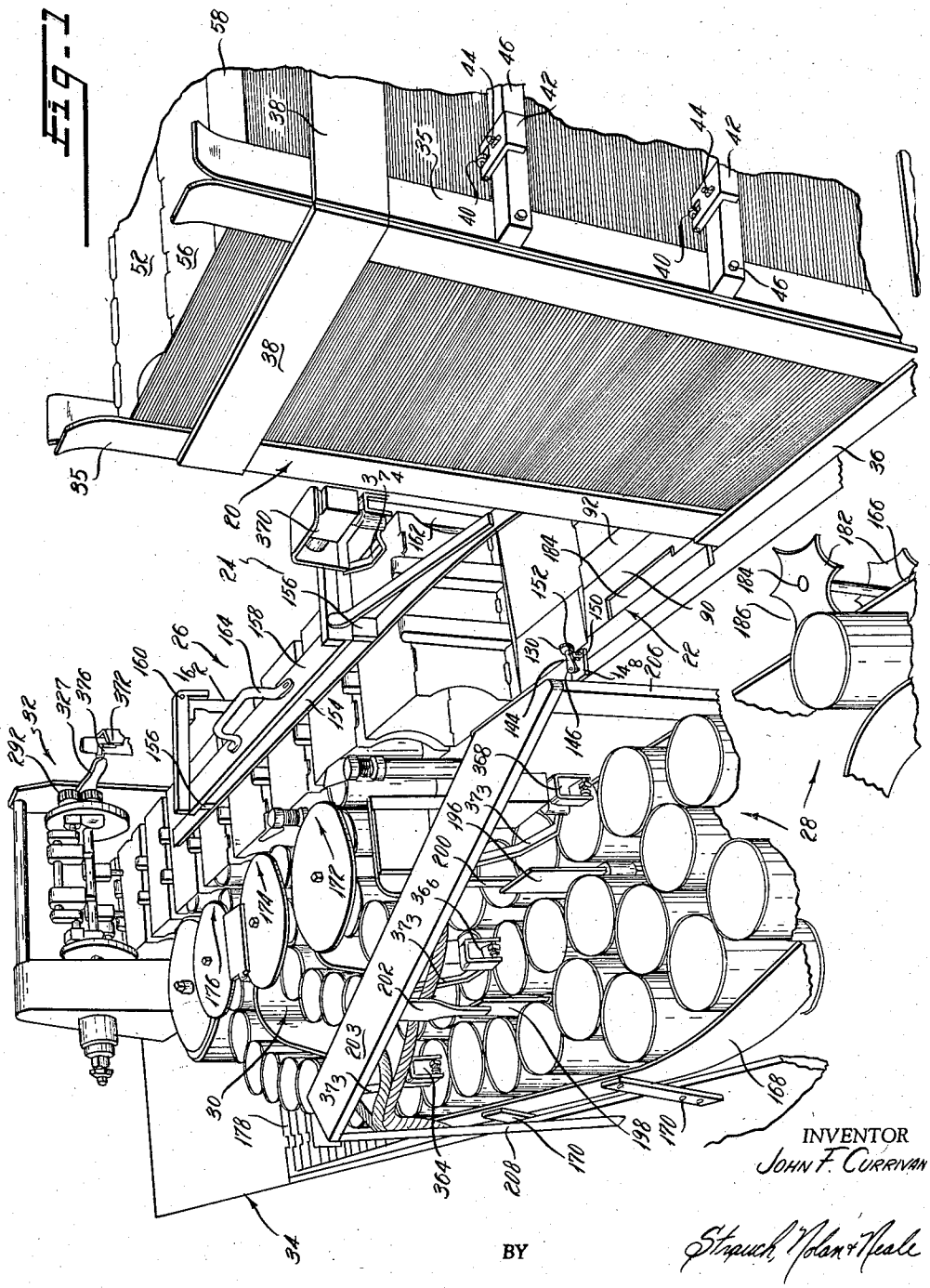
March 17, 1959 J. F. CURRIVAN 2,877,614

PACKAGING APPARATUS

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Fig. 1



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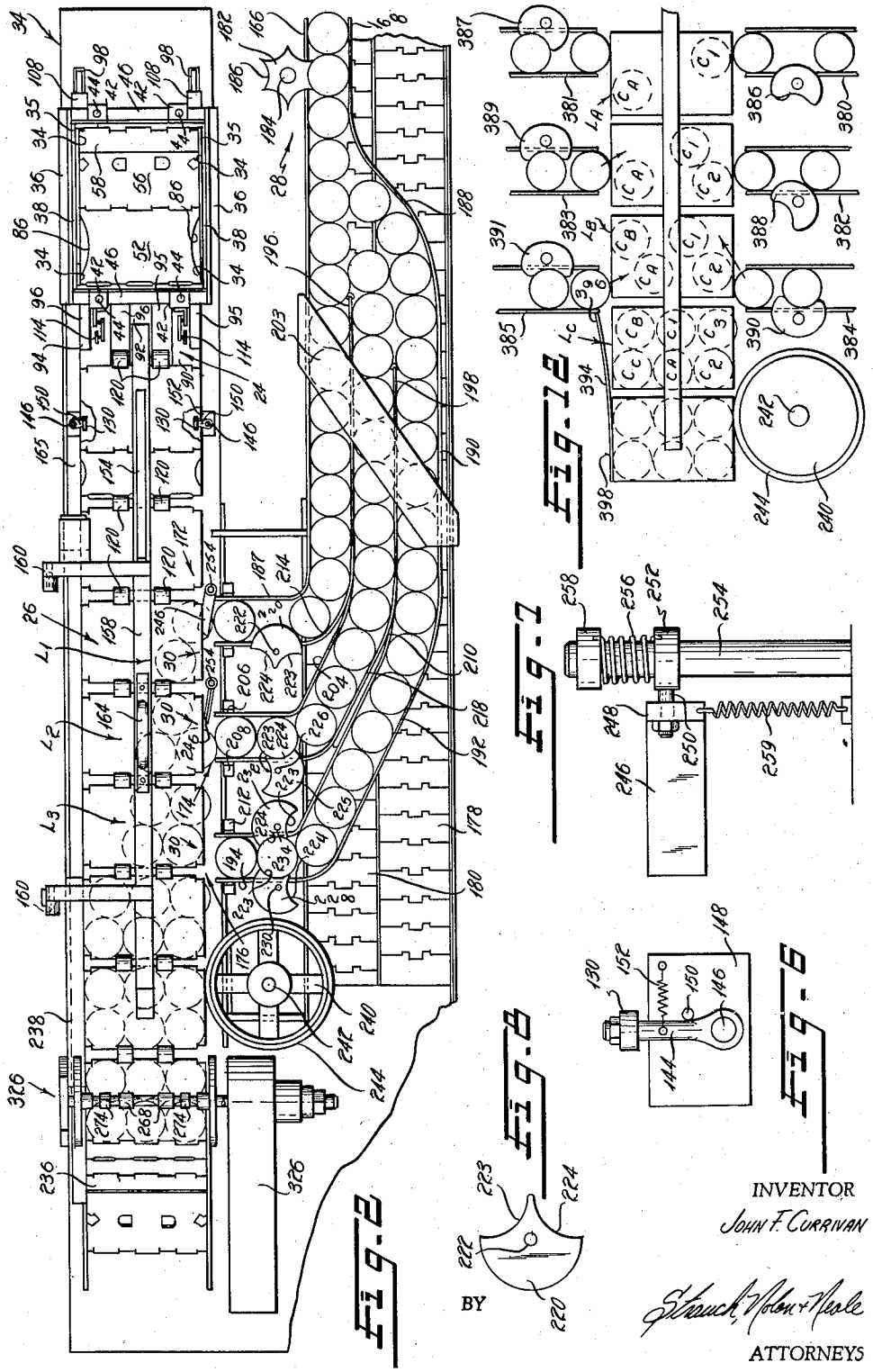


Fig. 2

Fig. 1

Fig. 7

Fig. 6

Fig. 8

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PACKAGING APPARATUS

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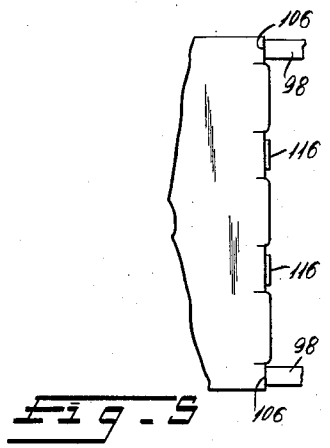


Fig. 5

Fig. 3

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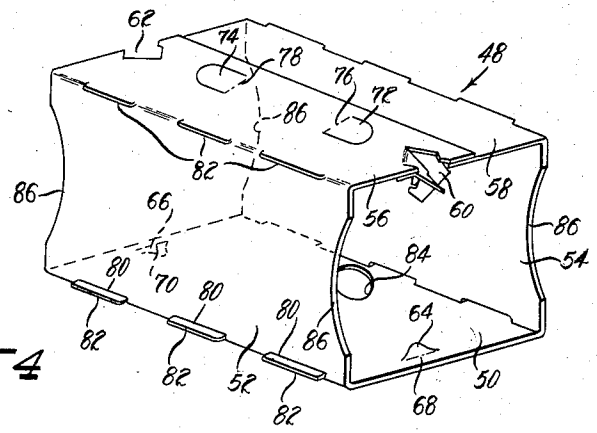


Fig. 4

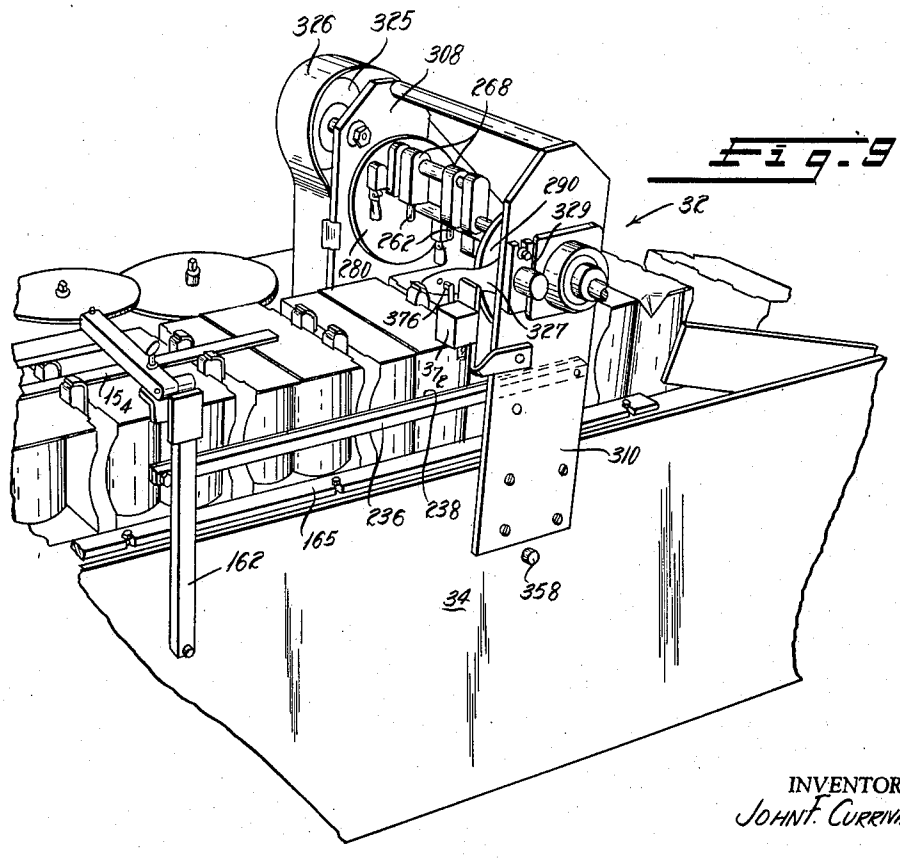


Fig. 9

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PACKAGING APPARATUS

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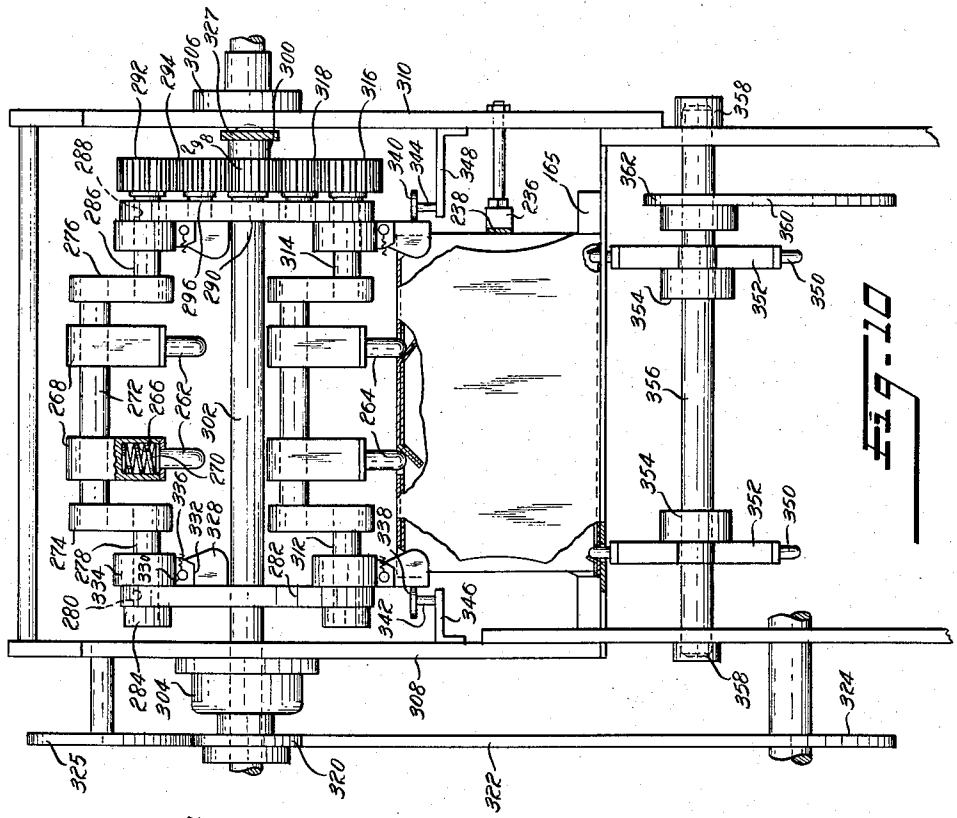


Fig. 10

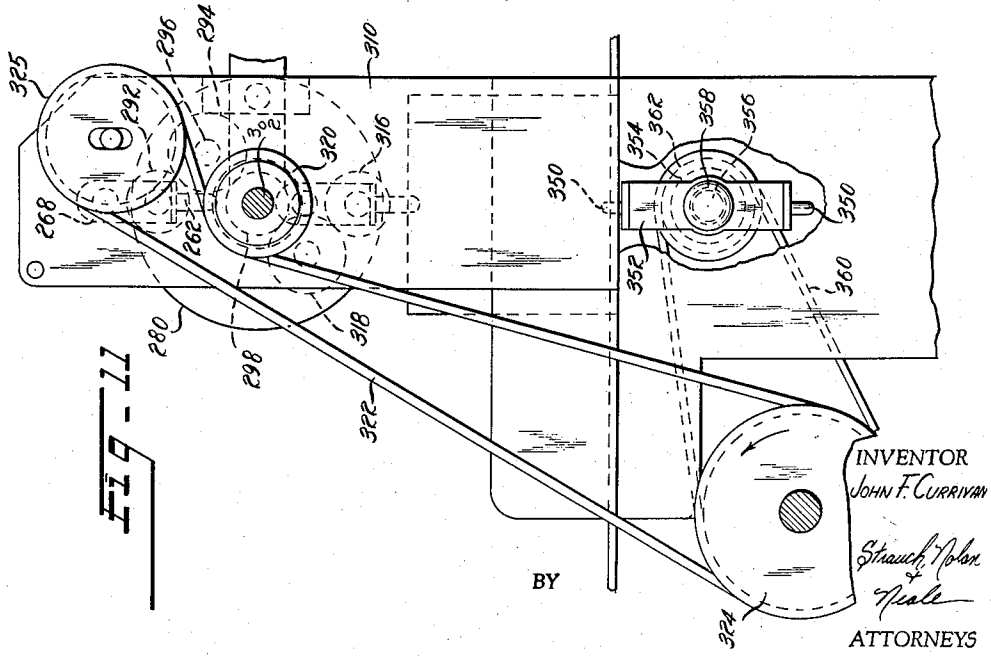


Fig. 11

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2,877,614

PACKAGING APPARATUS

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Application May 1, 1957, Serial No. 656,358

10 Claims. (Cl. 53—240)

This invention relates to packaging machines and more particularly to such machines for erecting and loading sleeve type cartons in a rapid continuous process.

Certain aspects of the invention are of broad utility and general application in the packaging field. However, for present purposes the invention will be disclosed in connection with the automatic erection of open ended sleeve cartons and the loading of such cartons with cylindrical cans such as beer cans.

The cartons which the apparatus of the present invention is particularly adapted to handle are disclosed and claimed in copending application Serial No. 619,735, filed November 1, 1956. These cartons are open ended sleeves which are delivered to the packaging machine folded flat and pre-glued. To assure retention of the cans within the cartons the cartons are provided with locking cut-outs along their upper and lower corner edges and locking tabs at their opposite ends. The locking cut-outs achieve their desired locking effect only if the interior dimensions of the carton (both height and width) are less than the corresponding dimensions of the can group which comprise the contents of the carton. Prior to the present invention such cartons were processed in semi-automatic or fully automatic carton machines which wrapped the carton blanks around a group of cans usually six and glued or otherwise fastened together the overlapping ends of the carton blank. In either case the mechanism for wrapping the carton blanks around the can group and for securing the overlapping ends of the carton blank together is complex, expensive and bulky and limits the capacity of the packaging machine.

Regardless of the nature of the packaging apparatus it is difficult to obtain and maintain the desired tight wrap. This is particularly true if the overlapping ends of the carton blank are glued together. In this case, the glue lap must be held in tightly assembled relation until the glue sets firmly by moving the carton between pressure applying belts over a distance as long as forty or fifty feet. It has been generally recognized that the difficulties encountered with wrapping the carton blank tightly around the can group and maintaining the tight wrap after the ends of the carton blank were secured together could be eliminated by loading the cans in the pre-glued cartons. However, it has also been generally recognized that this loading technique was not feasible because of the fact that the interior dimensions of the end of the pre-glued carton through which the cans must be loaded is less than the dimensions of the can group.

It is accordingly the principal purpose and object of the present invention to provide novel packaging apparatus for automatically loading cans and like containers into pre-glued open-ended cartons.

In accordance with the present invention this primary objective is obtained by the provision of apparatus for automatically erecting the pre-glued folded cartons and transporting them past one or more loading stations. The apparatus of the present invention also includes at each loading station means for inserting two or more of

the cans or like containers into the open end of the carton in staggered relation. In the particular example disclosed herein in which six cans are loaded into the carton, the cans being finally arranged in two rows of three cans each, three such loading stations are provided, the apparatus at each loading station being effective to load two cans into the carton. After the third loading station, six cans are arranged in the carton in staggered relation. The cartons carrying the six cans are then caused to traverse a final loading or aligning station where the staggered cans are smoothly moved into directly opposite side-by-side relation to complete the loading operation.

It is accordingly a further object of the invention to provide improved automatic apparatus for loading cans into open ended sleeve type cartons which, despite its relatively simplified construction, produces a tighter pack than heretofore possible, increases the capacity of a machine occupying a given space, and substantially decreases the cost of the loading operation.

It is a further object of the present invention to provide improved magazines for the folded cartons which permits stacking the cartons at any desired height.

It is an additional object of the present invention to provide improved means for positively and rapidly erecting sleeve type cartons.

It is also an object of the present invention to provide improved apparatus for moving the locking tabs which are provided at each end of the carton into locking position after the carton is fully loaded.

Additional objects and advantages will become apparent as the description proceeds in connection with the accompanying drawings in which:

Figure 1 is a perspective view of a typical embodiment of the present invention;

Figure 2 is a top plan view of the apparatus of Figure 1;

Figure 3 is an enlarged side elevation of the magazine and a portion of the carton erecting mechanism;

Figure 4 is a perspective view of a typical carton which the apparatus of the present invention is particularly adapted to handle;

Figure 5 is a top plan view of a portion of the carton feeding mechanism;

Figure 6 is an enlarged top plan view of a portion of the carton erecting mechanism;

Figure 7 is a side elevation of an element of the carton loading apparatus;

Figure 8 is a top plan view of one of the carton loading wheels;

Figure 9 is a perspective view of a portion of the overall apparatus of the invention;

Figure 10 is a front elevation of the mechanism for moving the carton locking tabs into locking position;

Figure 11 is a side elevation of the mechanism of Figure 10; and

Figure 12 is a top plan view of a modified form of the invention.

In the illustrated embodiments, the apparatus of the invention loads six cylindrical chimed cans such as beer cans into an open ended carton in two rows of three cans each, with the cans of one row directly opposite the cans of the other row.

The principal components of the packaging machine are the hopper or magazine indicated generally at **20**, the carton feeding mechanism indicated generally at **22**, the carton erecting mechanism indicated generally at **24**, the carton transporting mechanism indicated generally at **26**, the can feeding and loading mechanism indicated generally at **28**, the carton loading mechanism indicated generally at **30**, and the carton locking mechanism indicated generally at **32**, all of which are compactly arranged on a common machine frame indicated generally at **34** and all of which, with the exception of the hopper,

are operated in synchronism by a common drive mechanism as explained in detail below.

The hopper or magazine assembly comprises four vertically extending angle irons 35 which are flared outwardly slightly at their upper ends and at their lower ends are welded or otherwise suitably secured to horizontal angle irons 36 suitably secured to the machine frame. To provide additional rigidity to the structure additional upper straps 38 are secured to the corner members 35. The corner members 35 are so arranged and spaced as to form a vertically extending chute, the inner dimensions of which are slightly larger than the dimensions of the folded carton. In the past the capacity of such magazines or hoppers has been limited because of the fact that the weight of even a moderately high stack of cartons interferes with the positive feeding operation of the cartons from the lower end of the stack. This limitation has necessitated frequent loading of the hopper and the substantially constant attendance of an operator. It is an important feature of the present invention to provide means for overcoming this defect of the prior structures and to permit the cartons to be stacked in a hopper or magazine to a height which is determined only by space limitations.

This mechanism will be described with particular reference to Figures 1 and 3. As there shown a plurality of rollers 40 are interposed in the path of the edges of the cartons within the magazine at various points along the height of the magazine. The rollers are rotatably mounted on support members 42 which are adjustably secured by bolts 44 to cross bars 46 welded or otherwise suitably secured to the corner members 35 of the magazine. The openings in the members 42 through which the bolts 44 extend are elongated to permit shifting of rollers 40 into and out of the path of the carton edges as desired. As shown in Figure 2 the rollers 40 are preferably arranged in pairs, two on each of the bars 46 and the bars are arranged in offset relation along the front and rear edges of the magazine. The rollers 40 effectively divide the cartons positioned within the magazine into separate groups and support a substantial portion of the weight of the upper groups so that regardless of the number cartons in the magazine the load on the lowermost cartons never exceeds a value which prevents easy and positive removal of the lowermost carton from the magazine. For purposes of illustration the separation of the carton groups is greatly exaggerated in Figure 3. If desired, beveled bars may be used in lieu of the rollers 40.

As stated above a typical carton which the subject packaging apparatus is particularly adapted to handle is disclosed and claimed in copending application Serial No. 619,735. This carton is illustrated in Figure 4 to which detailed reference will now be made.

The carton indicated generally at 48 is preferably formed from a single blank and comprises a bottom wall panel 50, side wall panels 52 and 54, and top wall panels 58 and 56, the latter overlying the former and the overlapped surfaces of the panels 56 and 58 being glued together. Locking tab formations 60 and 62 are provided at the opposite ends of the top wall of the carton which comprise tabs which are disposed in the plane of the upper wall panels until after the carton is loaded, at which time they are pushed vertically downward to the position shown. Small locking tabs 64 and 66 are also provided adjacent the opposite ends of the bottom carton panel 50 which are also normally disposed in the plane of the panel 50 until the carton is fully loaded, at which time they are pushed upwardly about respective fold lines 68 and 70. Also provided in the top wall panel are finger grip tabs 72 and 74 which, after the carton is loaded, are pushed downwardly about respective fold lines 76 and 78. The side wall panels 52 and 54 are each provided with three cut-outs 80 along their lower edges and three similar cut-outs along their upper edges. The tabs 82 formed by the cut-outs are disposed on the plane of the top and bottom wall panels when the carton is erected as shown. When the carton is loaded the chimes at the upper and lower ends of the cans project through the cut-outs to assist in locking the cans in a loaded position. To facilitate the erecting operation as explained in detail below the bottom panel 50 is provided with a circular cut-out 84 and the end edges of the side wall panels 52 and 54 are each cut away as at 86. When the cartons are placed in the magazine 20 they are folded flat about the corner line joining the bottom panel 50 and the side wall panel 52 and the corner line joining the side wall panel 54 and the top wall panel 58 and the exposed edge of the top wall panel 56 facing toward the right as viewed in Figures 2 and 3.

Referring again particularly to Figures 1, 2 and 3 the cartons are supported for movement from one end of the apparatus to the other on three strips 90 and 92 and 94 which also extend along the under surface of the magazine 20. The strips 90 and 94 are cut away as at 95 and 96 to permit the operation of a portion of the feeding apparatus. This latter mechanism includes three pairs of feeding fingers 98 attached to chains 100 carried on pairs of sprockets 102 and 104 which are mounted at opposite sides of the machine frame by any suitable means. The two sprockets 102 are driven at the same speed by conventional drive mechanisms also not shown. Each of the fingers 98 is provided at its forward edge with a notch 106, the lower horizontal surface of which slides under the lowermost carton in the magazine 20 and the rear vertical edge of which is adapted to engage the carton adjacent the end of the carton. To assure the proper positioning of the feed fingers 98 hold-down rollers 108 are mounted adjacent the rear edge of the magazine 20 which force the leading edge of the fingers downwardly to the position shown in Figure 3. Thereafter a pin 110 projecting from the side of each of the fingers engages the undersurface of the side plates 112 to retain the fingers in their desired position. Thus, as the fingers 98 progress from right to left as viewed in Figure 3 along the upper span of the chain 100, they force the lowermost carton out of the lower end of the magazine 20 under spring mounted hold down rollers 114 mounted at the opposite sides of the forward side of the magazine. In order to reduce the possibility of impact damage to the rear edge of the carton two sets of helper fingers 116 are provided and are mounted on hubs 118 which are mounted on a shaft 119 which is mounted and driven by any suitable means not shown in such a manner that the fingers engage the rear edge of the carton between the locking tabs 82 simultaneously with the engagement of the outer ends of the carton by the two fingers 98.

The lowermost carton is advanced to the left as viewed in Figure 3 by the two fingers 98 until the front edge of the carton engages the rear surface of the adjacent pairs of transport fingers 120. The transport fingers are mounted at suitably spaced intervals on chains 122 which pass around sprockets 124 and similar sprockets at the opposite end of the machine and are driven in synchronism with the remaining components of the feeding and loading mechanisms by conventional drive means not shown. As best shown in Figure 2 the fingers 120 project upwardly through the spaces between the strips 90, 92 and 94 and are spaced laterally so that they engage the rear edge of the carton between the locking tabs 82 and are spaced longitudinally of the machine a distance substantially exactly equal to the width of the erected carton to firmly hold the cartons in erected position during the loading operation.

Immediately after the trailing edge of the carton has passed under the rollers 114 it is released by the feeding fingers 98 and engaged by the transport fingers 120 which immediately thereafter begin to move the trailing edge of

the carton upwardly and to the left as shown in Figure 3. A lifting finger **126** and two lifting fingers **128** and hold down rollers **130** are provided to assist in opening the cartons. The single lifting finger **126** and the two lifting fingers **128** are pivotally mounted at their lower ends on one end of a lever **132** which is in turn pivotally supported on a mount **134** rigidly secured to the machine frame **34**. The opposite end of the lever **132** carries a cam follower **136** which is periodically actuated by a cam **138** also mounted on the machine frame **134** and driven from the main drive mechanism, not shown, in synchronism with the remaining components of the mechanism. The cam **138** has a sharp rise so that the lifting finger **126** and the two lifting fingers **128** are moved upwardly rapidly with essentially a snap action. The lifting fingers **128** pass through openings in guide blocks **140** mounted on the machine frame which direct the upper end of the fingers through the cut-outs **86** in the carton side panel **54** into contact with the under surface of the top wall panel. The lifting finger rod **126** is located substantially in the center of the machine and passes through an opening in a guide block **142** which directs the upper end of the finger through the opening **84** in the bottom carton panel **50** into contact with the inner surface of the side wall panel **52**. When the lifting fingers **126** and **128** are actuated the marginal edges of the bottom carton panel **50** are held in place by the hold down rollers **130** shown in detail in Figure 6. The rollers **130** are each rotatably journalled on a shaft **144** mounted for horizontal swinging movement on a pivot pin **146** secured to a block **148** mounted on the upper surface of the machine frame. The members **144** are normally urged against a stop **150** by a tension spring **152** which disposes the roller **130** in normal operating position as shown. However they move freely except for the resistance of the spring **152**, in the direction of motion of the carton and are cammed out of the way by the rear carton panel **54** as the cartons pass the rollers.

During the entire opening operation the corner of the carton between the top wall panel and the rear side wall panel **54** rides along the undersurface of a curved guide bar **154** to further confine the carton and assure positive opening action.

It has been found in practice that the apparatus just described is effective to assure positive opening and erecting of the cartons even if the corner lines are imperfectly formed or the upper panels of the folded carton are inadvertently glued in spots to the lower carton panels.

As best shown in Figure 1 a portion of the guide bar **154** extends across the tops of the cartons during the entire loading operation. The guide bar **154** is mounted by blocks **156** on a frame structure **158** which is mounted by hinges at **160** to vertical support members **162** secured to the side of the main machine frame **34**. A handle **164** is provided on the frame structure **158** so that the latter may be swung away from the cartons to permit clearing the machine or inspection. When the guide bar **154** is in place as shown the erected cartons are completely confined between the strips **90**, **92** and **94** and the guide bar and between adjacent pairs of the transport fingers **120**. A retainer strip **165** is mounted on the machine frame in a position to engage the adjacent end edges of the carton. Accordingly each of the cartons is positively held at all times during the loading operation against vertical, longitudinal or lateral shifting movement and is positively maintained with the side walls exactly perpendicular to the bottom and top walls.

By means now to be described in detail the cans are fed into the mechanism at a metered rate and are divided into three rows each leading to a loading station and are loaded into the carton in groups of two at each loading station. The cans are initially delivered, preferably by gravity feed, to the entrance end of a chute formed between smooth strips **166** and **168**, which, as shown in Figure 1, are of less height than the height of the cans being handled and are secured to the main machine frame by brackets **170** at a sufficient height above the top of the machine bed so that they engage only the portions of the cans between the chimes. The cans are moved toward the three loading stations indicated generally at **172**, **174** and **176** by platform conveyor chains **178** and **180** driven by any suitable means. While the speed of the chains **178** and **180** is not critical preferably their surface speed is substantially greater than the speed of the moving cans so that the cans are urged into close contact with one another. It is an important feature of the invention that the cans are fed into the packaging apparatus at a metered rate. For this purpose a pair of superposed metering wheels **182** are mounted on a driven shaft **184** in a position to engage the upper and lower chimes of each of the entering cans. Six can engaging pockets **186** are formed in the periphery of each of the metering wheels **182** so that one complete revolution of the wheels permits the passage of six cans which is the contents of one of the cartons toward the loading stations. All other components of the apparatus are accurately timed to the rotation of shaft **184**. For example it is necessary that one carton be fed from the magazine and erected during one rotation of the shaft **184** and that two of the cans be inserted into the carton at each of the loading stations in each revolution of the shaft **184**. While this timing is essential to the successful operation of the invention nevertheless it is accomplished by standard gear, chain, and belt drives which are in all respects conventional and are not believed to require detailed description.

After the cans pass the metering wheels **182** they are delivered by the conveyor belts **178** and **180** to a simplified dividing mechanism which divides the cans into three rows, each row being delivered subsequently to one of the loading stations.

As best shown in Figure 2, the strip **166** which forms one wall of the entrance chute continues in a substantially straight line toward the first loading station where it is bent at right angles and terminates at a point slightly spaced from the adjacent end of the cartons. The opposite strip **168** is bent outwardly away from the strip **166** until it is spaced slightly more than the width of three side-by-side cans and thereafter extends in a direction generally parallel with the strip **166**. The straight portion **190** merges into an inclined portion **192** which extends toward the loading station which in turn merges into a section **194** extending parallel with a longitudinal axis of the cartons and terminating at a point adjacent the open end of the cartons.

Divider plates **196** and **198** are suspended by brackets **200** and **202** from a diagonally disposed overhead cross member **203** mounted by suitable support members **206** and **208** secured to the main machine frame. The divider plates **196** and **198** are so positioned between the strip sections **166** and **190** as to divide the space into three equal channels, each of the channels having a width slightly greater than the width of the cans. It will also be noted that the leading edge of the divider plate **198** is offset with respect to the leading edge of divider plate **196** a distance slightly less than the diameter of two of the cans. A chute strip **204** is secured to the rear edge of the divider plate **196** at one end and at its opposite end is provided with an angled portion **206** which extends parallel with the longitudinal axis of the carton and is secured by a bracket **208** to the machine frame adjacent the ends of the cartons. A similar chute strip **210** is secured to the rear edge of the divider panel **198** at one end and is secured at its opposite end by a bracket **212** to the machine frame. The chute for delivering the cans to the first loading station is completed by an additional strip **214** which is mounted at one end on the machine frame by a bracket **216** and at its opposite end merges smoothly into the adjacent surface of the strip member **204**. A similar strip member **218** completes the chute assembly for delivering the cans to the second

loading station and is secured at one end to the machine frame by a bracket **202** and at its opposite end merges smoothly into the strip **210**.

The passage of the cans out of the individual chutes at the three loading stations is controlled by feeding wheels positioned on each of the chutes. At the first loading station two identical feeding wheels **220** (one shown) are mounted on a shaft **222**, above and below the strip **214** in a position to engage the upper and lower chimes of the can. Each of the wheels **220** is provided with two feeding pockets **223** and **224**. The shaft **222** is rotated in a counterclockwise direction as viewed in Figure 2 by conventional drive mechanism (not shown) at the same speed as the shaft **184** so that in each revolution of the metering wheels **182** two cans are delivered by the feeding wheels **220**.

An identical feeding mechanism is provided at the second loading station including upper and lower feeding wheels **225** (one shown) and a drive shaft **226** for controlling the passage of cans through the chute formed between the strip sections **206** and **218**. The same construction including the upper and lower feeding wheels **228** (one shown) and the drive shaft **230** are also provided at the third loading station to control the passage of cans through the chute **190** formed by the strip sections **194** and **210**. Additional upper and lower feed wheels **232** (one shown) are mounted on a shaft **234** opposite the wheels **228**. The wheels **232** are identical to the wheels **228** but are mounted reversely on the shaft **234** so that the feeding action is effected by rotation of the shaft **234** by conventional reversing gears, not shown, in a clockwise direction as viewed in Figure 2. If desired, opposed wheel sets similar to those employed at the third station may be employed at the first and second stations to assure positive feeding particularly at high speeds.

The loading mechanism is initially readied for operation by filling the several chutes between the metering wheels **182** and the feed wheels **220**, **225**, **228** and **232** with cans. This may be accomplished by operating the mechanism slowly while the chutes are blocked just ahead of the feed wheels by gates **235** which may be swung into or out of the chutes. Other manually operated blocking means may also be used. When the cans leave the metering wheel **182** they tend to pass into the chute formed between the strips **166** and **204**. However since the chute can accept only one-third of the cans delivered by the metering wheel **182** the excess cans roll over the forward edge of the divider plate **196** and into the chute formed between the strips **204** and **218**. The remaining excess cans roll over the forward edge of the second divider plate **198** and into the chute formed between the outer strip and the strip **210**. It has been found in actual use that this divider mechanism, which does not require any moving parts, effectively divides the cans as required at substantially any desired speed. After the chutes have been filled the gates **235** are successively removed from the first, second and third loading stations. Thereafter because of the timed rotation of the metering wheels and the feed wheels the chutes remain full.

The passage of the erected cartons from right to left as viewed in Figure 2 is so timed with the rotation of the feed wheels that the latter each make one complete revolution during the time when corresponding points on three successive cartons pass the outer terminal ends of each of the chutes. Thus the mechanism at each of the loading stations is effective to load two cans into the carton. At the first loading station **172**, for example, the first can is pushed into the carton adjacent the front side wall panel **52**. The second can then enters the carton. Because of the fact that the width of the open end of the carton is somewhat less than the width of two cans side-by-side the loading of the second can urges the first can farther into the carton. This action is accomplished smoothly and the two cans tend to rotate as gears. That is, the leading can tends to rotate in a counterclockwise direction of the carton and the following can tends to rotate in a clockwise direction. When the carton leaves the first loading station **172** the two cans are disposed therein substantially as shown at L_1 with the second can projecting slightly out of the open end of the carton. The second two cans are loaded at the loading station **174** with a smooth rolling action and when the carton leaves the second loading station the cans appear substantially as indicated generally at L_2 in Figure 2. Finally when the carton leaves the third loading station **176** the six cans are disposed in the carton substantially as shown at L_3, the cans being arranged in offset relation and the last can to be loaded projecting slightly outwardly of the end of the carton. Since the cans are arranged in offset relation the width of the can group is substantially reduced, and the forces required to load the cartons and the forces imposed on the carton are relatively small. A retaining strip **236** which is faced with a strip **238** of Teflon or similar material having a low coefficient of friction is mounted midway of the height of the cans at the rear side of the machine to hold the cans against movement out of the rearward end of the cartons. The loading of the cartons is completed by the interaction of the backup strip **238** and a wheel **240** mounted on a shaft **242** which is rotated in a counterclockwise direction as viewed in Figure 2 by the main drive mechanism not shown. The outer periphery of the wheel **240** is covered by a strip **244** of rubber or similar material which engages the last loaded can midway of its height and smoothly rolls the cans into their final position in which the upper and lower chimes of each of the cans project through the locking cut-outs **80** provided in the carton. Preferably the peripheral speed of the roller **240** is greater than the advancing speed of the cartons. Thus when the wheel engages the projecting can it tends to rotate it in a clockwise direction as viewed in Figure 2 so the cans are rolled smoothly into final position.

As stated above the pre-glued cartons when erected are of slightly less height than the height of the cans. It is a feature of the invention that the problem posed by this condition is solved with self-operating mechanism of extremely simple construction.

This mechanism shown separately in Figure 7 comprises a blade **246** secured to a collar **248** rotatably journalled on a shaft **250** projecting from a collar **252** journalled on a post **254** suitably secured to the top of the machine frame. A spring **256** is coiled around the member **254** and secured at its opposite ends to a fitting **258** non-rotatably secured to the top of the member **254** and to the collar **252** which urges the latter in a counter clockwise direction as viewed in Figure 2. The blade is constantly urged toward a substantially vertical position by a light tension spring **259**. As best shown in Figure 2 the blade **246** is mounted directly in the path of the upper ends of the cans issuing from the end of the chute at the first loading station. As the cans are urged outwardly into the carton the upper edge of the can engages the undersurface of the blade **246** and rotates the latter both toward the horizontal position and bodily in a clockwise direction about the axis of the post **254** to move the edge of the blade under the adjacent surface of the top wall of the carton. This action raises the top carton panel sufficiently to permit the can to slide smoothly under the blade and under the top carton panel. As the carton passes the loading station the corner of the carton cams the blade out of the way and the blade is automatically pivoted to its normal nearly vertical position for engagement by the next succeeding can. An identical blade arrangement is provided at the second loading station. It has been found in practice that a similar assembly is not necessary at the third loading station because of the slight upward bowing of the top carton panel caused by the two blades at the first loading station and by the presence of four cans within the

carton at this loading station. After the cartons are fully loaded and pass by the wheel 240 they are delivered to the mechanism 32 which moves the upper and lower locking tabs and the finger grip tabs to operative position. This mechanism will now be described with particular reference to Figures 9, 10 and 11.

The mechanism for moving the finger grip tabs into operative position comprises two sets of plungers 262 and 264 slidably mounted in bores 266 in support members 268. The plungers 262 and 264 are urged to their extended positions by springs 270. The members 268 are non-rotatably secured to a shaft 272 in turn non-rotatably supported at its opposite ends in crank arms 274 and 276. The crank arm 274 is non-rotatably secured to one end of a stub shaft 278 the opposite end of which is rotatably journalled in a bore 280 of a circular plate 282, the outer end of the shaft 278 being provided with a locking cap member 284. The crank arm 276 is non-rotatably secured to a stub shaft 286 rotatably journalled in a bore 288 formed in a second circular plate 290. A pinion 292 is non-rotatably secured to the portion of the shaft 286 which projects through the plate 290 and is in mesh with an idler gear 294 rotatably journalled on a shaft 296 also mounted on the plate 290. The idler gear 294 is in constant mesh with a sun gear 298 non-rotatably secured to a sleeve 300 mounted on the drive shaft 302 in suitable bearings 304 and 306 mounted respectively on side plates 308 and 310 secured to the main machine frame. The plungers 264 are mounted by an identical construction supported on stub shafts 312 and 314 journalled in the plates 282 and 290 at points diametrically opposite the stub shafts 278 and 286. A pinion 316 is mounted on the stub shaft 314 and is in engagement with an idler gear 318 which meshes with the sun gear 298. The plates 282 and 290 are non-rotatably secured to the drive shaft 302.

The shaft 302 is driven in a clockwise direction as viewed in Figure 11 by a sprocket 320 driven by a chain 322 which is driven by a drive sprocket 324 and passes around an idler sprocket 325 mounted on the side frame member 308. Preferably the sprockets 320 and 325 and the drive chains are enclosed by a housing 326 omitted from Figures 10 and 11 for clarity. The sprocket 324 is driven in timed relation with the remaining components of the carton erecting and can feeding and loading mechanism by conventional apparatus. As the shaft 302 rotates carrying the plates 282 and 290 the plungers 262 and 264 are also carried around the axis of the shaft 302 and because of the arrangement of the gear train the plungers 262 and 264 remain exactly vertical as shown in Figure 11 as long the sun gear 298 is held stationary. The sun gear is normally held in the position shown by a handle 327 secured to the sleeve 300. A detent mechanism 329 is provided to hold the handle against movement. However, if the plungers 262 and 264 jam or if it is desired to take the plungers out of operation, the handle is moved upwardly from the position shown. This action rotates the stub shafts sufficiently to tilt the plungers sufficiently to clear the upper surface of the carton. The mechanism is so proportioned that the fingers 262 and 264 engage the finger grip tabs 72 and 74 of the carton with sufficient pressure to break them away from the body of the top carton panel and move them into operative position. The mechanism is timed so that during the period of engagement with the carton the fingers 262 and 264 move at substantially the same speed and in the same direction as the advancing carton.

The mechanism 32 also includes apparatus for automatically moving the end locking tabs in the upper carton panel into locking engagement. This mechanism, which has been omitted from Figure 11 for clarity, comprises four identical assemblies one being mounted on each of the stub shafts 278, 286, 312 and 314. Each of these mechanisms comprises a locking blade 328 pivotally mounted by a pin 330 on a projection 332 formed integrally with a collar 334 non-rotatably secured to the respective stub shafts. The blades 328 are biased to the position shown by springs 336 the opposite ends of which are secured to the projecting ends of the pin 330 and the central portion of which engages the blade 328 below the pivot axis. As the shaft 302 is rotated the blades 328 push the locking tabs at the opposite ends of the cartons vertically downward and this action is usually sufficient to move the tabs into locking engagement. However to assure positive locking of the tabs rollers 338 and 340 are interposed in a path of the rear edges of the blades 328 and as the blades pass the rollers they are moved inwardly to the position shown in the lower portion of Figure 10 from the normal position shown in the upper portion of Figure 10. The rollers 338 and 340 are suitably mounted on shafts 342 and 344 mounted in brackets 346 and 348, respectively, secured to the side members 308 and 310.

The lower locking tabs 64 and 66 are moved into locking position by fingers 350 mounted on support members 352 rigid with collars 354 which are non-rotatably secured to a drive shaft 356. The drive shaft 356 is mounted by suitable bearings 358 and is driven in timed relation with the remaining components of the apparatus by a chain 360 driven by the sprocket 324 and driving the sprocket 362 which is non-rotatably secured to the shaft 356. Again the mechanism is so proportioned that during the period of engagement of the fingers 350 and the bottom wall of the carton the fingers are moved in the same direction and at the same speed as the carton to assure smooth operation and to prevent damage to the carton.

The packaging apparatus thus far described includes conventional safety devices. For example, safety switches 364, 366, 368, 370 and 372 are connected in series with the drive motor. The switches 364, 366 and 368 are provided with feeders 373 which ride over the tops of the can rows so the switches are opened if one of the rows is not full.

The switch 370 is actuated by a feeder 374 which rides over the tops of the remaining cartons and is thus opened if the carton line is not full. The switch 372 is normally held closed by an arm 376 in contact with the lever 327 when the latter occupies its normal position.

It will be understood that additional switches, clutches, and overload release devices may also be used if desired.

Figure 12, to which detailed reference will now be made, discloses a modified form of the invention in which the cans are loaded through the opposite ends of the carton. The carton magazine, the carton erecting and feeding mechanism, the main can metering mechanism, and the mechanism for locking the carton tabs used in the apparatus of Figure 12 are preferably identical with the corresponding components of the apparatus of Figures 1 through 11 and accordingly have been omitted from Figure 12 for clarity.

The modified apparatus of Figure 12 provides loading apparatus at the opposite ends of the carton, the loading apparatus being substantially identical with the loading apparatus provided at one end of the carton in the above-described embodiment. Thus, six can chute assemblies 380, 381, 382, 383, 384 and 385 lead from identical can metering and dividing mechanisms not shown to points adjacent the opposite sides of the three loading stations. Respective upper and lower sets of feed wheels 386–391 are provided in the respective chutes 380–385, only the upper wheels being shown in each case. Since each of the wheel sets loads only one can into the carton, the wheels are each provided with a single can pocket and are rotated by conventional drive means not shown at the same speed as the main metering wheels. Alternately the wheels may be provided with additional pockets and rotated at correspondingly reduced speed. While the feed wheel sets are all rotated at the same speed,

the wheels of each set are angularly offset from the wheels of the other sets in a unique manner to load the carton as follows.

The cans loaded by the respective wheel sets **386**, **388** and **390** are designated C_1, C_2 and C_3 while the cans loaded by the respective wheel sets **387**, **389** and **391** are designated C_a, C_b and C_c. The feeding wheels **387** located in the chute **381** are timed slightly in advance of the feed wheels **386** in the chute **380** so the former load the can C_a adjacent the leading carton side wall while the latter dispose the can C_1 adjacent the trailing carton side wall as shown at L_a in Figure 12. The wheels **388** in the chute **382** are timed slightly in advance of wheels **389** in the chute **383** whereby the respective feed wheels dispose the second cans C_2 and C_b adjacent the leading and trailing carton side walls to dispose the four cans in the carton as shown at L_b. The first cans are moved smoothly inwardly of the carton when the second cans are loaded. The previously described blade assemblies **246** are provided adjacent the outlets of the chutes **380**, **381**, **382** and **383** to facilitate the loading of the containers at the first and second loading stations.

The feed wheel set **391** at the third loading station is timed slightly in advance of the opposite feed wheel set **390** so that the former loads can C_c into the carton adjacent the leading carton side wall while the latter loads the final can C_3 into the carton adjacent the trailing carton side wall. Accordingly when the carton leaves the third loading station, the six cans are disposed in the carton as shown at L_c, the cans being arranged in two rows of three each, the cans of one row being offset with respect to the cans of the other row longitudinally of the carton.

Since the cans C_3 and C_c project from the opposite ends of the carton, the mechanism for moving the cans into their final loaded position in which the cans are in side-by-side relation is slightly different from the corresponding mechanism of the previously described embodiment. In the mechanism of Figure 12, the final loading is performed in two stages. In the first stage the carton is passed from the third loading station opposite a Teflon faced back up strip **394** rigidly mounted on the machine frame. The back up strip assembly **394** which is located substantially midway of the height of the cans is provided with a smoothly curved entrance portion **396** and a final straight portion **398**. As the carton passes the entrance portion **396** of the back up strip, the projecting can C_c is cammed smoothly into the carton. Because of the dimensional relation between the cans and the carton, all of the cans may be shifted slightly toward the opposite end of the carton while maintaining the offset relationship. This operation disposes the cans in the carton in the same position as the cans leaving the third loading station of the embodiment of Figures 1 through 12. Thereafter the loaded carton is passed opposite the aligning wheel **240**, the rubber rim **244** of which smoothly rolls the cans into side-by-side relation in the manner described in connection with the embodiment of Figures 1 through 11 thus concluding the loading operation.

If desired, a second aligning wheel similar to the wheel **240** may be substituted for the back up strip **294**. Also if desired opposite feed wheels may be provided at any or all of the stations in the apparatus of Figure 12 in accordance with the arrangement at the outlet end of the chute **194** of Figure 2.

The invention may be embodied in other specific forms without departing from the spirit or essential characteristics thereof. The present embodiment is therefore to be considered in all respects as illustrative and not restrictive, the scope of the invention being indicated by the appended claims rather than by the foregoing description, and all changes which come within the meaning and range of equivalency of the claims are therefore intended to be embraced therein.

What is claimed and desired to be secured by United States Letters Patent is:

1. Apparatus for moving a plurality of containers positioned in staggered relation in a carton into aligned relation, one of said containers projecting out of one end of said carton, comprising means for moving said carton past an aligning station, a roll having a peripheral portion disposed in the path of said one of said containers, means for rotating said roll to move its peripheral container contacting portion in the direction of movement of said cartons and at a speed greater than the speed of said cartons to urge said one container and the containers behind said one container into said carton with a rolling action, and means for retaining said containers against passage out of the opposite end of said carton.

2. Apparatus for loading six cans in an open ended sleeve carton to dispose said cans in two rows, the cans of one row being directly opposite the cans of the other row, and the height and width of said carton being less than the height and width of the group of cans loaded therein comprising, means for moving a series of erected cartons along a predetermined path past three loading stations and an aligning station, means for urging two of said cans into said carton at each of said loading stations in a direction parallel with the longitudinal axis of said carton whereby the forward motion of said carton disposes said cans in staggered relation in said carton, the last-loaded can projecting out of the end of said carton, means at certain of said loading stations actuated by movement of said cans toward said cartons to raise the top panel of said cartons to permit the entry of said cans into said carton, a roller at said aligning station having a peripheral portion disposed in the path of said last-loaded can to urge said can into said carton, and means for retaining said cans against passage out of the opposite end of said carton.

3. Apparatus for depressing tab formations normally disposed in the plane of the top or bottom wall panels of a carton comprising, means for moving a series of cartons past an operating station at a predetermined constant speed, plungers for depressing each of said tab formations, shafts rotatably mounted in support members and carrying said plungers, means for rotating said support members to move said plungers into and out of contact with said tab formations and for moving said plungers in the direction of motion of said cartons substantially at the speed of said cartons, and means for maintaining said plungers in a substantially vertical position throughout their range of movement.

4. Apparatus for loading six cylindrical cans or like containers into open ended sleeve cartons at three loading stations comprising, means for transporting a series of erected cartons past said loading stations, three container delivery chutes leading to one side of the respective loading stations, three additional container loading stations, each of said delivery chutes having a terminal portion substantially normal to the line of movement of said cartons past said loading stations and terminating at points closely adjacent the line of movement of the ends of the carton, means for feeding said containers into said chutes, means adjacent each of said loading stations for moving one container through the end portion of the adjacent chute into said carton and disposing said containers in said carton in staggered relation, the last-loaded container projecting out of the end of said carton, and means disposed in the path of said last-loaded container in the further movement of said carton for urging said last-loaded container into said carton to complete the loading operation.

5. Apparatus for loading six cylindrical cans or like containers into pre-fastened open-ended cartons at three loading stations, the height of said cartons being less than the height of said containers and the width of said cartons being less than twice the width of said con-

tainers comprising means for transporting a series of erected cartons past said loading stations, container delivery chutes leading to each of said loading stations and having end portions angularly related to the line of movement of said cartons, said end portions terminating at points closely adjacent the line of movement of the ends of the cartons as they pass said loading stations, means for feeding said containers into said chutes, feed wheels adjacent each of said loading stations for engaging and positively moving two of said containers through said end portion of said chute into said cartons as the end of said cartons pass the loading station whereby the containers are disposed in said carton in staggered relation, the last-loaded container projecting out of the end of said carton, means at certain of said loading stations actuated by movement of said containers toward said cartons to raise the top panel of said cartons to permit the entry of said containers into said cartons, and means disposed in the path of the last-loaded container in the further movement of said carton for urging said last-loaded container into said carton to complete the loading operation.

6. Apparatus for loading six cylindrical cans or like containers into pre-fastened open-ended cartons at three loading stations, the height of said cartons being less than the height of said containers and the width of said cartons being less than twice the width of said containers, said cartons having tab formations normally disposed in the plane of the top or bottom wall carton panel comprising means for transporting a series of erected cartons past said loading stations, container delivery chutes leading to each of said loading stations and having end portions angularly related to the line of movement of said cartons, said end portions terminating at points closely adjacent the line of movement of the ends of the cartons as they pass said loading stations, means for feeding said containers into said chutes, feed means adjacent each of said loading stations having container-engaging portions for positively moving two of said containers through said end portion of said chute into said cartons as the end of said cartons pass the loading station whereby the containers are disposed in said carton in staggered relation, the last-loaded container projecting out of the end of said carton, means at certain of said loading stations actuated by movement of said containers toward said cartons to raise the top panel of said cartons to permit the entry of said containers into said cartons, means disposed in the path of the last-loaded container in the further movement of said carton for urging said last-loaded container into said carton to complete the loading operation, plungers for depressing each of said tab formations, shafts rotatably mounted in support members and carrying said plungers, means for rotating said support members to move said plungers into and out of contact with said tab formations and for moving said plungers in the direction of motion of said cartons substantially at the speed of said cartons, and means for maintaining said plungers in a substantially vertical position throughout their range of movement.

7. Apparatus for loading a plurality of cylindrical cans or like containers into open-ended pre-fastened cartons at a plurality of loading stations comprising, means for transporting a series of erected cartons past said loading stations, container delivery chutes leading to each of said loading stations and having end portions angularly related to the line of movement of said cartons, said end portions terminating at points closely adjacent the line of movement of the ends of the cartons as they pass said loading stations, means for feeding said containers into said chutes, container-engaging feed wheels at each of said loading stations for positively moving a predetermined number of said containers through said end portion of said chute into said carton and disposing said containers into said carton in staggered relation, the last-loaded container projecting out of the end of said carton, and rotatable means disposed in the path of said last-loaded container in the further movement of said carton for rotating said last-loaded container to move said last-loaded container into said carton to complete the loading operation.

8. Apparatus for depressing tab formations normally disposed in the plane of the top or bottom wall panels of a carton comprising means for moving a series of cartons past an operating station at a predetermined constant speed, plungers for depressing each of said tab formations, shafts carrying said plungers, support members rotatably carrying said shafts adjacent the ends of the latter, means rotating said support members to move said plungers into and out of contact with said tab formations and for moving said plungers in the direction of motion of said cartons substantially at the speed of said cartons, cooperating gears on said support members and said shafts operable upon rotation of said support members to maintain said plungers in a substantially vertical position throughout their range of movement.

9. The combination according to claim 8 together with manually operable means for selectively angularly shifting said shafts to maintain said plungers out of contact with the cartons throughout their range of movement.

10. Apparatus for loading six cylindrical cans or like containers into open ended pre-fastened cartons at three loading stations comprising means for transporting a series of erected cartons past said loading stations, separate container delivery chutes leading to each of said three loading stations and having end portions angularly related to the line of movement of said cartons, said end portions terminating at points closely adjacent the line of movement of the ends of the cartons as they pass said loading stations, means for feeding said containers into said chutes, container-engaging feed wheels at each of said loading stations for positively moving two of said containers through said end portion of said chute into said carton while said carton is in motion to dispose said containers in said carton in staggered relation, the last-loaded container projecting out of the end of said carton, and rotatable means disposed in the path of said last-loaded container in the further movement of said carton for rotating said last-loaded container to move said last-loaded container into said carton to complete the loading operation.

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