United States Patent

Langen

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[45] **Feb. 29, 1972**

[54] CARTON LOADING MACHINE

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[52] **U.S. Cl.** **53/186,** 53/374

[51] **Int. Cl.** **B65b 7/20,** B65b 43/30

[58] **Field of Search** 53/29, 183, 186, 251, 374–376, 53/381, 382

[56] **References Cited**

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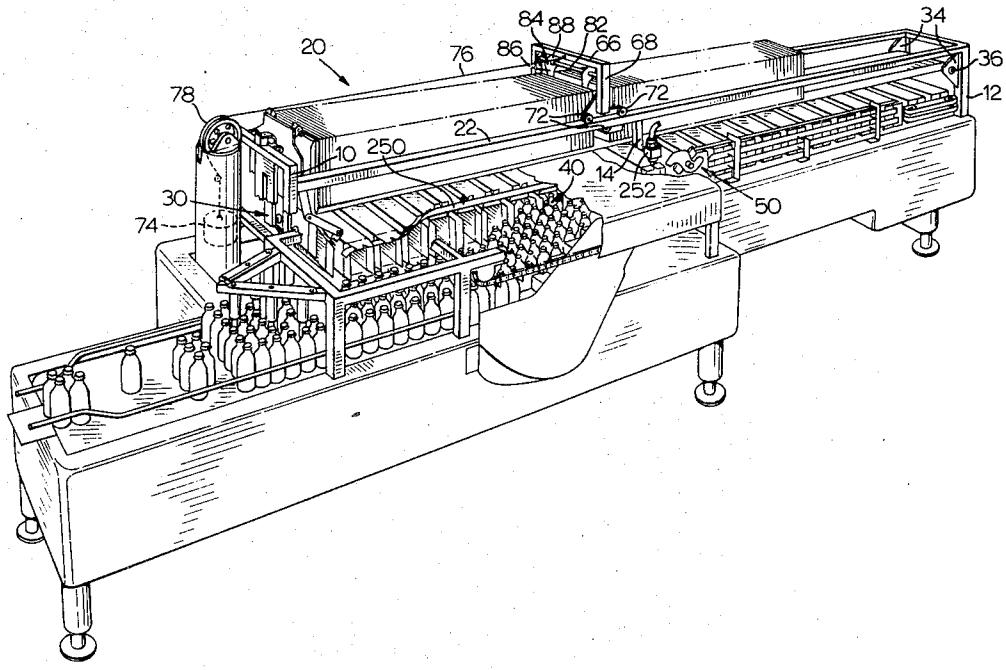
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[57] **ABSTRACT**

A method and apparatus for loading cartons, particularly end-loading cartons. The method includes improvements in the opening of the carton from the knockdown configuration, the transferring of the carton from the knockdown storage area to a continuously moving conveyor, the loading of the open carton and the closing of the carton. The improved method of opening the carton includes the steps of engaging adjacent sidewalls of the knockdown carton with suction cups and moving the suction cups away from one another along an arcuate path while simultaneously moving the opening carton to a position on the continuously moving belt. The apparatus includes a carton opening apparatus, a carton transfer apparatus for transferring the opening carton into a continuously moving conveyor and closure means for closing the carton after it has been loaded with bottles or the like. The opening apparatus is characterized by oppositely disposed suction cup means which engage oppositely disposed pairs of adjacent sidewalls and a control mechanism for causing the suction cups to move away from one another in an arcuate path to move the adjacent wall of the carton to an open position. The transfer mechanism includes a movable carriage which is adapted to remove a knockdown carton from a storage station and transfer it by way of a two-stage operation onto a continuously moving conveyor. The closing apparatus includes a double-bladed rotor mounted in the path of movement of the ends of the carton after loading. One blade is adapted to close a top or bottom wall and the other blade is adapted to close the trailing wall.

17 Claims, 11 Drawing Figures



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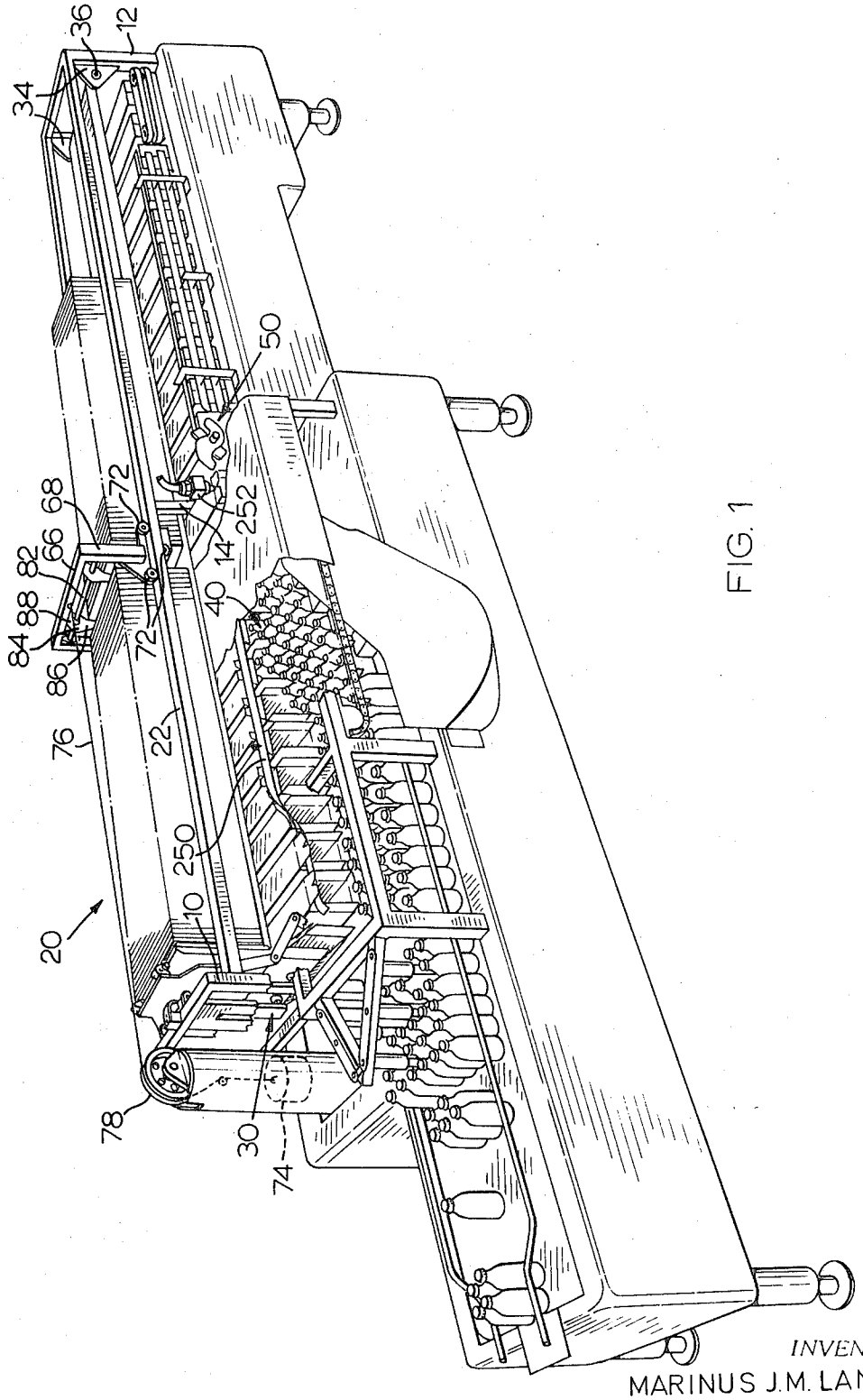


FIG. 1

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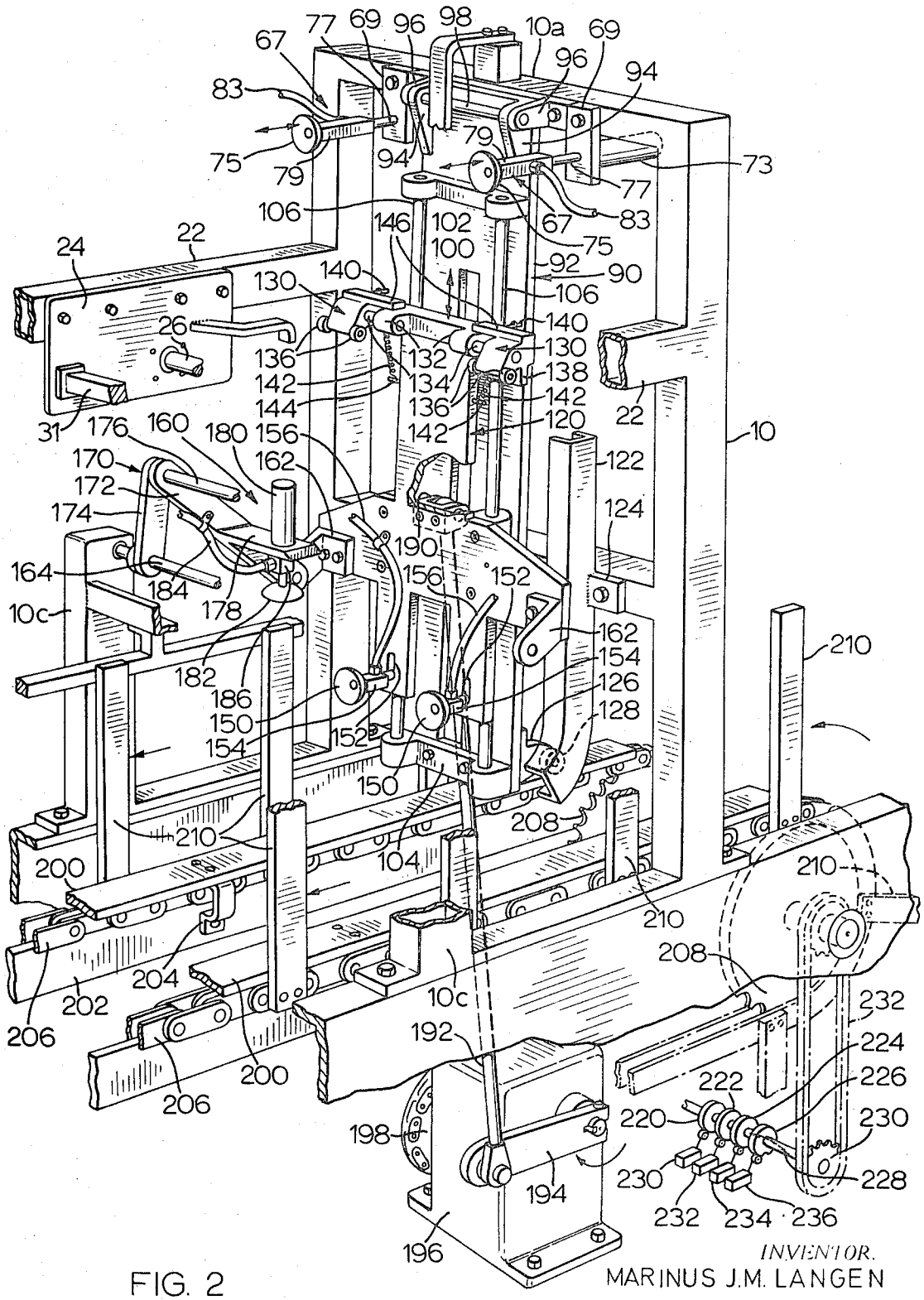


FIG. 2

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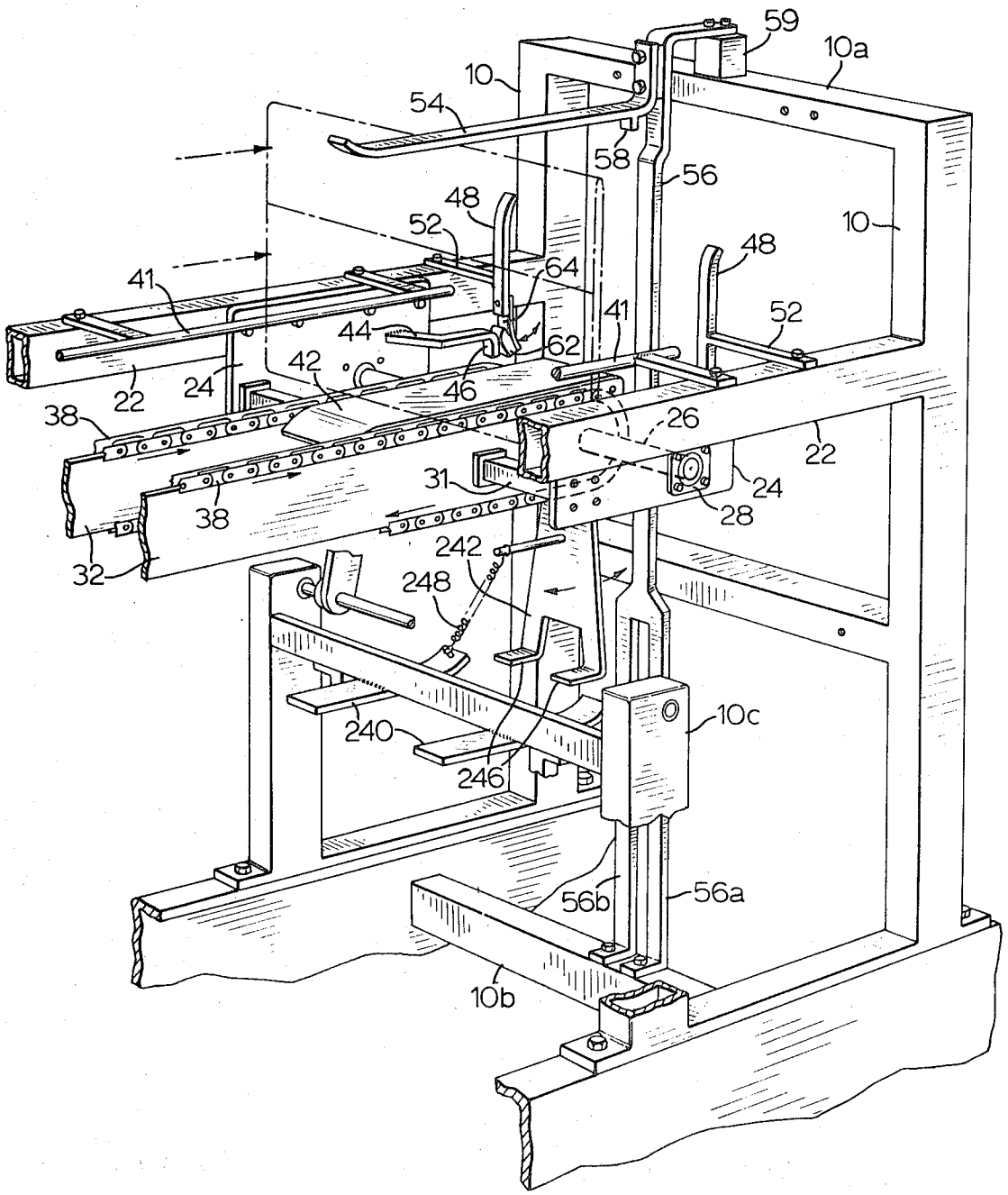


FIG. 3

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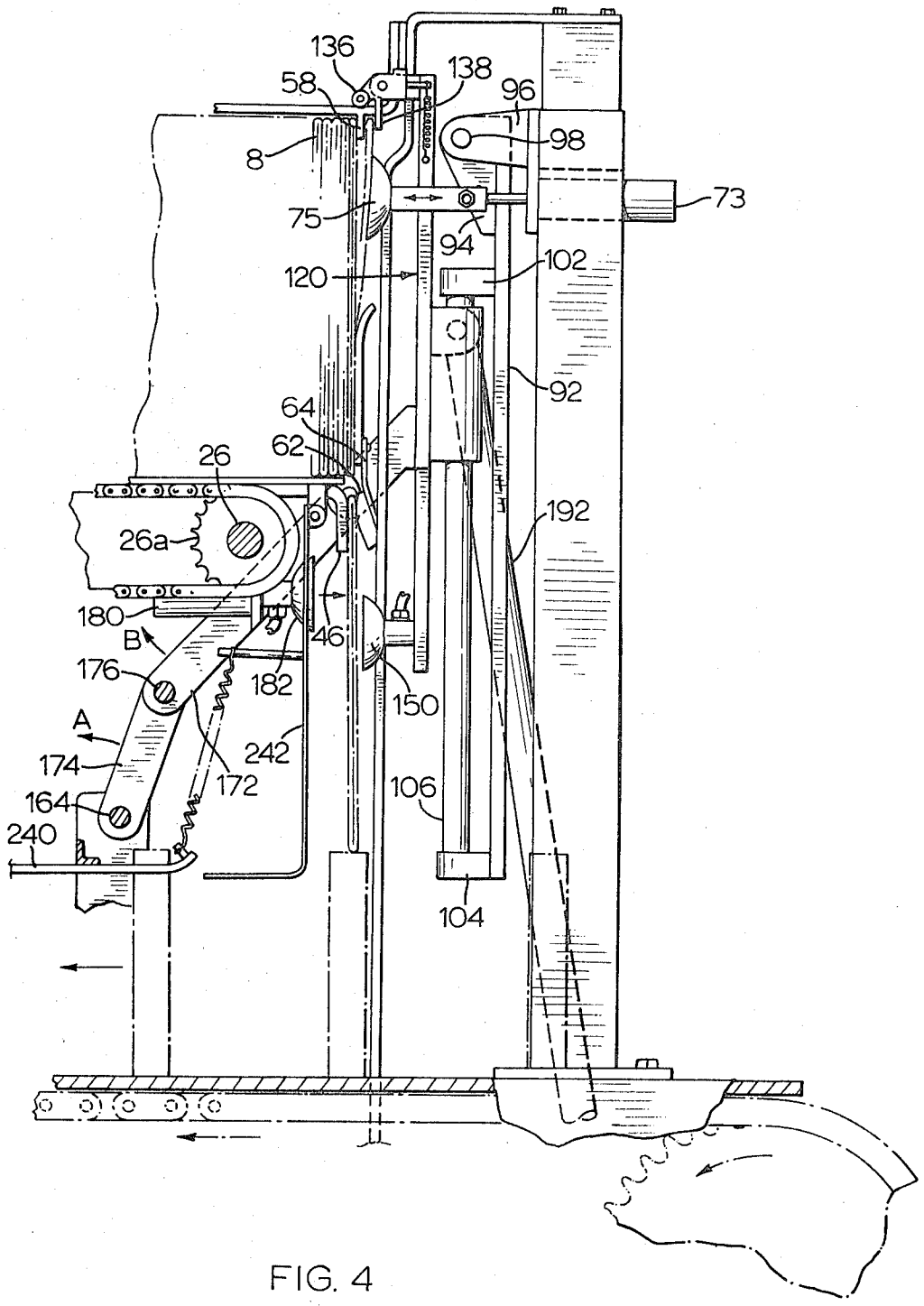


FIG. 4

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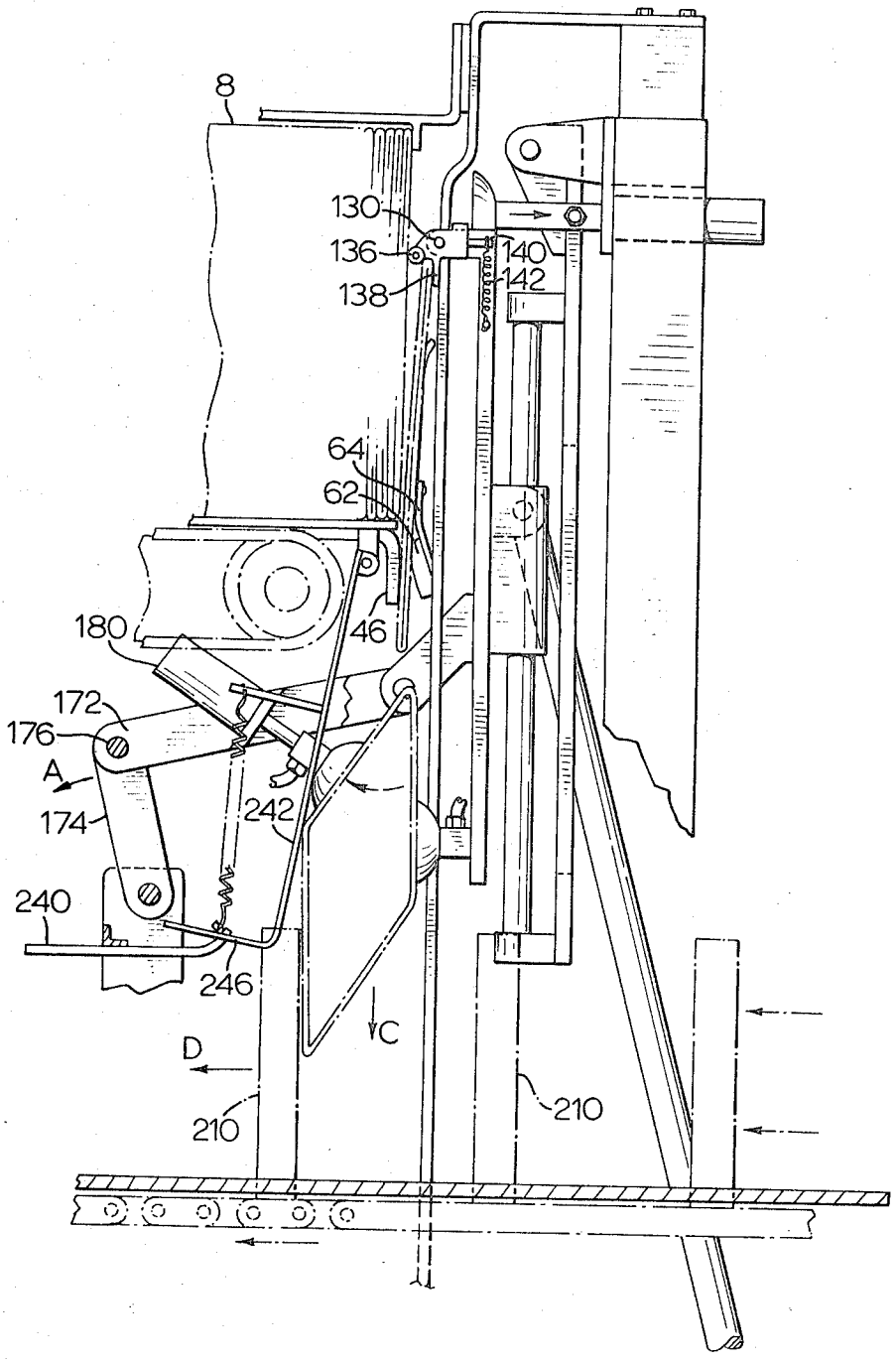


FIG. 5

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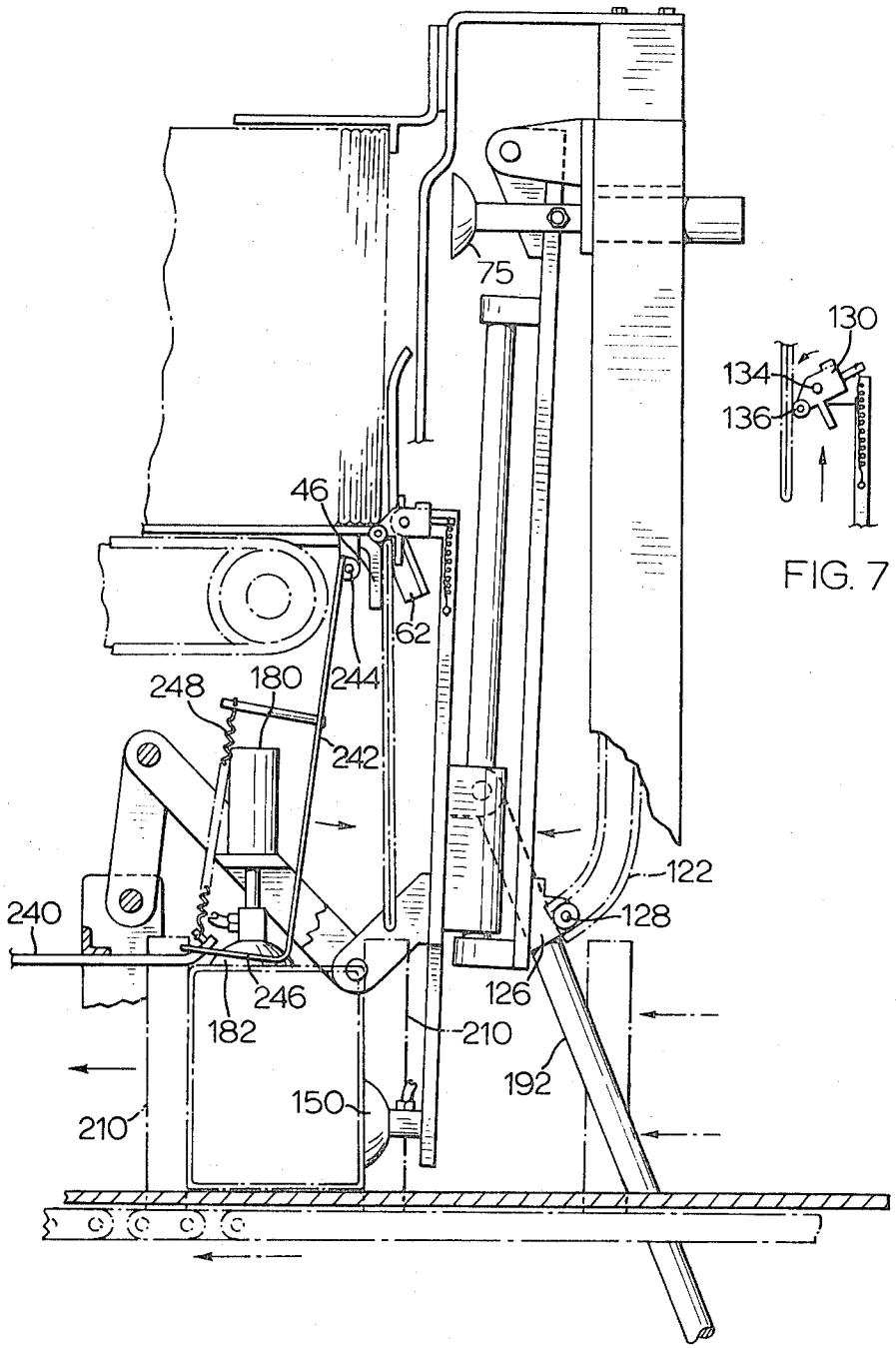


FIG. 6

FIG. 7

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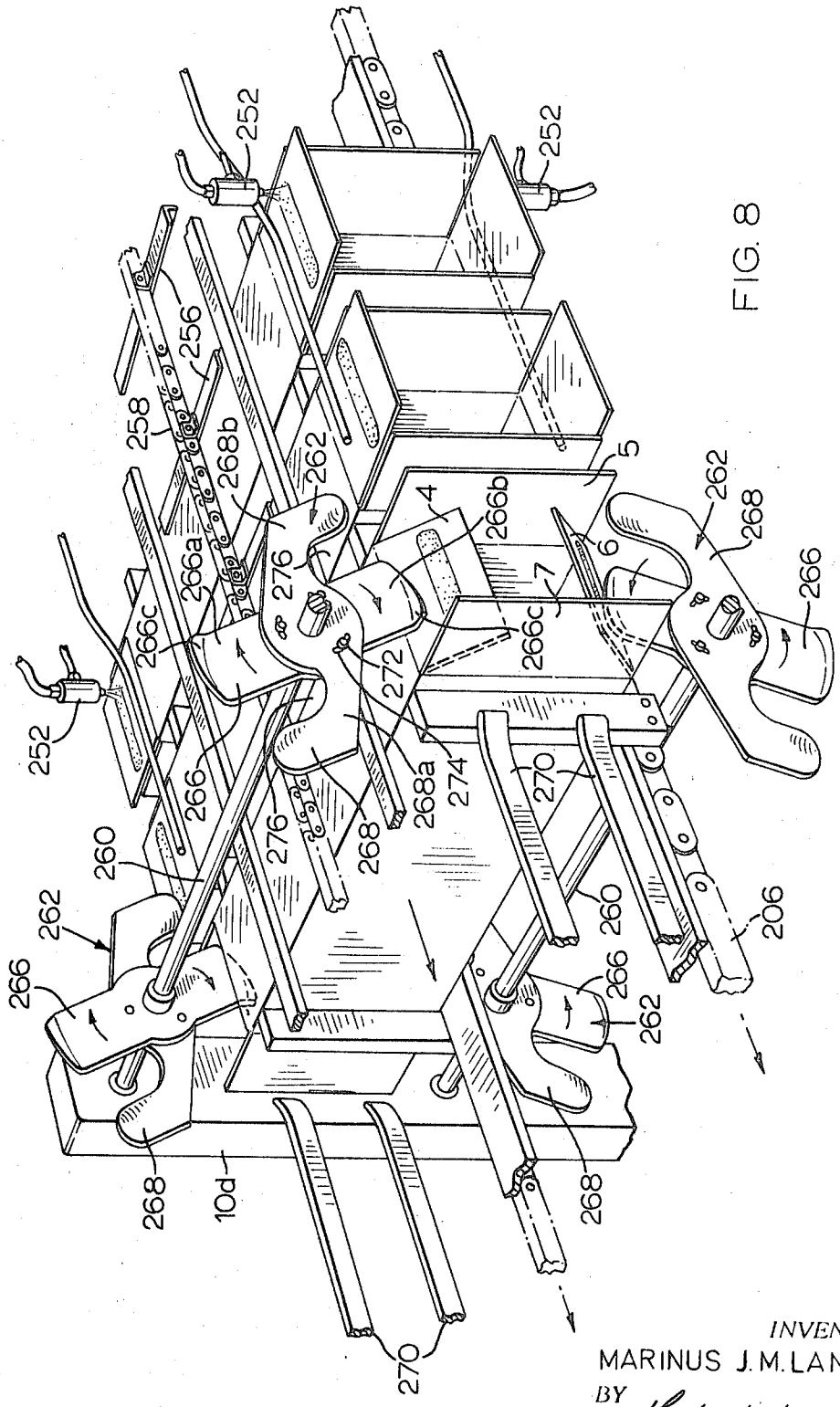
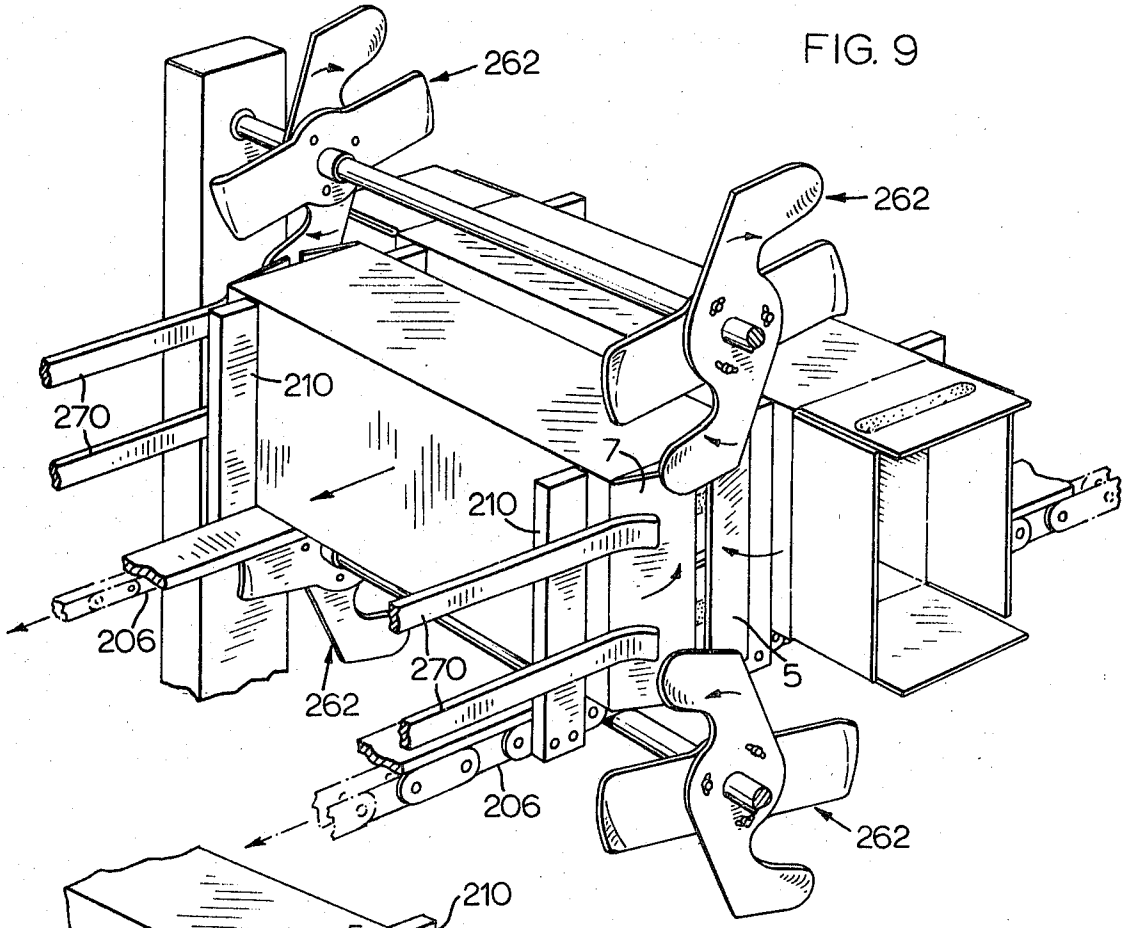


FIG. 8

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FIG. 9



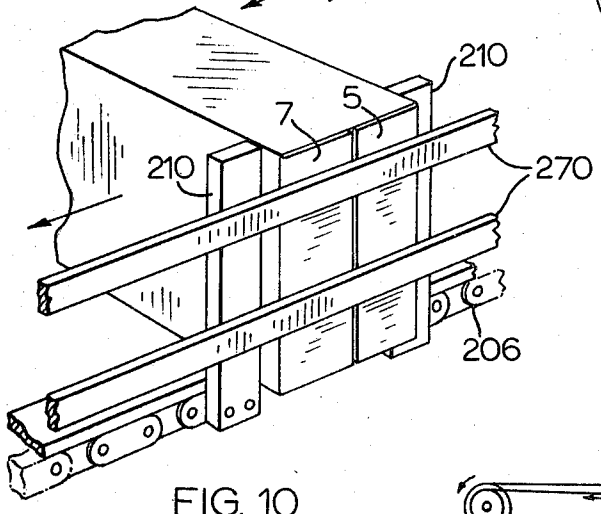
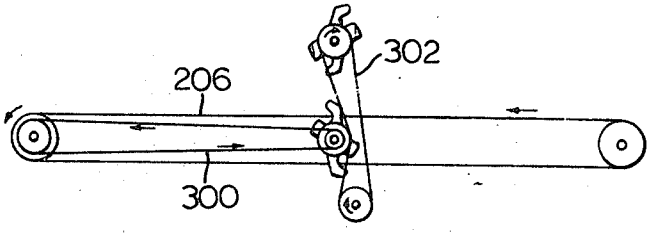


FIG. 10

FIG. 11



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CARTON LOADING MACHINE

1. Field of the Invention

This invention relates to carton loading devices and their method of operation. In particular, this invention relates to an improved method and apparatus for continuously loading and unloading cartons, such as those used for shipping bottles and the like.

2. Description of the Prior Art

To save valuable space, empty paperboard cartons are generally shipped in a knockdown configuration. These cartons must then be erected to an open configuration, loaded and then closed. Numerous machines have been designed to perform the opening, loading and closing operation, however, the known machines do not perform these functions satisfactorily.

It is well known to arrange a plurality of knockdown cartons in a feeding device and to transfer these cartons one at a time to an opening station and to open the carton in the opening station and to place the opened carton on a conveyor. In the best known form of opening device, suction cups are applied to one panel of the knockdown carton when it is located in the storage station and the carton is then removed from the storage station in contact with the suction cups. The carton remains in contact with the same suction cups and is moved towards the conveyor such that one of the hinge lines about which the carton is folded strikes an abutment and causes the carton to fold about the flattened hinge lines to move from a knockdown configuration to an open erect configuration. This concept of striking one edge of a knockdown carton while holding the top wall panel by means of suction cups works reasonably satisfactorily where the top and bottom walls of the carton are substantially wider than the sidewalls and where the carton is made from a relatively lightweight paperboard. However, where the carton has top and bottom walls of substantially the same width, considerable difficulty is experienced in attempting to open the carton by causing one edge of the knockdown carton to strike an abutment. Where the top and bottom walls are substantially the same width as the sidewall, the hinge lines about which a knockdown carton is not hinged, will be located very close to one another such that on striking an abutment, the carton may very easily tend to fold inwardly upon itself rather than outwardly to the erect position. This tendency to fold inwardly is further increased in many instances due to the fact that glue used in the fabrication of the carton tends to spread out within the carton when it is in the knockdown configuration thereby tending to adhesively secure adjacent oppositely disposed panels. This occurs very frequently in cartons employing divider units which are secured to the interior of the carton. A further problem which is encountered in the operation of a carton opening device which employs a conveyor system for conveying the cartons away from the opening station is that the conveyor must move intermittently to permit an opened carton to be located thereon. This intermittent operation of the conveyor reduces the operational speed at which the apparatus may run, increases wear and requires a considerable power input to accelerate and decelerate the conveyor as required. The problems associated with attempting to design the apparatus to run continuously are increased substantially when the height of the carton is increased. The greater the height of the carton, the more time required to locate the carton on the conveyor and, consequently, the greater the amount of relative movement which occurs between the opening apparatus and the conveyor.

Turning now to consider the methods and apparatus as previously used for closing the end flaps of a carton, it will be found that the known methods usually involve the closing of the sidewall flaps as a first step and, subsequently, closing the top and bottom flaps over the side flaps. This is usually the case because the top and bottom walls are of substantially greater width than the sidewalls. However, the apparatus used for effecting this type of closure cannot be used where it is necessary to close the top and bottom flaps before closing the side flaps as in the case of end loading beer cartons and the like. Generally, the leading and trailing flaps of a carton are folded over and then the top and bottom flaps are folded over. The forward end of the top and bottom flaps can then be held by a guide rail and the folded end top and bottom flaps will hold the trailing flap in the closed position. However, where the top and bottom flaps are folded in as a first step, it has proved difficult to design apparatus capable of folding the trailing flap to be closed in position and retaining it in the closed position for sufficient period of time to enable it to be engaged by a fixed guide rail.

Furthermore, difficulty has been experienced in attempting to provide a carton closure device capable of high-speed operation and occupying a very short portion of the travel of the carton. Usually a considerable portion of the travel of the conveyor is required to provide for the folding sequence of the end flaps. This is to say, a period of travel is required to permit the sidewall flaps to be folded in and a further period of travel is required to permit the top and bottom wall flaps to be folded over the sidewall flaps.

The carton loading machines which are presently available do not provide the combined ability to operate continuously at high speed to open and close a carton of the type wherein the sidewalls and top and bottom walls are of substantially the same width and wherein the top and bottom end closure flaps must be folded inwardly before the sidewall end closure flaps are folded.

SUMMARY

The present invention overcomes the difficulties of the prior art as described above by providing an improved carton opening apparatus capable of opening a knockdown carton of the type wherein the sidewalls are of substantially the same width as the top and bottom walls. According to an embodiment of this invention, a carton opening apparatus includes first wall panel engaging means for engaging a first wall panel of a knockdown carton and second wall panel engaging means for engaging a second wall panel of the same carton which is hingedly connected to the first wall panel and disposed in opposing face-to-face relationship therewith. The apparatus also includes means for moving the second wall panel engaging means in an arc relative to the first wall panel engaging means to move the wall panels engaged thereby from the knockdown configuration to the open erect configuration. The first and second wall panel engaging means preferably comprise suction cups adapted to sealingly engage the surface of the wall panels of the carton in use. In addition, the opening means of the present invention is capable of operating in such a manner that it can deposit opened cartons onto the continuously moving conveyor.

The present invention also provides an improved closure means for closing the end flaps of a carton of the type wherein the top and bottom end closure flaps are to be folded over to a closed position before the sidewall closure flaps are folded over. The improved closure apparatus of the present invention is also capable of closing the cartons in the course of a very short movement of the conveyor on which the cartons are supported. According to an embodiment of the present invention, the carton closing device includes a first closure blade mounted for rotation about an axis disposed outwardly from the path of travel of the carton and extending radially into the path of travel of the carton to fold a first flap inwardly about its hinge line as a carton moves through the closing station, and second closure blade means rotatably mounted coaxially with respect to said first closure blade means and circumferentially displaced relative to said first closure means to fold the trailing flap inwardly about its fold line as a carton moves through said station.

The present invention also provides an improved carton loading apparatus capable of operating with the continuously moving conveyor and useful for loading and unloading cartons

of the type wherein the sidewalls and top and bottom walls are of substantially the same widths.

PREFERRED EMBODIMENT

The invention will be more clearly understood after reference to the following detailed specification read in conjunction with the drawings, wherein:

FIG. 1 is a pictorial view of a carton loading device according to an embodiment of the present invention;

FIG. 2 is a pictorial view of the carton opening and conveyor means partially sectioned to reveal details of the mechanism;

FIG. 3 is a further pictorial view of the opening station with some of the structure shown in FIG. 2 removed and some of the structure omitted from FIG. 2 included;

FIG. 4 is a partially sectioned side view showing one stage in the transfer of a carton from the storage station to the opening station;

FIG. 5 is a side view similar to FIG. 4 showing a further stage in the transfer and opening operation of the apparatus according to the present invention;

FIG. 6 shows a still further stage in the transfer and opening operation;

FIG. 7 is a small detailed view of the upper end of the transfer carriage;

FIG. 8 is a pictorial view of a carton closure apparatus according to an embodiment of the present invention in the first stage of the operation;

FIG. 9 is a view similar to FIG. 8 showing a further stage in the closing operation;

FIG. 10 is a pictorial view of a further stage in the closing operation; and

FIG. 11 is a diagrammatical end view showing the manner in which the closure devices are synchronized with the conveyor.

Referring to FIG. 1 of the drawings, it will be seen that the apparatus illustrated therein is of the type which could be used for loading bottles into end loading cartons. This type of apparatus is particularly suitable for loading end loading beer cartons. The apparatus consists of a carton storage station generally indicated by the reference numeral **20**, a carton opening station generally indicated by the reference numeral **30**, a carton loading station generally indicated by the reference numeral **40** and a carton closing station generally indicated by reference numeral **50**.

Generally, in the known carton loading machines, the carton storage station is arranged to dispose the knockdown cartons in a stack which is located in the plane which is inclined at an angle to the horizontal. This structure has the advantage that it utilizes the weight of the cartons located in the storage means to urge them towards the discharge end thereof. However, where the storage station is inclined at an angle to the horizontal, its length must be limited due to the fact that the end which is upwardly inclined, very rapidly becomes inaccessible for loading. Where relatively heavy gauge cartons are to be stored and removed from a storage area at high speed, it is advantageous to provide storage means capable of housing a substantial supply of cartons to be opened. The knockdown carton storage means of the present invention consists of a horizontally extending frame structure which extends rearwardly from the carton opening station. The frame structure includes horizontally extending box section beams **22** which are secured at their forward end to upright transfer frame members **10** and at their rear end to upright frame members **12**. Additional frame members **14** support the frame members **22** between the ends thereof. A pair of support plates **24** are secured to the inner sides of the frame members **22** and extend downwardly therefrom. A shaft **26** extends transversely across the forward end of the storage station and is rotatably mounted in bearings **28** which are secured to the support plates **24**.

A pair of sprockets **26***a* (FIG. 4) are secured to the shaft **26** for rotation therewith at transversely spaced apart locations. The opposite ends of a support bar **31** are secured to the plates **24** and a pair of track guide plates **32** are secured at their forward end to the support bar **31** at spaced apart intervals. At the rear end of the storage station, the plates **32** are secured to support flanges **34** and shaft **36** is rotatably mounted on the flanges **34**. A pair of sprockets (not shown) are rotatably mounted on the shaft **36** for rotation thereon. A pair of conveyor chains **38** are mounted on the sprockets and guided by the guide plates **32** to provide a freely movable feeding conveyor for supporting the lower edges of the cartons in the storage station. Adjustable guide rails **41** are secured to the frame members **22** to vary the effective widths of the storage station to receive varying widths of cartons. As the cartons approach the discharge end of the storage station, it is important to make sure that they are properly aligned for effecting the transfer from the storage station to the opening station. To achieve this proper alignment, a skid plate **42** is secured to the support bar **31** when disposed in a generally horizontal plane. The forward end of the skid plate **42** is curved downwardly to facilitate the passage of the carton onto the plate. As the carton progresses towards the discharge end, the outer ends of the lower edge are supported by arms **44** which project outwardly from the support plates **24** into the path of travel of the cartons. The arms **44** have a downwardly extending lip portion **46** at the end disposed towards the discharge of the storage station. The forward travel of a carton in a storage station is terminated by vertical abutment arms **48** which project into the path of travel of the carton. The abutment arms **48** are rigidly secured to the frame members **22** by transversely extending arms **52**. The upper edges of the knockdown cartons are properly aligned by means of a grade bar **54** which is upwardly curved at its free end to facilitate the passage of cartons thereunder. The bar **54** is rigidly secured to frame member **56**. The frame member **56** is secured at its upper end to transversely extending frame member **10***a* and spaced therefrom by a spacer block **59**. The lower end of the frame member **56** divides into forked legs **56***a* and **56***b* which are secured to transversely extending frame member **10***b*.

A lip **58** projects downwardly from the under surface of the guide **54** into the path of travel of a carton in the storage station. The lip **58** cooperates with abutment arms **48** to define the inner end of the storage station. Downward movement of a carton located in the storage station is prevented by the pressure of the cartons following in the storage station and by support pads **62** which are secured by means of a resiliently flexible strap **64**. The support pads **62** are pressed against the downwardly projecting tongues **46** of the support arms **44** by the resilient straps **64**. The cartons are urged towards the discharge end of the storage station by means of a pressure unit **66** which consists of an inverted U-shaped frame **68**. The frame **68** has rollers **72** rotatably mounted thereon to guide the frame **68** along the frame supports **22**. The pressure unit **66** is urged towards the discharge end of the storage station by means of a weight **74** which is suspended at the forward end of the storage station and is connected to the frame **68** by a wire rope **76**. The wire rope **76** passes over a pulley **78** which is subsequently supported for rotation at the forward end of the storage station. A shaft **82** extends transversely across the frame **68** and a pair of pusher fingers **84** are pivotably mounted on the shaft **82**. The fingers **84** are formed with a pushing portion **86** extending radially outwardly from the shaft **82** and the locking portion **88** extending radially outwardly on the shaft **82** in the opposite direction from the pushing portion **86**. The rushing and locking portions are adapted such that the pushing arm **86** will push any cartons which are located in the storage station in a direction towards the discharge end of the storage station while the frame may also be moved rearwardly of the storage station to pass over additional cartons located in the storage station rearwardly of the frame. This feature permits the storage station to be loaded from time to time without interfering with the pressure applied by the feeder unit. For example, when the machine commences operation, the storage station may be completely filled

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with cartons and as the operation continues, the feeder unit will move towards the discharge end leaving a space in the storage station. The space left in the storage station may then be filled with additional cartons and the feeder may be moved manually towards the rear end of the storage station to be located rearwardly of these additional cartons by permitting the arms 84 to pivot about the shaft 82. This simple feeding structure contributes to the ability of the loading machine as a whole to operate at high speed.

As a first stage in the transfer of a carton from the storage station to the opening station, the upper edge of the first carton in the storage station must be separated from the carton next in line. This is achieved by moving the carton from one side of the lip 58 to the other side. It will be noted that the upper ends of the abutment arms 48 are curved away from the discharge end of the storage station. This permits the carton to bend over a sufficient portion of its height to enable the upper edge of the innermost carton to pass under the lip 58. The movement of the carton from one side of the lip 58 to the other is achieved by transfer suction cup devices illustrated in FIG. 2 and generally identified by reference numeral 67. The suction devices 67 are mounted on support brackets 69 which extend downwardly from the transverse frame member 10*a*. A pneumatic cylinder 73 is secured on one side of each of the support brackets 69 and suction cups 75 are mounted on the outer ends of the reciprocating piston rods 77 which are activated by the pneumatic cylinders 73. A suction chamber is formed in the block 79 and suction is applied to the suction cups by way of conduits 83 which open into the suction chambers. When in use, the pneumatic cylinders 73 are activated and the suction cups move forward to engage the upper end of a carton located within the storage station. The suction is then applied to cause the suction cups to firmly engage the carton. The pneumatic cylinders 73 are activated to move the suction cups away from the storage station. The first carton in the storage station bends over the curved portions of the abutment arms 48 to pass under the lip 58. The suction is then released and the suction cups further withdrawn to a position spaced outwardly from the carton, as shown in FIG. 5. In this position, the tongue 58 maintains a gap between the first and second cartons into which a tongue may be inserted to grip the first carton to effect transfer from the storage station to the opening station.

The opening of a carton is a two-stage process. In the first stage, the carton is moved from the storage station into the upper end of the opening station. The transfer apparatus includes primary support guide means generally indicated by the reference numeral 90 which is pivoted at its upper end to the horizontal frame member 10*a*. The primary support guide means includes a backplate 92 which has flanges 94 secured adjacent the upper end thereof and extending outwardly therefrom. Support brackets 96 are secured to the transversely extending frame member 10*a* and extend outwardly therefrom. A shaft 98 extends between the support brackets 96 and passes through the flanges 94 to pivotably support the primary support guide means 92. A longitudinally extending rectangular slot 100 extends from adjacent lower end of the plate 92 to a position spaced downwardly from the upper edge thereof to provide clearance for the reciprocating drive means as will be described hereinafter. A slide support bracket 102 is secured adjacent the upper end of the baseplate 92 and a corresponding slide support bracket 104 is secured adjacent the lower end of the baseplate. A pair of guide rails 106 are secured to and extend longitudinally between guide supports 102 and 104.

One of the important structural features of this apparatus is the provision of a carriage generally indicated by the reference numeral 120 which is adapted to reciprocate to and fro on the guide rails 106. The actual path followed by the carriage 120 is controlled by a secondary guide rail 122. The secondary guide rail 122 is in the form of a U-shaped channel which is secured by means of a clamping bracket 124 to the horizontally extending frame member 10*b*. The major portion of the length of the secondary guide rail 122 is disposed in a substantially vertical plane while towards the lower end thereof, the track is curved in the direction of travel of the conveyor which is used to convey the open cartons away from the opening station. A roller support bracket 126 is secured to the rear face of the carriage adjacent the lower end thereof and has a roller 128 mounted thereon. The roller 128 is adapted to travel within the U-shaped recess formed in the secondary guide rail 122. In operation, when the carriage is located with the roller 128 adjacent the upper end of the secondary guide rail 122, it will move downwardly in the vertical plane until roller 128 reaches the curved portion of the track. The roller will continue to follow the curved portion of the rail 122 and the carriage 120 on the associated support plate 92 will pivot about the shaft 98 to move in the direction of travel of the conveyor, as previously described.

A pair of finger units 130 are mounted adjacent the upper end of the slidable carriage. Bosses 132 extend outwardly from the upper end of the carriage to support pivot pins 134 to extend transversely outwardly therefrom. The finger units 130 are pivotably mounted on the pivot pins 134. Each unit consists of a lever structure having a pair of small rollers 136 mounted on the outwardly disposed end thereof. A finger 138 extends downwardly in a spaced apart relationship with respect to the rollers 136 to provide a gap therebetween adapted to receive the upper edge of a knockdown carton, as shown in FIG. 5. A small pin 140 extends rearwardly from the unit 130 on the opposite side of the axis of pivot pins 134. A tension spring 142 extends between the pins 140 and a further set of pins 144 mounted on the side of the carriage 130. The tension springs serve to urge the fingers to the position shown in FIG. 4. Further rotation of the fingers about the pivot pin is prevented by a stop lip 146 which abuts the upper end of the bosses 132.

To effect opening of the carton, a pair of suction cups 150 are located adjacent the lower end of the carriage 120. The suction cups are adjustably mounted in slots 152 formed in the carriage to permit adjustment of the position of the cups according to the size of the box which is being opened. Again, each of the suction cups has associated with it a suction chamber located in a block 154. The suction chambers are connected to a suitable suction device such as a suction pump or the like by means of conduits 156. The suction cups 150 are adapted to engage one panel of a knockdown carton, as will be described hereinafter.

A pair of second wall panel engaging suction devices, generally indicated by reference numeral 160, are used in association with the suction cup devices 150. Only one of these secondary wall panel engaging units 160 is shown in FIG. 2. However, it will be understood that a similar unit is mounted at the other side of the machine and has only been removed to clarify the drawing. A pair of brackets 162 are mounted adjacent opposite edges of the carriage 120 between the top and bottom ends thereof and slightly closer to the lower end thereof. A pair of upright frame columns 10*c* have a shaft 164 extending transversely between the upper ends thereof.

The carriage 120 is connected to the stationary frame by linkage means, generally indicated by the reference numeral 170. It will be understood that two such linkage means are provided, one being disposed on either side of the machine. However, for clarity, one of these has been removed from FIG. 2. Each linkage means consists of an intermediate link arm 172 and a secondary link arm 174. The intermediate link arm is pivotably connected at one end to a bracket 162 and at the other end to the secondary link arm 174. The other end of the secondary link arm 174 is pivotably mounted on the shaft 164. A shaft 176 extends transversely across the opening station to the other pair of link arms. A suction cup support plate 178 is secured to each intermediate link arm 172 and extends transversely outwardly therefrom into the opening station. The suction cup device 160 is mounted on the support plate 178. The suction device includes a two-way valve 180 having a piston rod extending outwardly therefrom supporting a suc-

tion cup 182. Suction is applied by way of a conduit 184 and suction chamber 186 as previously described. The suction cup 182 may be moved towards and away from the support plate 178 by means of the valve 180. As the carriage 120 reciprocates vertically on the guide rails 106, the intermediate link arm 172 will pivot in an arc about its pivotal connection to the bracket 162 to move the suction cup from the position shown in FIG. 2 to the position shown in FIG. 4.

Reciprocating movement of the carriage 120 is achieved by means of a rotating crank drive. A U-shaped bracket 190 is secured to the rear face of the carriage 120 and the connecting rod 192 is pivotably connected thereto by a suitable pivot pin (not shown). The lower end of the connecting rod 192 is pivotably connected to a rotating crank arm 194. The rotating crank arm is mounted on the output shaft of a gearbox 196 which is driven by a power input drive sprocket 198 which is, in turn, driven by a suitable motor (not shown). The slot 100 formed in the baseplate 92 provides clearance for the connecting rod 192 as it moves the carriage 120 upwardly and outwardly in response to rotation of the crank arm 194.

The lower end of the opening station is defined by support plates 200 which are secured to the stationary longitudinally extending track support rails to a tube by means of support brackets 204. the track support rails 202 are rigidly carried by the frame of the machine to underlie the continuous conveyor chains 206. The chains 206 stand over sprockets 208 which are mounted outwardly from the opening station and rotatably driven by a suitable drive means. Divider arms 210 are secured to spaced apart links on the chains to define the width of the compartment into which the open carton is to be placed.

It is important to synchronize the operation of the valves 73 and 180 which move the suction cups backwards and forwards and also to synchronize the application of the suction to the various suction cups in relation to the position of the conveyor chains 206. This is done by mounting cams 220, 222, 224 and 226 on a rotatable shaft 228. The shaft at 228 is driven by a sprocket 230 which is connected by means of a chain 232 to the main drive shaft which supports the main chain sprockets 208. The cams are located to activate microswitches 230, 232, 234 and 236, respectively. The microswitch 230 is adapted to activate the circuit of valve 180. The switch 232 is adapted to control the application of the suction to suction cups 150 and 182. The microswitch 234 is adapted to control the operation of the solenoid valve 73 and the switch 236 is adapted to control the application of the suction to the suction cups 75.

The operation of the transfer and opening apparatus will be more clearly understood after reference to FIGS. 4, 5, 6 and 7 of the drawings. It is to be understood that the cartons 8 which are arranged in the storage station are of the end loading-type consisting of four wall panels arranged in oppositely disposed pairs and hingedly connected to one another. The four wall panels being of substantially the same width such that when the carton is in the knockdown configuration, the hinge lines about which it is not bent are located substantially midway between the top and bottom edges of the knockdown carton. As a first step in the operation, the valves 73 are activated and the suction cups 75 move forward into engagement with the first carton which is located at the discharge end of the storage station. Valves 73 and suction cups 75 are activated in this manner as the transfer carriage 120 approaches the upper end of its stroke. When the transfer carriage 120 has reached the upper end of its stroke, the valves 73 are deactivated and the suction cups, with the attached carton, move away from the discharge end of the storage station. The upper edge of the carton which is gripped by the suction cup 75, passes under the lip 58 and then the suction applied by the suction cup 75 is released so that the suction cup 75 may be further withdrawn to the position shown in FIG. 6. By this time, the transfer carriage 120 has commenced its downward movement and the upper edge of the carton is located in the gap formed between the rollers 136 and the finger 138. The rollers serve to permit the gripper assembly to move downwardly relative to the next carton in the storage station without damaging the said next carton. As the first carton moves downwardly into the opening station, the straps 64 bend outwardly to permit the carton to pass between the shoulder 46 and abutting gripping pad 62, as shown in FIG. 5. Downward movement of the carriage continues until the first carton is located in the transfer position illustrated in FIG. 6 wherein only the upper edge thereof is gripped between the shoulders 46 and pads 62. The carriage then begins to return to the upper end of its stroke and, as shown in FIG. 7, the gripping devices 130 pivot about pivot pins 134 and the rollers 136 roll on the outer surface of the next carton as the carriage returns to the upper end of its stroke. When the carriage reaches the upper end of its stroke, the first stage of the transfer procedure described hereinabove is repeated while, simultaneously, the carton is opened by the carton opening means as will be described hereinafter.

Referring once more to FIG. 4 of the drawings, it will be seen that when the first carton is located in the broken line position wherein the upper edge thereof is gripped between the shoulder 46 and pads 62, the suction cups 150 and 182 are disposed adjacent to the carton. The valve 180 is then activated to move the suction cup 182 towards the carton. The suction cup 182 will continue to move forwardly after it engages the carton a sufficient extent to cause the carton to be pressed against suction cup 150. Suction is then applied to both suction cups 150 and 182. It is important to note that suction cup 150 engages the sidewall of the carton while suction cup 182 engages the top wall which is hingedly connected to the sidewall to which suction cup 150 is attached and located in a face-to-face relationship with said sidewall panel. The securing of the suction cups to the knockdown carton occurs while the carriage is moving at a relatively slow speed towards the upper end of its stroke. As the carriage moves downwardly, the suction cup 150 continues downwardly in a substantially vertical direction while the suction cup 182 is pivoted in an arc away from suction cup 150. The pivoting of the cup 182 is achieved by the pivoting of the link arms 172 and 174 about pivot pins 176 and 164. It will be seen that as the drive shaft 192 moves downwardly, the arm 174 pivots on the direction of the arrow A shown in FIG. 4, causing the link 172 to pivot in the direction of the arrow B. This action opens the carton as shown in FIG. 5 of the drawings. It will be noted that this opening action occurs as the carriage moves downwardly thereby causing the carton to move downwardly in the direction of arrow C as it opens. The divider arms 210 which are carried by the chains 206 define the compartment into which the carton is to be placed. The divider arms move continuously through the opening station and, consequently, the compartment into which the carton is to be placed, moves continuously across the opening station in the direction of the arrow D. The operation of the downward movement of the carriage and pivoting movement of the intermediate crank arm 172 are, as previously indicated, synchronized with respect to the movement of the conveyor chain 206. During most of the downward travel of the carriage, the forward sidewall of the carton is maintained adjacent the forward divider arm 210 of the compartment into which the carton has been placed by the opening action of the carton. However, adjacent the lower end of the travel of the carriage, it is necessary to permit the carriage to move in the direction of the conveyor. This is achieved, as previously described, by the curved portion of the guide track 122. It is by combining the downward and forward action of the carriage that the device of the present invention is capable of squarely locating a carton in an open position on the conveyor between the divider arms 210.

When the carton is in the open position shown in broken lines in FIG. 6, the suction is removed from suction cups 182 and 150. The valve 180 is activated to withdraw the suction cup 182. The carriage then moves upwardly to its original starting position and the cycle is repeated.

After the suction cups 150 have released the carton in the open position, shown in FIG. 6, it is important to provide some

means for preventing the carton returning to the knock down flattened configuration. There is a tendency for this to occur, due to the fact that the new fold lines have not been permanently set. It is a simple matter to provide a guide rail **240** which will ride over the upper end of the carton as it moves out of the opening station. However, some form of holding device is required to maintain the open configuration immediately upon release of the suction cups **182** and **150**. This is achieved in the present invention by means of an arm **242** which is pivotally connected at its upper end to the support bracket **244**. The arm extends downwardly from the pivot connection and is generally L-shaped with a lower leg **246** being adapted to overlie the upper end of a carton. The arm **242** is urged to the vertical plane in the direction of the arrow shown by means of a tension spring **248**. As shown in FIG. **5**, the arm **242** is forcibly moved out of the opening station by the opening carton. However, immediately after the upper forward edge of the opening carton passes below the lower end of the arm, the horizontally extending portion **246** will pivot to the position shown in FIG. **6**.

When the carton is located on the conveyor **206** between a pair of divider arms **210**, it is moved by the conveyor to the loading station. In this embodiment of the invention illustrated in FIG. **1**, a plurality of bottles, such as beer bottles, are loaded into the carton by a pusher unit **40** which is obliquely disposed relative to the continuous moving conveyor which feeds the bottles to the loading station. The pusher unit is synchronized with the continuously moving open cartons as the cartons are loaded as they pass through the loading station. A hot melt adhesive is applied to flaps **4** and **6** as the open carton passes from the loading station to the closing station. The adhesive is applied by conventional hot melt applicators **252**, illustrated in FIGS. **1** and **8**. The applicators **252** are mounted adjacent to the carton closing station.

The closure device of the present invention is generally indicated in FIGS. **8**, **9** and **10**. The main frame includes vertically upstanding support members **10***d* only one of which is not shown in FIG. **8** in order that the remainder of the closure apparatus may be more clearly illustrated. The cartons advancing along the conveyor are held in the squared position by means of L-shaped angled plates **256** carried on a continuously moving chain **258**. The chain **258** extends over a major portion of the length of the main conveyor **206** and returns to the discharge end of the opening station in a plane disposed above the plane in which it is shown in FIG. **8**.

The actual structure used to close the cartons comprises a pair of shafts **260** rotatably mounted on the frame members **10***d* and extending transversely of the path of movement of the cartons. The shafts **260** are rotatably driven at a speed synchronized with the speed of the main conveyor. Two closure devices, generally indicated by the reference numeral **262**, are mounted on the upper shaft and two similar devices **262** are mounted on the lower shaft. The closure devices **262** each consist of two dissimilar, propellerlike blades **266** and **268**. The blades **266** are designed to fold the top and bottom flaps **4** and **6** inwardly while the blade **262** is designed to fold the trailing sidewall flap **5** inwardly. The leading sidewall flap **7** is folded inwardly as it strikes the curved forward end of the closure bars **270** which are rigidly mounted on the frame. The closure blades **266** are in two halves, **266***a* and **266***b*, extending radially outwardly from the shafts **260**. The leading edge of the blades **266***a* and **266***b* is curved outwardly at **266***c* to prevent the blade from damaging the carton on impact. The blades **268** also have two sections, **268***a* and **268***b* extending radially outwardly from the shaft **260**. Blades **266** and **268** are connected to one another by adjustable setpins **272** which are located in elongated slots **274** formed in the blade **268**. These pins and slots permit one blade to be circumferentially adjusted relative to the other to permit adjustment of the timing of the action of one blade relative to the other. The blade portions **268***a* and **268***b* are shaped somewhat in the form of a boot having a leg portion extending radially outwardly from the shaft and a foot portion extending circumferentially at the other end of the leg portion to provide a recess **276** in the leading edge of the blade. Recess **276** permits the foot portion to enter the gap between adjacent cartons to engage the trailing sidewall flap **5** and fold inwardly over the top and bottom flaps to be adhesively connected thereto. It will be noted that the combination of the blade portions **266***a* and **268***a* are all that is required to close any one carton and, in fact, only one propeller unit **268** is required at each end of the carton. The blade elements **266** must be provided at the top and bottom of the carton to close the top and bottom flaps while only one of the blade elements **268** is essential to effect closing of the sidewall flap **5**. However, it is desirable to provide a second blade **268** at each end of the carton to apply equal force to the top and bottom of the flap **5**. It will be seen that the closure device of the present invention can effectively close both ends of a carton in the space of a very short portion of the travel of the carton on the main conveyor. In operation, the closure blades are synchronized such that a first section of the blades **266** engage the top and bottom flaps **4** and **6**, respectively, and fold them inwardly of the carton. Further advancing of the conveyor and further rotation of the closure propellers causes the sections **262** to engage the trailing sidewall flap **5** and folded over the top and bottom end flaps. The leading end flaps **7** are folded inwardly by means of the bars **270** as the carton advances on the conveyor and the rotating blades **268** are designed to hold the trailing end flap **5** in the closed position until it is in contact with the closure bars **270**. When one carton has been closed, the other halves of the closure blades are in a position to begin closing the next carton on the conveyor. By providing a propellerlike closure device, it is possible to locate the cartons in a close side-by-side relationship on the conveyor without operating the blade closing device at high-rotational speeds.

It is important to synchronize the speed of rotation of the closure devices with the speed of movement of the main conveyor. In FIG. **11** of the drawings, one method of achieving this synchronized movement is illustrated. The main conveyor chain **206** is shown extending over the full length of the machine. The bottom closure device is rotatably driven by a drive chain **300** while the top closure device is driven by drive chain **302**. By this drive means, the operation of the closure devices is synchronized with the operation of the main conveyor. The position of one blade **266** relative to the other blade **268** may be adjusted depending upon the distance between the adjacent containers.

What I claim is:

1. A carton loading device for loading end loading cartons comprising, a frame, a knockdown carton storage station having carton storage means therein, a carton opening station, carton opening means in said opening station, transfer means for sequentially releasing a carton from said storage means and transferring the released carton to said opening station, conveyor means for conveying an open carton from the opening station to a loading station, knockdown carton storage means in said storage station consisting of substantially horizontally disposed guide rail means for supporting a stack of knockdown cartons in a vertical face-to-face relationship, said storage means having a discharge end and feeder means for urging the stack of cartons towards said discharge end, restraining means for preventing said knockdown carton from discharging from said storage means under the influence of said feeder means, said restraining means including lip means projecting downwardly from an upper horizontal edge of the knockdown carton, abutment means for engaging in turn the flat face of each knockdown carton which is directed towards said discharge end of said storage means, releasable lower edge support means for supporting the lower edge of the first carton of the stack of cartons against downward vertical movement, said transfer means including transfer suction cup means mounted on said frame for movement towards the discharge end of said storage means to engage a carton and away from the discharge end of said storage means to cause the upper end of the engaged carton to pass under said

downwardly projecting lip, such that the upper edge of a first carton of the stack of cartons is spaced from the upper edge of the second carton of the stack of cartons, said transfer means also including primary support guide means pivotably connected its upper end to said frame, and a carriage adapted to reciprocate on said guide means to move to and fro between said storage station and said opening station, rotary crank drive means and connecting rod means connecting said rotary crank drive means to said carriage to provide reciprocating movement of said carriage on said support guide, secondary guide rail means adapted to retain said carriage in a substantially vertical plane over a major portion of its reciprocating movement and to cause said primary support to pivot about the pivotal mounting thereof when said carriage reaches the lower end of its reciprocating movement to cause the carriage to move transversely of the opening station in the direction of the movement of the conveyor, said transfer means also including a tongue at the upper end of said carriage for engaging the upper edge of the first carton and moving said carton downwardly through said releasable support to an intermediate position wherein the upper edge of said carton is retained by said releasable support, said carton opening means including; first opening suction cup means mounted on the lower end of the transfer carriage to reciprocate vertically with the carriage and to move transversely with the carriage at the lower end of the carriage travel, said first opening suction cup means being engageable with a sidewall of the carton disposed in said intermediate position when said carriage is in the upper position, linkage means connecting said carriage to a stationary frame member, said linkage means including intermediate link arms having one end pivotably connected to said carriage and secondary link arms pivotably connected at one end to said intermediate link arm and at the other end to said frame, said intermediate link arms being adapted to pivot about its pivotal connection to said carriage to move away from said carriage in an arc as said carriage moves downwardly and towards said carriage as it moves upwardly, second opening suction cup means mounted on said intermediate link and disposed with the suction surface thereof located in a substantially vertical plane for movement into engagement with a top wall of a carton located in said intermediate position when said carriage is in its upper position, said second opening suction cup means moving downwardly with said intermediate link in an arc as said carriage moves downwardly to locate the suction surface thereof downwardly and transversely of its vertical position in a substantially horizontal position to cause a top wall of a carton engaged thereby to move in an arc away from an adjacent sidewall engaged by said first opening suction means to open a carton in use, said second opening suction means also moving transversely in response to the transverse movement which occurs at the lower end of the reciprocating movement of said carriage, said conveyor means including a continuously moving conveyor, divider means carried by and extending upwardly from said conveyor to define a plurality of carton receiving compartments each having a base for supporting a bottom of a carton and side supports for restraining the sidewalls of a carton the upper end of each of said compartments being open when in said opening station whereby a carton which is opened by the cooperating movement of said suction cups and a transfer carriage may be located in each of said compartments as said conveyor moves continually through said opening station, movable carton restraining means pivotally mounted on said frame and extending downwardly therefrom to overlie the top wall of a carton located in said conveyor compartment immediately after loading, said movable restraining means being adapted to pivot away from said overlying position as a carton is opening to permit the carton to enter the conveyor compartment, fixed carton restraining means for engaging the upper wall of a carton as it moves transversely out of said opening station, loading means for loading a carton carried by said conveyor and closure means for closing a carton carried by said conveyor.

2. A carton loading device for loading end-loading cartons comprising, a frame, a knockdown carton storage station, a carton opening station, transfer means for transferring a carton from said storage station to said opening station, conveyor means for conveying an open carton from the opening station, and carton opening means in said carton opening station, said carton opening means including, first wall panel engaging means for engaging a first wall panel of a knockdown carton positioned in said opening station, second wall panel engaging means for engaging a second wall panel which is hingedly connected to said first wall panel and disposed in an opposing face-to-face relationship with the first wall panel, activator means for moving said second wall panel engaging means relative to said first wall panel engaging means to move the wall panels engaged thereby from the knockdown configuration to an open erect configuration, said first wall panel engaging means comprising suction cup means mounted to reciprocate within said opening station along a path which is substantially vertical over a major portion of the travel and which curves at its lower end to the horizontal plane, said second wall panel engaging means comprising suction cup means mounted for movement in an arc relative to said first wall panel engaging means to move away from said first wall panel engaging means to be disposed substantially at right angles to said first wall panel engaging means, the movement of said first and second wall panel engaging means being synchronized to simultaneously open a carton and deposit it on a continuously moving conveyor.

3. A carton loading device as claim in claim 2, wherein said transfer means includes a transfer carriage mounted to reciprocate on said frame between said storage station and said opening station, said first wall panel engaging means being mounted adjacent the lower end of said carriage to reciprocate therewith, linkage means connecting said carriage to said frame, said second suction means being mounted on said linkage means and movable therewith in response to movement of said carriage to move the wall panel engaged thereby in an arc away from said first wall panel engaging suction cup means and drive means for moving said carriage relative to said frame.

4. A carton loading device, as claimed in claim 3, wherein said first suction cup means comprises a pair of suction cups mounted on the lower end of said transfer carriage and said second suction cup means comprising a pair of suction cups mounted for reciprocal movement relative to said linkage means to move into and out of engagement with a wall panel in use.

5. A carton loading device for loading end-loading cartons comprising, a frame, a knockdown carton storage station, a carton opening station, transfer means for transferring a carton from said storage station to said opening station, conveyor means for conveying an open carton from the opening station, and carton opening means in said carton opening station, said carton opening means including, first wall panel engaging means for engaging a first wall panel of a knockdown carton positioned in said opening station, second wall panel engaging means for engaging a second wall panel which is hingedly connected to said first wall panel and disposed in an opposing face-to-face relationship with the first wall panel, activator means for moving said second wall panel engaging means relative to said first wall panel engaging means to move the wall panels engaged thereby from the knockdown configuration to an open erect configuration, said transfer means including a primary support and guide means pivotably connected at its upper end to said frame, a carriage adapted to reciprocate on said guide means to move to and fro between said storage station and said opening station, secondary guide rail means adapted to retain the carriage in a substantially vertical plane over a major portion of its reciprocating movement and to cause said primary support to pivot about its pivotal mounting thereof when said carriage reaches the lower end of its reciprocating movement to cause the carriage to move simultaneously vertically and transversely of the opening station,

said first wall panel engaging means comprising a pair of suction cups mounted adjacent the lower end of said carriage, said first pair of suction cups being adapted to reciprocate in a plane normal to the plane of movement of said carriage, linkage means connecting said carriage to said frame, said linkage means including an 'intermediate link arm having one end pivotably connected to said carriage and a secondary link arm connected at one end to said intermediate link arm at the other end to said frame, a support bracket carried by said intermediate link arm and extending transversely across said opening station, said second opening suction cup means being mounted on said support bracket and adapted to reciprocate relative to said support bracket for movement towards and away from a wall panel in use, said intermediate link arm being adapted to pivot about its pivotal connection said carriage to move away from said carriage in an arc as said carriage moves downwardly and towards said carriage as said carriage moves upwardly.

6. A carton loading device for loading end-loading cartons comprising, a frame, a knockdown carton storage station, a carton opening station, transfer means for transferring a carton from said storage station to said opening station, conveyor means for conveying an open carton from the opening station, and carton opening means in said carton opening station, said carton opening means including, first wall panel engaging means for engaging a first wall panel of a knockdown carton positioned in said opening station, second wall panel engaging means for engaging a second wall panel which is hingedly connected to said first wall panel and disposed in an opposing face-to-face relationship with the first wall panel, activator means for moving said second wall panel engaging means relative to said first wall panel engaging means to move the wall panels engaged thereby from the knockdown configuration to an open erect configuration, and carton storage means in said storage station, said storage means having a discharge end and feeder means for urging a stack of cartons towards said discharge end, restraining means for preventing said knockdown cartons from discharging from said storage means under the influence of said feeder means, said transfer means including transfer suction cup means mounted on said frame for movement towards the discharge end of said storage means to engage a carton and for movement away from said discharge end of said storage means to cause the upper edge of a carton to move outwardly from said storage means, said transfer means also including tongue means carried by said carriage for engagement with the upper edge of a first carton, said tongue means moving downwardly with said carriage means to transfer a carton from said storage station to said opening station.

7. In a carton closure device for closing at least one open end of a carton as it is moved continuously in a path which passes through a closing station, the open end of the carton having a first pair of oppositely disposed closure flaps hingedly connected to the carton along hinge lines extending parallel to the path of travel of the carton and a second pair of oppositely disposed closure flaps connected along hinge lines which extend normal to the path of travel, said second pair of flaps including a leading flap disposed towards the closure station and a closure flap disposed away from the closure station as the carton moves towards the closure station, the improvement of closure means comprising first closure means for folding said first pair of flaps inwardly about said parallel hinge lines and second closure means for subsequently folding said leading flap and trailing flap inwardly upon said first and second flaps to be adhesively secured thereto, said first closure means for closing said end flaps includes at least two rotatably driven first blade members mounted for rotation about axes disposed one on either side of and extending transversely of the path of travel of the carton, said first blades being adapted to rotate into the path of travel of the open end of the carton to cause said first pair of flaps to fold inwardly about said parallel hinge lines, said second closure means comprising, at least one trailing flap closure blade mounted for rotation into the path of travel of the trailing flap to fold said flap inwardly of a carton after said first pair of flaps are folded inwardly and stationary flap closure means mounted in the path of travel of said leading flap to fold said leading flap inwardly onto said first pair of flaps to be secured thereto, said stationary closure means also serving to retain said leading and trailing flaps in their closed position as said carton moves out of said closing station.

8. A closure device as claimed in claim 7 including two trailing flap closure blade members, one of said trailing flap closure members being mounted on an axis coincident with the axis of one of said first closure blades and the other trailing flap closure blade member being mounted on an axis which is coincident with the axis of the other of said first blade members.

9. A closure device as claimed in claim 7 wherein each of said trailing flap closure means comprises a pair of diametrically opposed second blade elements extending radially from said axis, each of said blade elements being generally boot shaped having a toe portion projecting circumferentially at the radially outer end thereof for engaging said trailing flap.

10. A closure device as claimed in claim 7, wherein each of said first closure means comprises a pair of diametrically opposed first blade elements extending radially outwardly from said axis, and each of said second closure means comprises a pair of diametrically opposed closure blade elements extending radially outwardly from said axis, said first and second blade segments being alternately arranged and circumferentially spaced relative to one another, each of said second blade elements having a generally boot-shaped configuration having a toe portion projecting circumferentially at the radially outer end thereof for engagement with said trailing flaps.

11. In a carton closure device for closing two open ends of a carton as it is moved continuously in a path which passes through a closing station, the open ends of each carton having a first pair of oppositely disposed closure flaps hingedly connected to the carton along hinge lines extending parallel to the path of travel of the carton and a second pair of oppositely disposed closure flaps connected along hinge lines which extend normal to the path of travel, each of said second pair of flaps including a leading flap disposed towards the closure station and a closure flap disposed away from the closure station as the carton moves towards the closure station, the improvement of closure means comprising: a pair of drive shafts extending transversely of the path of travel of a carton and having one end disposed adjacent the path of travel of each open end of a carton, four double-bladed closure devices rotatably mounted at each end of each of said drive shafts, each of said blades consisting of, a first blade member having diametrically opposed first flap engaging segments extending radially from said shaft, and a second blade member having diametrically opposed second flap engaging segments extending radially from said shaft, said first and second blade members being circumferentially spaced relative to one another whereby on rotation of said shaft, one of said first flap engaging segments will rotate relative to a carton moving through said closure station to fold one of the first pair of flaps to a closed position and on further rotation one of said second pair of flap engaging segments will rotate relative to a carton to fold the trailing flap of the carton to a closed position, said second flap engaging segments each consisting of a radially inner portion and a radially outer portion each having a leading and trailing edge, the leading edge of said radially outer portion projecting circumferentially outwardly from the leading edge of the inner portion such that on rotation of said blade the leading edge of said outer portion will make contact with the trailing flap of a carton while the leading edge of the inner portion is spaced therefrom.

12. In a carton loading device for loading end-loading cartons and having a frame, a knockdown carton storage station and a carton opening station, the improvement of transfer means for transferring a carton from said storage station to said opening station, said transfer means including a transfer carriage mounted to reciprocate on said frame between said

storage station and said opening station, first wall panel engaging means for engaging a first wall panel of a knockdown carton positioned in said opening station and second wall panel engaging means for engaging a second wall panel which is hingedly connected to said first wall panel, said first wall panel engaging means being mounted adjacent the lower end of the carriage to reciprocate therewith, linkage means connecting said carriage to said frame, said second wall panel engaging means being mounted on said linkage and moveable therewith in response to movement of said carriage to move the wall panel engaged thereby in an arc away from said first wall panel engaging means and drive means for moving said carriage outward to said frame.

13. A carton loading device as claimed in claim 12 wherein said transfer means also includes a primary support and guide means pivotally connected at its upper end to said frame, a carriage adapted to reciprocate on said guide means to move to and fro between said storage station and said opening station, secondary guide rail means adapted to retain the carriage in a substantially vertical plane over a major portion of its reciprocating movement and to cause said primary support to pivot about is pivotal mounting thereon when said carriage reaches the lower end of its reciprocating movement to cause the carriage to move simultaneously vertical and transversely of said opening station.

14. A carton loading device as claimed in claim 12, wherein said transfer means and carton opening means are adapted to operate simultaneously whereby a first carton may be opened in said opening station while a second carton is transferred from said storage station to said opening station.

15. In a carton loading device having a carton opening station and means for locating a knockdown carton in a first position in said station in a configuration in which the carton is folded along a pair of hinge lines, and has a first wall panel disposed on one side of one of said hinge lines and a second panel disposed on the other side of said one hinge line, and continuously moving conveyor means for conveying an open carton from said station, said first position of said knockdown carton being spaced a substantial distance from said continuously moving conveyor the improvement of carton opening means in said opening station including first wall panel engaging means for engaging said first wall panel of a knockdown carton in said first position and second wall panel engaging means for engaging said second wall panel when said carton is in said first position, and means for simultaneously moving said first and second wall panel engaging means away from one another to open said carton and to move said carton from said first position and deposit it on said continuously moving conveyor in driving engagement with said continuously moving conveyor.

16. In a carton loading device having a longitudinally extending carton loading frame having an input end and an output end, a carton storage station, a carton opening station at the input end of the carton loading frame and transfer means for transferring a carton from said storage station to said opening station the improvement of carton storage means in said storage station, said storage means being disposed above said frame and extending from said input end of said frame in a direction toward the output end of the frame in a spaced parallel relationship thereto, said storage means having a discharge end disposed adjacent said input end of said loading frame and opening in a direction opposite to the direction in which the loading frame extends away from said discharge end of said storage means, feeder means for urging a stack of cartons towards said discharge end, restraining means for preventing knockdown cartons in said storage station from being discharged from said storage means under the influence of said feeder means, said transfer means including transfer suction cup means mounted on said frame for movement towards the discharge end of said storage means to engage a carton for movement away from said discharge end of said storage means to cause the upper end of a carton to move outwardly from said storage means, said transfer means also including a transfer carriage mounted to reciprocate on said frame between said storage station and said opening station, tongue means carried by said carriage for engagement with the upper edge of a first carton, said tongue means moving downwardly with said carriage means to transfer a carton from said storage station to said opening station.

17. In a carton loading device having a carton opening station and means for locating a knockdown carton in a first position in said station in a configuration in which the carton is folded along a pair of hinge lines, and has a first wall panel disposed on one side of one of said hinge lines and a second panel disposed on the other side of said one hinge line, and continuously moving conveyor means for conveying an open carton from said station, said first position of said known down carton being spaced a substantial distance from said continuously moving conveyor the improvement of carton opening means in said opening station including first wall panel engaging means for engaging said first wall panel of a knockdown carton in said first position and second wall panel engaging means for engaging said second wall panel when said carton is in said first position, and means for simultaneously moving said first and second wall panel engaging means away from one another to open said carton and to move said carton from said first position and deposit it on said continuously moving conveyor in driving engagement with said continuously moving conveyor, said first wall panel engaging means being mounted to reciprocate within the said opening station along a path which is substantially vertical over a major portion of its travel and which curves at its lower end to the horizontal plane, said second wall panel engaging means being mounted for movement in an arc relative to said first wall panel engaging means to move away from the first wall panel engaging means to be disposed substantially at right angles to said first wall panel engaging means.

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