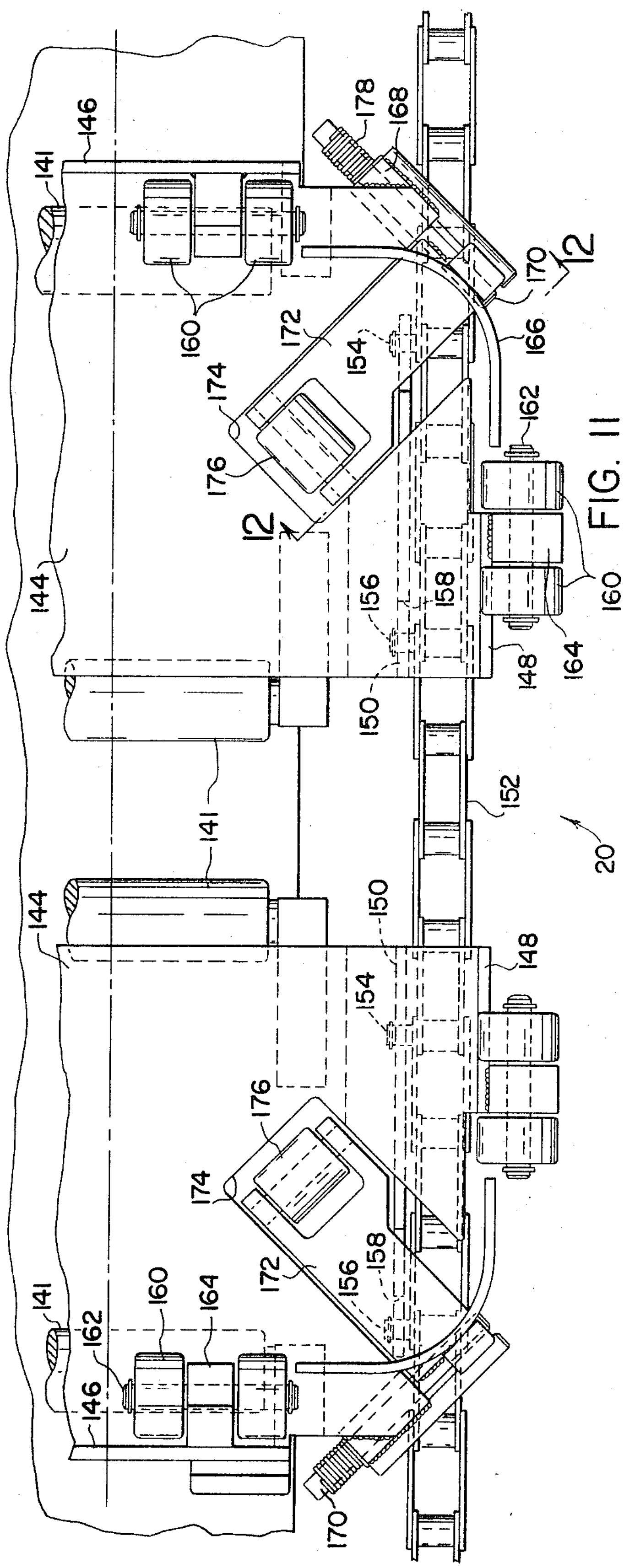


FIG. 10



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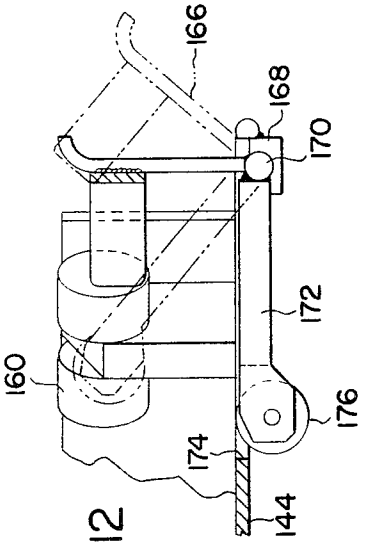
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FIG. 12

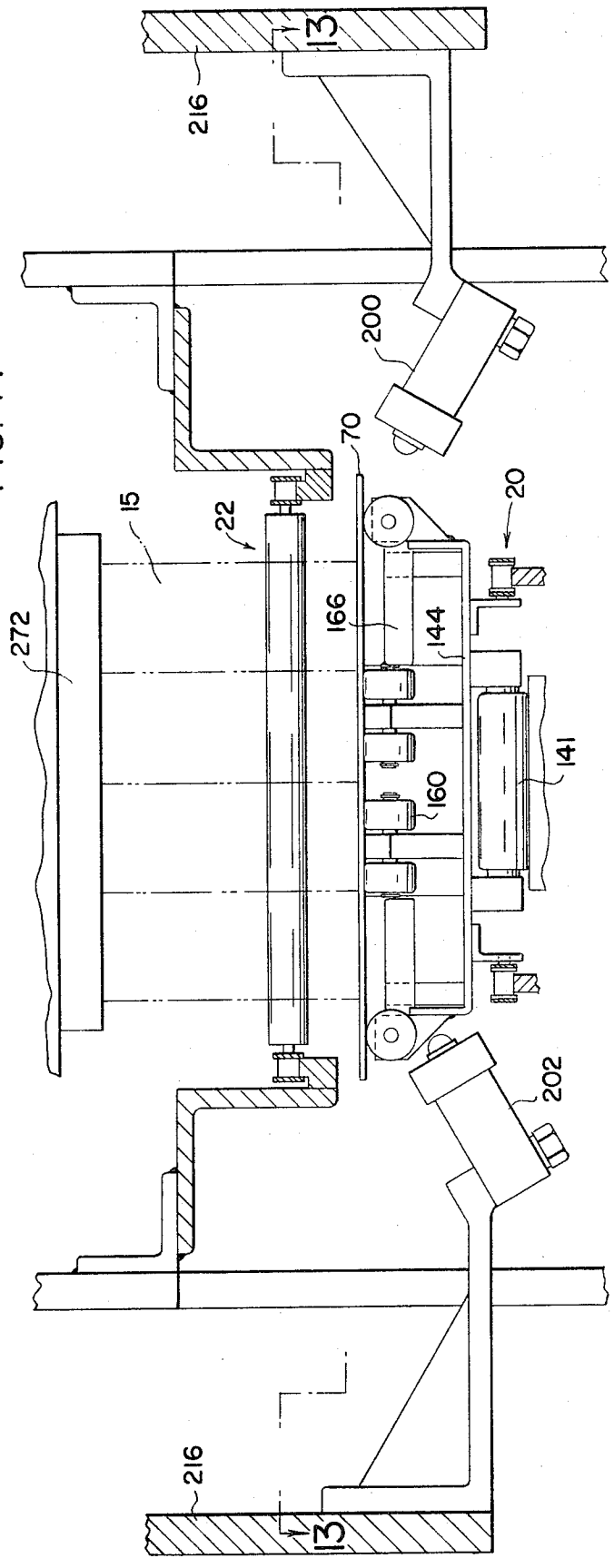
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FIG. 14

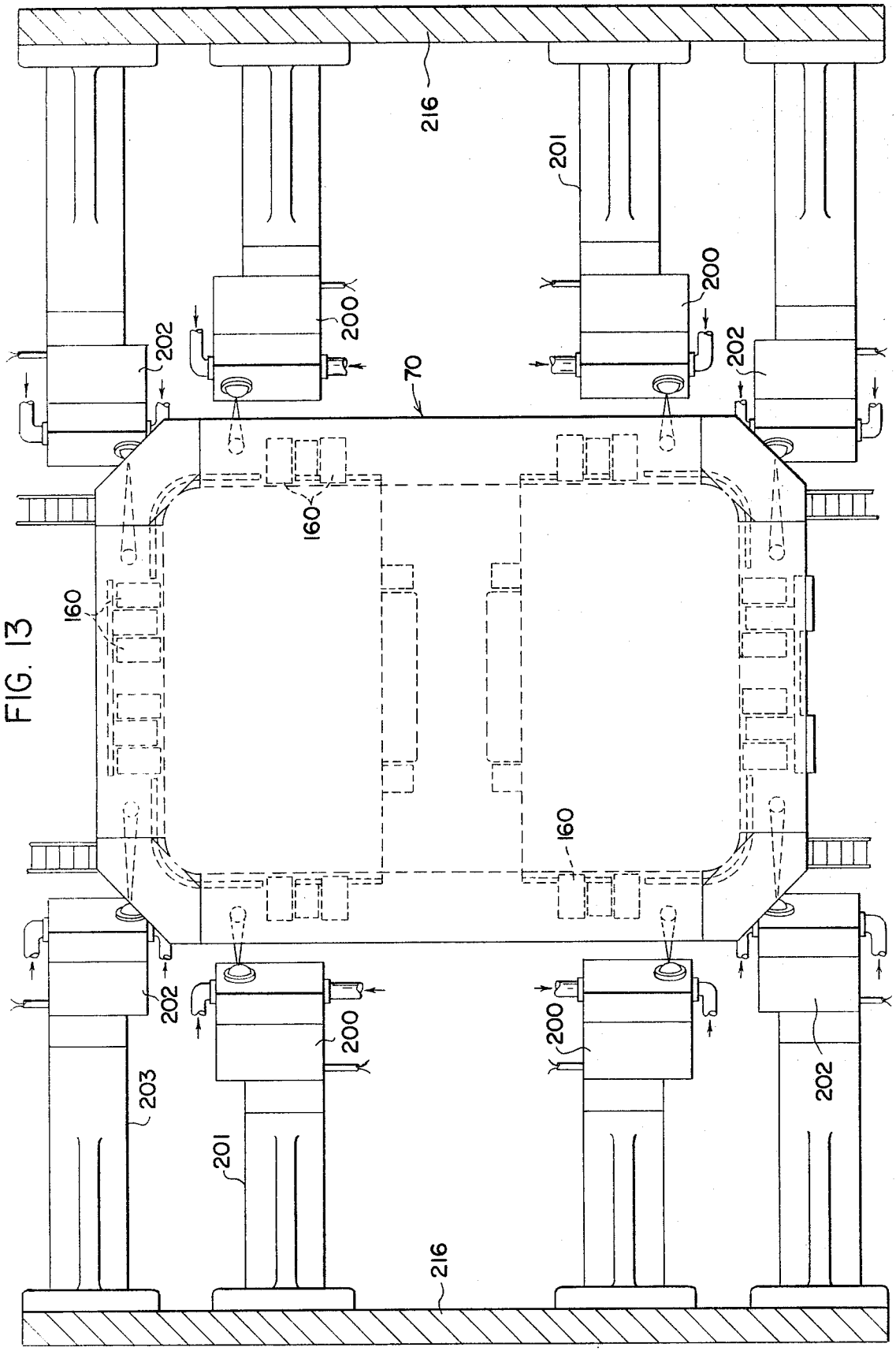

FIG. 13

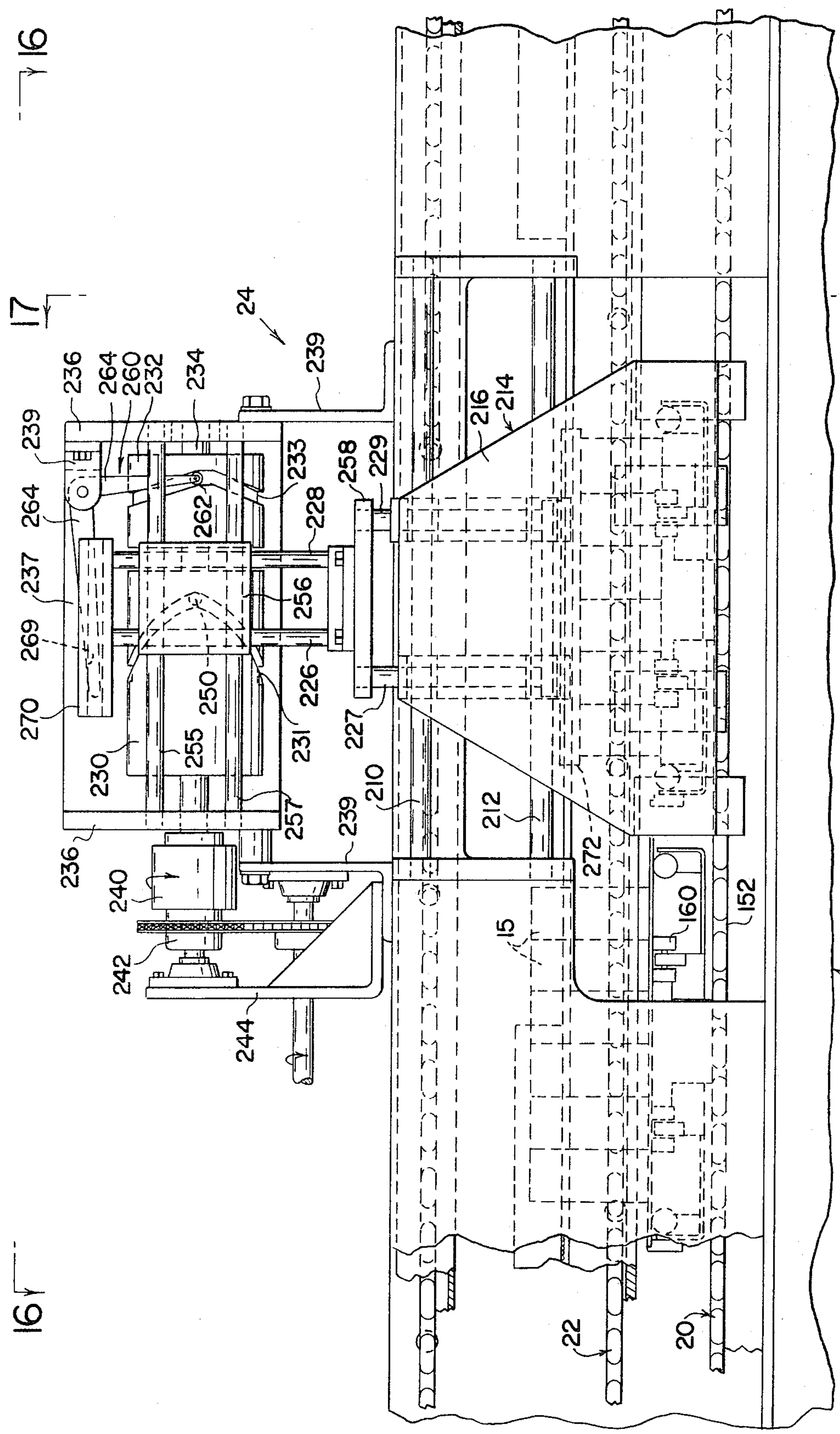
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FIG. 15

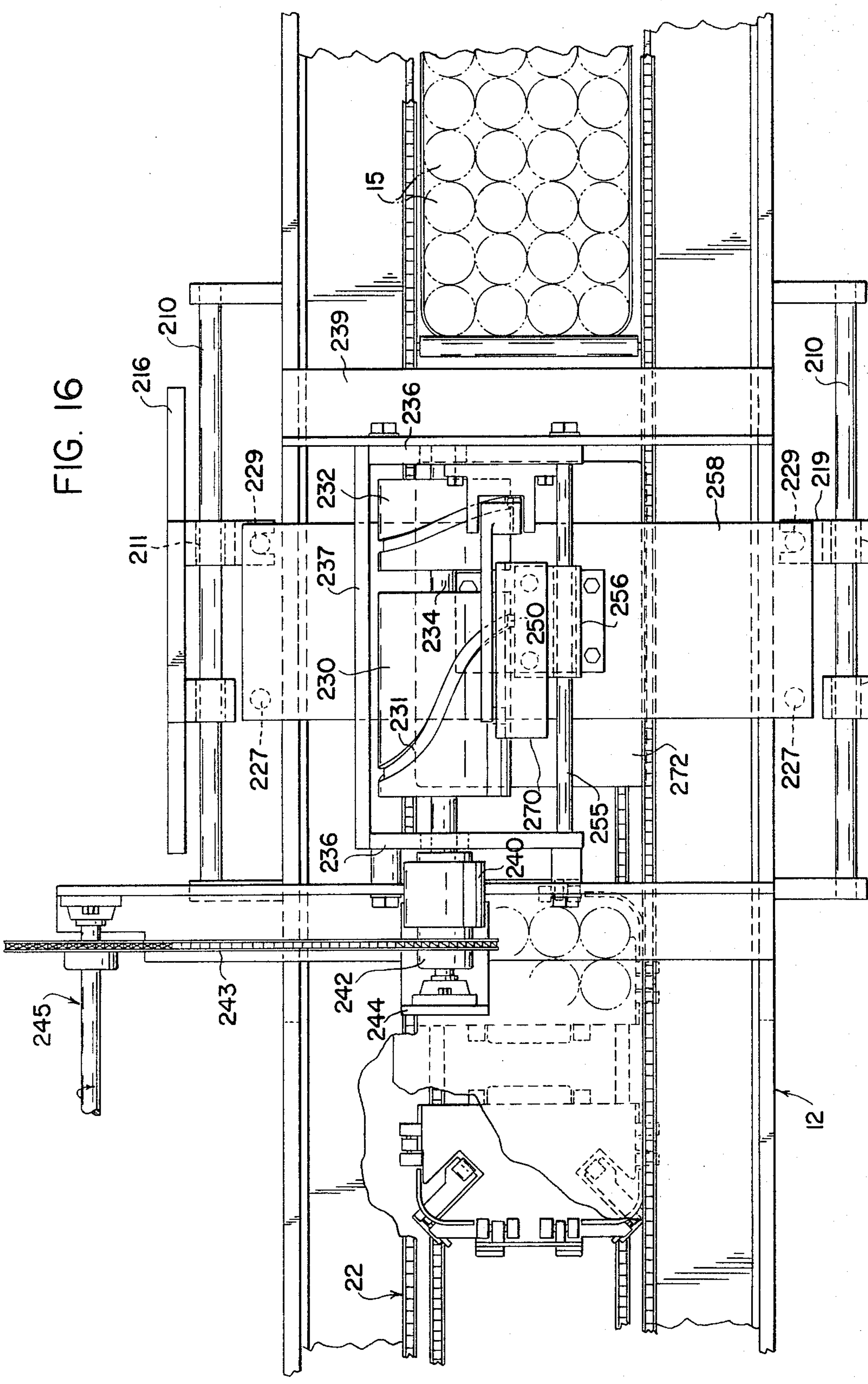
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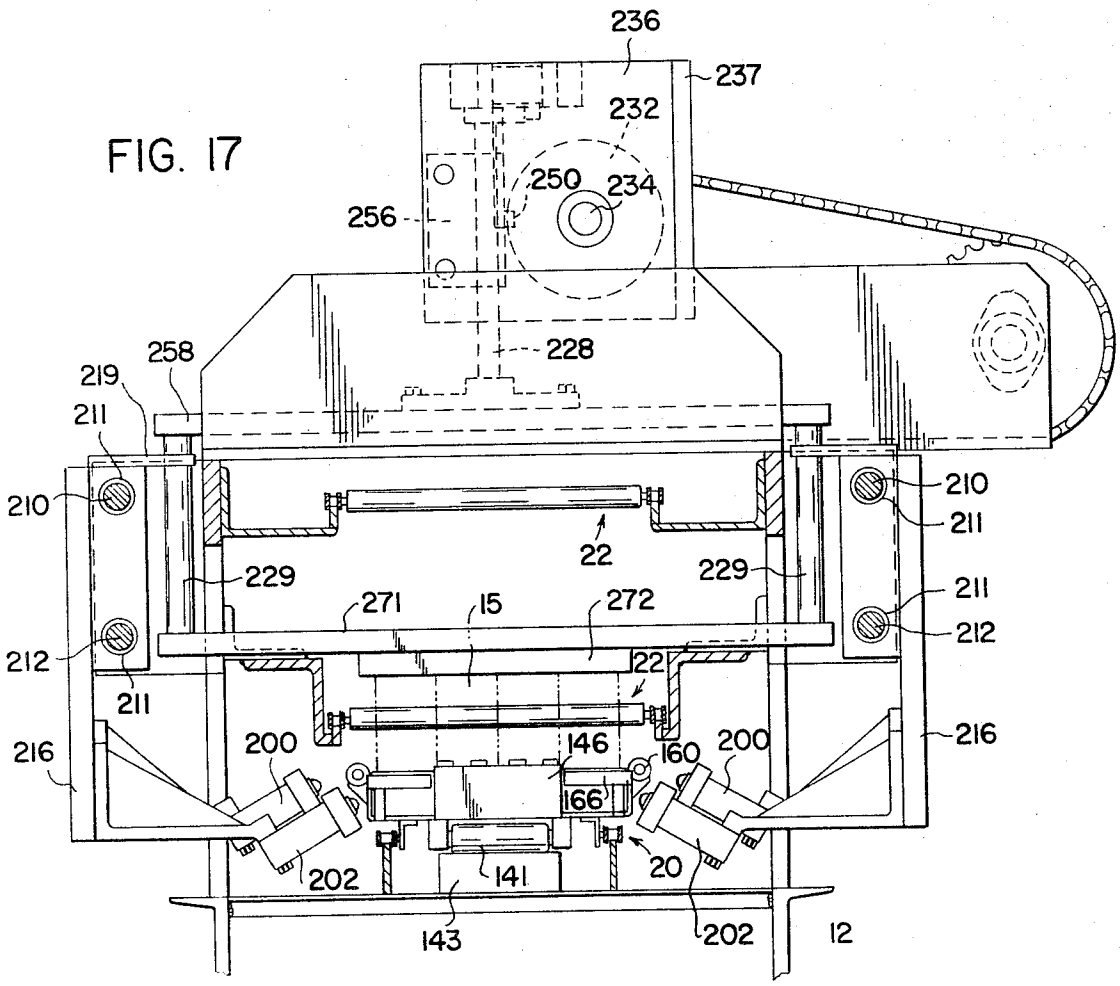
FIG. 16

FIG. 17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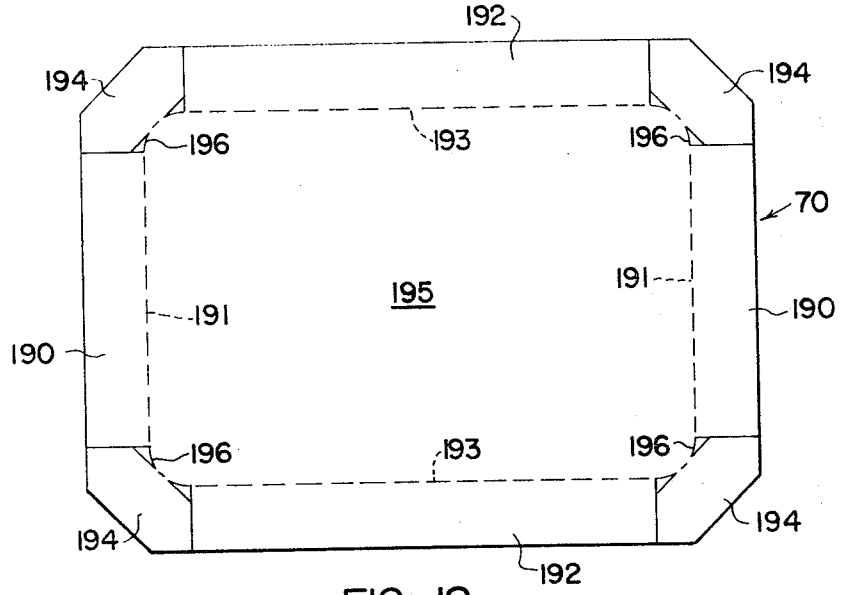
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FIG. 18

HIGH SPEED TRAY FORMER AND LOADER

This invention in general relates to packaging apparatus, and especially to tray formers and loaders. The apparatus is adapted to erect a tray to operative form from a flat blank and to fill the tray or carrier with the desired article or group of articles to be carried thereby.

BACKGROUND OF INVENTION

Heretofore there have been many different types of packages or receptacles provided for packaging a plurality of articles therein. These articles, such as beverage containers for carbonated drinks, beer, or other articles, are usually adapted to package a group of the articles as a unit for storage and shipment purposes. The packages provided have varied widely in size and the number of articles packaged in the carrier package by packaging means as available heretofore is subject to change.

While a number of prior types of packaging means and apparatus have been provided heretofore and have functioned relatively well, it is always desirable to package articles more rapidly and by improved types of apparatus which can be relatively inexpensive to make and which are relatively low in maintenance cost.

Cardboard or paperboard trays of various types have been provided heretofore and which trays engage the lower portions of the articles received therein. Some type of overwrapping means then normally is used for retaining the containers in the tray. Obviously these packaged articles or containers must be adapted for rapid processing by the apparatus, for automatic tray and article handling and for filling the tray with articles in a relatively short time.

In processing a plurality of articles for packaging action, normally the articles are fed into the apparatus in a number of streams of abutted articles. The articles then must be formed into groups, the tray blank be formed to operative shape, and the articles be deposited into the tray. Prior patents in the field of article grouping apparatus are U.S. Pat. Nos. 3,107,775 and 3,190,434.

The general object of the present invention is to provide apparatus for separating a plurality of articles fed into the apparatus as streams of abutted articles into spaced groups of articles, to maintain the groups of articles moving longitudinally along in the apparatus, to position a tray blank underneath the articles as grouped, and then to form the tray blank to operative form and position the articles therein by a substantially simultaneous tray erection and article deposit action.

Another object of the invention is to provide a tray blank forming or erecting apparatus wherein a flying shear type of article depressing means is provided for simultaneously forming the tray blank to operative shape and for depositing a plurality of grouped articles therein.

Another important object of the invention is to combine a tray forming or erecting action obtained by a limited downward movement of the tray with an article deposit action for a group of articles to be received in the tray whereby in a relatively short path of longitudinal movement of the grouped articles they can be deposited in and a tray blank be formed to operative shape with the articles being in the tray as it is erected.

The foregoing and other objects and advantages of the invention will be made more apparent as the specification proceeds.

The present apparatus and method are particularly adapted for use with tray blanks of the type as generally shown in and covered by my copending U.S. patent application Ser. No. 193,025, filed Oct. 27, 1971 now U.S. Pat. No. 3,774,835.

Reference is made to the accompanying drawings, wherein:

FIG. **1** is a diagrammatic side elevation showing the tray formation and article filling apparatus of the invention;

FIG. **2** is a diagrammatic plan view of the apparatus of FIG. **1**;

FIG. **3** is a side elevation of the article feed conveyor and associated means shown in more detail;

FIG. **4** is a fragmentary plan of the apparatus in FIG. **3**;

FIG. **5** is a fragmentary vertical section taken on line **5—5** of FIG. **3** and showing only the article feed and group separating means of FIG. **3** and some supports therefor;

FIG. **6** is a fragmentary plan view of the tray blank feeder means of the invention in association with the longitudinal frame and conveyor means of the apparatus;

FIG. **7** is a side elevation of the apparatus of FIG. **6** taken on line **7—7** thereof;

FIG. **8** is a fragmentary vertical section showing further details of the tray blank injector means;

FIG. **9** is a fragmentary vertical section indicating diagrammatically the positioning of the tray blank as it is injected into the apparatus and its deposit onto the tray blank formation means;

FIG. **10** is a fragmentary side elevation of one blank forming means and the blank receiving and formation conveyor;

FIG. **11** is a fragmentary plan view of the tray blank formation means and conveyor of FIG. **10**;

FIG. **12** is a fragmentary vertical section of the corner forming means taken on line **12—12** of FIG. **11**;

FIG. **13** is a fragmentary plan view of a portion of the tray blank carrier conveyor and the adhesive applying means of the apparatus;

FIG. **14** is a fragmentary cross section of the apparatus of FIG. **13** and the apparatus directly associated therewith;

FIG. **15** is a fragmentary side elevation of the tray forming means and article deposit means of the apparatus;

FIG. **16** is a fragmentary plan view of the apparatus of FIG. **15** with portions omitted for clarity;

FIG. **17** is a vertical section through the apparatus of FIG. **15** taken on line **17—17** thereof; and

FIG. **18** is a plan of a tray blank used in the apparatus.

APPARATUS OF THE INVENTION

The present apparatus is adapted to function with streams of abutted articles being fed into the mechanism for grouping into a selected number of units and for deposit into a tray for carrying thereby.

The articles are fed into the apparatus in a plurality of abutted rows on a support conveyor moving at a selected speed and a plurality of spacer fingers positioned on a separate conveyor come up and engage groups of

the articles on the input conveyor and retard the movement of these articles along such conveyor. Thereafter, the article grouping or separating means separate from the input conveyor to release the end group of articles which advance more rapidly in the apparatus and are spaced from the adjacent trailing group. A tray formation conveyor is provided below an article moving conveyor and a tray blank is fed into the apparatus from the side thereof into engagement with the tray blank forming means on the tray formation conveyor. The grouped articles are deposited on a tray blank and the unit moves to a tray filling and forming station. There an article depressing means moves with the articles and tray blank unit to force such articles downwardly which causes the tray blank to be moved into the tray forming means and a packaged tray-article combination is provided. Adhesive is sprayed onto portions of the tray blank prior to tray formation. Then the formed tray, filled with articles is moved along the apparatus and discharged.

The apparatus of the invention is indicated as a whole by the numeral **10** and it comprises an apparatus for forming a tray blank to tray shape and simultaneously filling the tray with the desired group of articles and ultimately discharging the filled tray from the apparatus.

The apparatus includes any suitable type of frame means **12** and the major components of the apparatus include an input conveyor **14** for conveying a plurality of streams of aligned, abutted articles or containers such as cans **15** longitudinally of the apparatus and a separation or group forming conveyor **16** is associated with the input conveyor **14** for a portion of the upper course of the input conveyor as the articles are moving into the apparatus. A tray blank feeder means **18** is positioned laterally offset from the longitudinal axis of the conveyor to feed individual tray blanks into the apparatus in timed relationship to the movement of groups of the containers longitudinally of the apparatus. An endless, pocket type tray forming conveyor **20** is operatively positioned in a lower portion of the frame means **12** for being brought into association with the groups of the articles formed after a tray blank has been deposited on means on such conveyor **20.** The containers, in groups, are moved longitudinally of the apparatus by an overhead drive conveyor means **22.** After the articles and tray blank have been brought into operative association, the conveyor **22** moves the groups of articles through a tray formation and article depressing means **24** article depressing for moving the tray blank downwardly of the apparatus in relation to the pocketed tray forming conveyor **20** to shape or form the tray and at the same time pushing the articles into the formed tray. Adhesive may be placed on portions of the tray prior to the tray formation action. Thereafter, the trays are moved through the apparatus for the adhesive to set, and the filled trays are then deposited onto a discharge conveyor **26** to be processed in any desired manner.

CAN INFEED AND GROUP FORMATION

FIGS. **3** and **4** best show the input and article feed action, and a plurality of parallel longitudinally extending partition plates **30** are provided for positively separating the continuous streams of articles supplied to the apparatus into the desired number of longitudinally abutted rows of articles. Any conventional means can be used for supply of the cans or other articles to the apparatus for processing action. The partition plates are mounted, for example, on a pair of transversely extending support bars **32** and **34** that are positioned parallel to each other at longitudinally spaced portions of the apparatus by engaging means such as side plates **36** provided at each lateral margin of the input conveyor **14.** The partition plates **30** can be engaged with the support bars **32** and **34** by any desired means, such as clamps **38,** which have set screws or lock screws **40** provided thereon for bringing the clamps into fixed engagement with the support bars **32** and **34.** The clamps have brackets or members **42** at their lower ends for suitably engaging the upper portions of the partition plates to fix them in the apparatus but the lateral spacing of the partition plates can be varied by the clamps **38** to adjust the apparatus to process different sizes of containers as desired.

The input conveyor **14,** as shown in FIG. **5,** usually comprises a plurality of endless flexible chains each including conveyor bars **44** and associated roller support means **46.** A plurality of these bars **44** and rollers **46** are conventionally secured together to form endless chains for each article space between adjacent pairs of the partition plates **30.** The individual conveyor sections can be supported on or be guided by members such as pairs of chain slides **48** and **50** mounted on and extending between members such as longitudinally spaced cross bars **52** secured to the frame of the apparatus so that the endless conveyor bands are fixedly located as they are moved along in the apparatus.

As these streams of articles are being moved along on the individual chains of the input conveyor **14,** the separation or group forming conveyor **16** is adapted to move through an orbit the upper course of which is in the same plane as the upper course of the input conveyor **14** to provide an article separation action. This action is obtained by means of a plurality of uprights or fingers **54** secured in proper lateraly spaced relationship to cross bars **56** secured to and forming a portion of this conveyor **16.** The cross bars **56** are secured to shafts **57** protruding from endless side chains **58** and they are positioned as by the use of suitable roller means **59** operatively journalled on end portions of these cross bars **56.** The upper portions of the fingers **54** may comprise roller means that are between adjacent abutted articles on the input conveyor **14.** The fingers **54** are positioned to be brought up under the partition plates **30** intermediate the rows of articles being processed in the apparatus but protrude laterally from the plates to engage the containers longitudinally of each other by the positioning of the cross bars **56** on the conveyor so as to engage a predetermined number of articles between longitudinally adjacent fingers on the adjacent cross bars carried by the conveyor. Hence, the fingers separate the streams of abutted articles into groups of articles which can only move through the apparatus **10** at the speed of the separation conveyor **16.** Normally the speed of this conveyor **16** is less than that of the input conveyor **14** so that in this longitudinally extending section of the apparatus, the speed of the article movement has been reduced as long as the fingers **54** are engaging both the front and rear portions of a group of the articles divided by this conveyor **16** from the incoming streams of abutted articles. However, when the separation conveyor **16** moves downwardly of the apparatus as indicated at **60,** the forward fingers **54** defining an article group release the articles for move-

ment longitudinally of the apparatus at an increased speed and this separates the leading group of articles from the trailing group of articles still being engaged both front and rear by groups of the fingers **54.**

TRAY FEEDER STATION

In FIGS. **6, 7** and **8,** details of the tray blank feeder means **18** are shown and this apparatus includes an offset frame **62** suitably secured to the main frame **12** and laterally offset therefrom at the tray feeder station. A pair of uprights **64** and **66** are provided at opposed lateral margins of this offset frame **62** and these uprights combine with guide plates **68** for positioning a stack of tray blanks **70** in the apparatus. The guide plates **68** have inner guide edges **72** that aid in urging the blanks **70** into engagement with the uprights **64** at all times. The blanks are then individually fed from the stack of blanks by withdrawing the bottom blank of the stack and individually feeding it into the longitudinal axis of the apparatus to be picked up therein for further movement through the apparatus.

This pair of guide plates **68** are adjustably positioned in the apparatus by suitable clamps **74** engaging a base flange on the guide plates and which clamp means **74** engage slots in the offset frame extending parallel to the axis of this offset frame **62.** The actual feed means includes a transversely extending bar **76** that has a pair of spring fingers **78** and **80** positioned on laterally spaced portions of this bar and having end shoulders **82** formed thereon of a height for engaging the lowermost tray blank **70** in the stack of blanks. The transverse bar **76** is carried on or mounted by a slide mechanism or means **84** that slidably engages a center rod **86** suitably carried by the offset frame **62** usually on the center line thereof. Drive means for the tray feeder may include a motor **90** or other driven means having an output sprocket **92** that drives a chain or belt **94** engaged therewith and which chain extends to a second sprocket **96** suitably journalled on the offset frame **62.** The sprocket **96** in turn drives a shaft **98,** journalled in the apparatus, and which shaft has a crank **100** provided thereon. The crank in turn connects to a drive link **102** that extends to and has its other end pivotally secured to a bracket or extension **104** extending downwardly from the slide means **84** whereby for each revolution of the shaft **98,** the slide means **84** and associated means can be moved laterally inwardly of the apparatus and then be retracted back away from the longitudinal axis of the apparatus **10.** The uprights **64** and **66** are supported on a suitable member, such as a cross bar **106** mounted on the offset frame **62** and positioned thereabove immediately adjacent the main frame means **12.** The uprights have brackets **108** thereon engaging this cross bar and secured in position in relation thereto by means such as lock screws **110** to permit lateral adjustment of the uprights. A pair of vertically extending plates **67** and **69** are also adjustably positioned on the cross bar **106** by means like the brackets **108** and lock means **110.**

The lower ends of the plates **67** and **69** provide a slight space thereunder whereby one of the flat tray blanks **70** can be moved for discharge action by the driven slide means. The forward edge of the tray blank is moved to and engaged by a pair of rollers **112** and **114** suitably journalled in the apparatus and with the lower roller **114** having a sprocket **116** thereon connecting to a drive chain or belt **118** that in turn also extends to and is driven by a suitable sprocket or drive means secured to and moving with the shaft **98.** Thus, the tray blank is positively gripped and pulled from the tray blank feed means. The upper roller **112** is normally just resiliently positioned in the apparatus and is urged down into operative engagement with the lower roller by its mounting means. The mounting means may include vertically adjustable end supports **120** that engage a shaft **122** for this upper roller whereby the upper or idler roller will readily lift up vertically with relation to the lower roller **114** and normally just be urged down into engagement therewith by gravity and/or by spring means carried by the end support assembly for the upper roller.

The means for receiving the tray blanks **70** as fed into the apparatus **10** is shown in FIG. **9** and these means comprise a shaft **130** having a plurality of substantially L-shaped fingers **132** thereon at 90° intervals on the circumference of the shaft **130.** These fingers **132** extend across the frame and are adapted to engage one lateral margin of the tray blank as fed into the main frame portion of the apparatus, and the opposite edge of the blank is engaged with a finger **134** on a second control shaft **136** positioned on the main frame of the apparatus. The positions of a blank that has been fed into these means is indicated in dotted lines as the blank is progessively lowered in the apparatus. The shaft **130** is adapted to turn one quarter revolution clockwise for each cycle of operation of the apparatus, i.e. a tray blank being processed to shape and filled with articles. The control shaft **136** is provided with a one third revolution counterclockwise drive for each cycle of operation of the apparatus and again, the positions of the tray blank is indicated in dotted lines and with one edge of the tray blank dropping down onto a support or portion of the conveyor **20** as it is released from the fingers **134** on the shaft **136.** The fingers **132** have slots or recesses **133** provided at the center portion thereof for a reason to be described hereinafter.

TRAY FORMING CONVEYOR

This apparatus is adapted to deposit the tray blanks in properly timed and spaced relationship onto the pocketed tray forming conveyor **20** as previously referred to in the description. This pocketed tray forming conveyor **20** extends a major portion of the length of the apparatus **10** and with the conveyor providing a series of longitudinally spaced tray forming members on such conveyor in desired longitudinally spaced relationship to each other. Thus, the conveyor includes two substantially identical pocket forming means or sections **140** and **142** positioned in reversed and opposed relationship and spaced a short distance from each other.

Each of the pocket or tray former means **140** and **142** includes a bottom plate **144,** an end plate **146** and side plates or sections **148.** These pocket forming means include side or edge flanges or brackets **150** at each lateral margin thereof, and these brackets **150** are engaged with an endless chain type conveyor chain **152.** The brackets engage the chain, as by suitable bolts, rivets or equivalent means **154** and have adjustable movement with relation to the chain **152** by means such as pins or equivalent means **156** that engage slots **158** formed in these brackets **150.** Such pins **156** are suitably engaged with and carried by the endless conveyor chain **152** whereby the conveyor chains and associated

pocket forming means can pass around drive and control sprockets at the ends of the courses of movement of the pocket forming means and conveyor chains. This construction of two pocket forming means **140** and **142** aids in tray discharge action.

The end and side plates **146** and **148** extend vertically upwardly from the bottom plate **144** and with each of such plates **146** and **148** having suitable means journalled thereon, such as a pair of rollers **160** carried by and journalled on shafts **162** that in turn are mounted by a bracket **164** or equivalent member. The rollers **160** are positioned to have their inner surfaces or peripheries being in the desired line or shape required for the outer contour of a tray formed from the tray blank **70.**

The corner forming members associated with the pocket forming means **140** and **142** have special features and with each corner including a 90° arcuate shaped edge flange **166** that is pivotally positioned as by a hinge, lug or offset **168.** This lug is journalled on a shaft **170** that in turn is secured to a portion of the bottom plate **144** protruding laterally therefrom. A roller support arm **172** is also carried by the shaft **170** and is interlocked with the lug **168** extending from the flange **166** for unitary movement therebetween. This arm **172** extends into a slot **174** provided in the bottom plate **144** and the arm journals an end roller **176** thereon. The shaft **170** has one end of a coil spring **178** engaged therewith and the opposite end of such spring engages the lug **168** to urge such arm **172** to its uppermost position as indicated in dotted lines in FIG. **12.** At that time, the upper surface of the roller **176** if positioned slightly below the vertical upper edges of the end and side plates **146** and **148** on the pocket forming means. Hence, when a tray forming blank is deposited on top of the pair of the pocket forming means **140** and **142,** it rests on the rollers **160.** The corners of the blank are folded inwardly after the shaping or erecting of the other marginal portions of the blank has started.

The tray blank itself has a pair of end portions **190** formed by scored lines **191** therein. Likewise, side flanges **192** are provided at lateral margins of the blanks by scored lines **193** and a corner section **194** is formed at each corner of the blank. This blank is adapted to provide a tray with rounded corners therein, as hereinafter described.

The tray blank **70** as positioned on one of the fingers **132** is picked off of it by a flange **133** on the trailing end of the pocket former **140.** This flange **133** extends up into the path of the fingers **132** into a center slot **135** therein. The pocketed tray forming conveyor, with the tray blank thereon, moves downstream of the apparatus to the tray formation and article depressing means and when the tray blank is at such station, a suitable adhesive is sprayed onto lower end portions of both the end and side flange forming means of the tray blank, which spray means is provided as by a number of spray heads **200** and **202** positioned on a lower part of the article depressing means at this tray formation area of the apparatus. The spray heads **200** and **202** are provided adjacent margins of the blank to spray adhesive onto end portions of the side and end flanges thereof, respectively.

Each of the pocket forming means **140** and **142** has suitable support rollers **141** suitably journalled thereon and positioned therebelow whereby these pocket forming means can be supported against load applied thereto as hereinafter described.

The groups of articles being processed are still being conveyed longitudinally of the apparatus by the overhead can spacing conveyor **22** as indicated in FIG. **14** to provide for the controlled movement of the groups of articles through the apparatus in vertical alignment with a tray blank on the conveyor **20.**

TRAY FORMATION AND LOADING

At the tray formation and article depressing means or station **24,** a pair of horizontally directed, parallel guide rods **210** and **212** are provided adjacent each lateral margin of the frame **12.** The sets of guide rods **210** and **212** are suitably secured to the frame and the guide rods mount a slide assembly thereon indicated as a whole by the numeral **214.** The slide assembly includes an end plate **216** at each side. The slide assembly mounts two pairs of horizontally aligned bushings **211** which engage, respectively, the guide rods **210** and **212** for slide movement of the unit longitudinally of the apparatus. The slide means **214** is adapted to be picked up and moved at the same speed as the overhead can spacing conveyor **22** for the tray formation and filling action as hereinafter described and then be returned by its control means for the next tray forming cycle.

The slide end plates **216** each mount a set of the spray heads **200** and **202** thereon by brackets **201** and **203** respectively. These brackets extend laterally inwardly of the frame **12** through openings therein so that the spray heads move with the tray and grouped articles that are moving at the same speed. The spray heads are suitably controlled to operate when the tray blank is fully received at the tray forming station and the tray blank and spray heads are moving at the same speed.

In order to obtain the pickup and desired, controlled longitudinal movement of the slide means with the conveyors **20** and **22,** a pair of translators **230** and **232,** of the rotary type, are positioned on a control shaft **234.** This control shaft is suitably journalled in a pair of end plates or similar means **236** on a carrier **237** that in turn is secured to brackets or equivalent members **239** on the main frame of the apparatus. Drive is transmitted to this shaft **234** through a single revolution overload release clutch **240** connecting to a drive sprocket **242** operatively carried on a shaft journalled in a bracket **244** carried by the frame of the apparatus. A drive chain **243** on the sprocket **242** connects to a control drive means **245.**

The longitudinal movement for the slide assembly **214** is provided by a pin or cam follower **250** that engages the control groove or recess slot **231** formed in the barrel or cylindrical rotary translator **230.** Such pin **250** is suitably secured to a block or plate **256.** This plate **256** is slidably positioned on a pair of parallel rods **255** and **257** that are secured to and extend between the end plates **236.**

Such plate or block **256** also is operatively carried by the side plates **216** of the slide assembly **214.** Hence, on rotary movement of the translator **230,** the pin **250** causes the entire slide assembly to move longitudinally along the guide rods **210** and **212** for controlled longitudinal movement as hereinafter described.

For controlled vertical movement, a bell crank lever **260** that is journalled on the plate or carrier **237** is actuated by a pin **262** carried at one arm **264** of the lever

260. Such pin engages the operative slot 233 in the translator 232. The opposite arm of the bell crank lever in turn engages a control slot 269 provided in a horizontally positioned bar 270 that is provided in a vertically movable subassembly including vertical rods 226 and 228 on the slide assembly. These vertical rods 226 and 228 slidably engage the block 256. Such bell crank lever 260 is thus adapted to provide a vertical operative stroke of the slide rods 226 and 228 and means operatively secured thereto for each rotation of the translator 232. The drawings, FIG. 17, show that a pressure plate 272 is positioned by these slide rods 226 and 228 and by a pair of lower slide rods 227 and 229. This pressure plate 272 engages the upper surfaces of the groups of the articles at the tray formation and article depressing means or station. Hence, the pressure generated onto the tray blank in combination with the support provided for such blank by the pocket former means 140 and 142 in association with the top rollers and the arm 172 and rollers 176 thereon, initially causes the center portion of the tray blank to move downwardly in the apparatus and next the movement causes the arms 170 to bring the corner forming flanges 166 into engagement with the corners 194 of the tray and move them inwardly of the apparatus. Hence both the end flanges and the side flanges of the tray blank have been turned inwardly by the downward movement of the tray blank in the pocket forming means prior to the corner fold up action.

As previously indicated, the vertical rods 226 and 228 operatively engage the plate 256 for vertical sliding movement with relation thereto at the same time as the plate 256 is moved longitudinally of the apparatus. The lower ends of such rods 226 and 228 are secured to an upper cross plate 258 which extends out to lateral marginal portions of the frame. The vertical guide or slide rods 227 and 229 are positioned on the laterally outer portions of the frame beyond the conveyor 22. The lower ends of the rods 227 and 229 engage a lower cross plate 271 to which the pressure plate 272 is secured. A guide plate 219 on each of the end plates 216 slidably engages the rod 229 so that the end plates will move longitudinally with the upper cross plate 258 and means attached thereto, but also will permit vertical movement of the cross plates 258 and 271 and the pressure plate 272.

The tray forming action has served to bring the corners of the tray blank up into engagement with the end portions of the side and end flanges on the tray to contact the adhesive thereon. The tray forming and pocket forming means 140 and 142 retain the tray components in proper association with each other to set the tray in the desired shape. After the tray forming action, the article moving conveyor 22 carries the packaged and formed trays longitudinally of the apparatus a desired distance until the adhesive means applied to the corners of the tray has dried. The tray forming conveyor 20 aids the article engaging conveyor 22 in moving the formed tray with the articles therein longitudinally of the apparatus.

When the tray is ready for discharge, the article engaging conveyor 22 passes around suitable control sprockets and returns back to its operative course by an inoperative upper course in the apparatus.

The tray blank and conveyor means are supported on a suitable fixed support 143 carried by the frame 12 when at the tray formation station to prevent undesired flexing of the pocketed tray forming members and of the support chain of such conveyor when downwardly directed pressure is applied to the flat tray blank.

Obviously the article supporting and moving conveyor 22 can be maintained in a fixed position, as by roller means provided on edge portions, or guides provided on the frame 12 of the apparatus for engaging the support chains of this conveyor. FIG. 17 shows how the upper inoperative course of the conveyor 22 extends back through the tray blank forming and article depressing station 24 of the apparatus.

When pocketed tray forming conveyor 20 reaches the end of its operative upper course, the individual tray formers will pivot around the front support pins 154 provided therefor and some relative movement between a trailing portion of the pocketed tray forming means and the conveyor is permitted by the pins and/or roller means 56 being received in the slots 158 in the members attaching them to the tray formers. The individual trays are then deposited onto the discharge conveyor 26. Portions of the tray may be supported on the bottom roller 141 of the leading tray blank former 140 as this tray blank passes around a drive or sprocket for the conveyor 20.

The conveyor 26 can be driven by any suitable means such as a drive sprocket or equivalent member 270 positioning the downstream end of such conveyor.

It will be realized that conventional types of control means can be provided for the apparatus of the invention. Such control means is of a conventional nature and is set up to operate the various portions of the apparatus in timed relationship to each other for processing the articles into groups and forming and filling the trays with such articles. Obviously, the control drive means in the apparatus suitably connect to the shafts 130 and 136 for timed actuation thereof to permit a tray blank to be picked up by the pocketed tray forming members as moved along under the tray blank feed station.

For clarity of the drawings, various portions of the apparatus have been omitted and the controls connect the associated portions of the apparatus for timed functioning relationship therebetween. Pressure supply lines and the like are generally omitted for clarity. Supply tubes as required are provided for the adhesive spray means for adhesive and pressure gas supply thereto, or a supply tank may be carried by the flying shear means.

A support plate 300 for the containers 15 to slide on extends substantially to the tray forming station 24 but with the articles sliding gently from such support plate onto a tray blank 70 as carried by the tray formation conveyor 20 positioned immediately adjacent such support plate immediately prior to the articles moving into the tray blank forming station 24.

Corner sections 194 normally are cut from the tray blank when it is formed to facilitate bending the tabs 194 about their center portions that are attached to the tray bottom 195. Such tabs or corner sections 194, side flanges 192 and end flanges 190 are cut from the blank as indicated in FIG. 18.

The translator 232 is designed so that the pressure plate 272 is moved downward after the spray means has been actuated and the slide assembly 214 has been brought up to the speed of movement of the tray and of the articles.

Adjustment for the heighth of articles processed is made by changing the length of the guide or spacer rods **227** and **229.**

The translator **232** naturally returns the pressure plate **272** to its upper position after an operative stroke and starts such return before the downstream movement of the slide means is decreased as it approaches a return condition.

The group of articles fill the bottom area of the tray as the tray is formed therearound to obtain a simultaneous forming and loading action. The side and end flanges and corner tabs of the blank usually abut onto peripheral portions of the grouped articles to aid in tray erection action.

The feeder means **18** is shown in more detail in my copending application Ser. No. 325,084, filed Jan. 19, 1973.

The apparatus of the invention is believed to be of the type that will function rapidly and with a minimum maintenance thereon. It will group articles into desired numbers, deposit the articles on a tray blank, form and load the tray blank substantially simultaneously, and then discharge the filled tray. Hence, 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.

What is claimed is:

1. In apparatus for erecting tray blanks and filling trays with articles and wherein groups of articles spaced longitudinally from each other are moved longitudinally on a fixed course,

a tray erecting form means,

means for longitudinally moving the tray erecting form means

means positioning said tray erecting form means below a group of articles, a tray blank being positioned on said tray erecting form means,

article depressing means for moving longitudinally with the group of articles, and

driven pusher means carried by said article depressing means and being movable vertically downwardly of the apparatus, such pusher means being adapted to engage the articles and force them and their supporting tray blank downwardly into said tray erecting form means.

2. Apparatus for erecting tray blanks and filling trays with articles and wherein groups of articles spaced longitudinally from each other are moved as groups longitudinally of the apparatus on a fixed course, and characterized by

tray erecting form means,

an endless conveyor positioning said tray erecting form means thereon and driven at the speed of movement of the articles,

means for feeding a tray blank onto the tray blank forming conveyor for each group of articles, said conveyor being positioned below the path of movement of the groups of articles longitudinally of the apparatus and the articles being deposited onto a tray blank,

article depressing means for moving longitudinally with the groups of articles, and

driven pusher means carried by said article depressing means and being movable vertically downwardly of the apparatus, such pusher means being adapted to engage and force such articles and their supporting tray blank downwardly into said tray erecting form means on said conveyor.

3. Apparatus for erecting tray blanks and filling trays with articles and wherein a plurality of streams of abutted articles are fed into the apparatus, which comprises a frame, means for moving streams of the abutted articles longitudinally of the frame, means for collecting articles moving along the frame into groups of articles spaced longitudinally from each other, means on the frame to move the articles as a group longitudinally thereof on a fixed course, and characterized by

an endless conveyor having tray erecting form means thereon,

means for feeding a tray blank into the longitudinal course of movement of the collected articles and for depositing tray blanks in timed relationship to the movement of groups of articles longitudinally of the frame onto the tray erecting form means on said tray blank forming conveyor, said conveyor being positioned below the path of movement of the groups of articles longitudinally of said frame,

article depressing means for moving longitudinally of the frame with the groups of articles at a tray erecting area,

driven pusher means carried by said article depressing means and being movable vertically downwardly of the apparatus, such pusher means being adapted to engage the tops of articles at the tray erecting area and force such articles and their supporting tray blank downwardly into engagement with said tray erecting form means on said conveyor; said tray blank being brought into engagement with said tray blank erecting conveyor means prior to passage to the tray erecting area;

drive means for said article depressing means for moving the same longitudinally of the apparatus at the speed of movement of the groups of articles longitudinally of the frame whereby said pusher means will force the tray blank into engagement with said means on the tray blank erecting conveyor to erect the tray and deposit groups of articles therein substantially simultaneously, and

means for discharging the erected trays with articles therein from the apparatus.

4. In apparatus as in claim **1** where said tray erecting form means comprise a pair of opposed pocket means each including a bottom, side walls and one end wall, the pocket means being spaced from each other a short distance with the open ends thereof adjacent each other, and a pair of corner forming means pivotally carried by each of said pocket means between said side walls and end walls thereof.

5. Apparatus as in claim **4** where said corner forming means include a control arm, a curved corner flange carried by said control arm, a roller means at an end of said control arm, and means resiliently and pivotally securing said control arm to said bottom to have a siad control arm extend into said pocket means at each corner thereof to have a tray blank engage said roller means when the blank is moved downwardly of said pocket means to bring said corner flanges into engagement with corner portions of said tray blank and move them to operative positions.

6. In apparatus as in claim 4 where said tray erecting form means further comprise roller means carried by said side and end walls and defining at their inner peripheries marginal portions of a tray bottom area, said rollers aiding in folding side and end flange portions of a tray blank upwardly.

7. A tray erecting and loading apparatus comprising a frame, a article depressing means slidably mounted on said frame, a pair of rotary cylindrical translators each having a control groove formed in and extending circumferentially therearound, a shaft carrying said translators journalled on said frame, drive means connecting to said shaft; and said article depressing means including a sub-frame, a pusher means carried on said sub-frame for only vertical sliding movement, a control arm engaging the control groove of one of said translators and engaging and controlling said pusher means to reciprocate it, a second control arm on said sub-frame engaging the control groove of the second of said translators to reciprocate said article depressing means on said frame whereby articles supported on a tray blank can be engaged by said pusher means to move said articles downwardly and likewise move parts of a tray blank downwardly for tray erection and loading action.

8. In apparatus as in claim 1 and further comprising said article depressing means including a pair of rotary cylindrical translators each having a control groove formed in and extending circumferentially thereof, a shaft carrying said translators journalled on the frame of the apparatus, drive means connecting to said shaft; and said article depressing means including a sub-frame, a control arm on said sub-frame engaging the control groove of one of said translators and engaging and controlling said pusher means to reciprocate it, and a second control arm on said sub-frame engaging the control groove of the second of said translators to reciprocate said article depressing means on said frame.

9. In apparatus as in claim 1, where said article depressing means include drive means for moving said article depressing means longitudinally of the apparatus at the same speed as the groups of articles are moved longitudinally of the frame whereby said pusher means will force the tray blank downwardly into engagement with said means on the tray blank erecting conveyor to erect the tray and deposit groups of articles therein substantially simultaneously, and

means for discharging the erected trays with articles therein from the apparatus.

10. A method of erecting tray blanks and filling trays with articles where streams of abutted articles are fed to an apparatus for movement longitudinally thereof and the articles are gathered into predetermined size groups of articles which are moved longitudinally of the apparatus in spaced relationship to each other towards a tray erecting area, and characterized by the steps of depositing the grouped articles onto a tray blank, moving a tray forming means longitudinally of the apparatus below the grouped articles, feeding a flat tray blank into the apparatus and depositing it on the tray forming means, moving the blank with articles thereon to the tray forming area, and forcing the articles at the tray forming area and their supporting tray blank downwardly to shape the blank to operative form.

11. Amethod as in claim 10 and including applying adhesive to end portions of the tray flanges prior to the shaping of the tray blank, continuing the movement of the grouped articles in the formed tray longitudinally of the apparatus, and discharging the trays from the apparatus.

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