

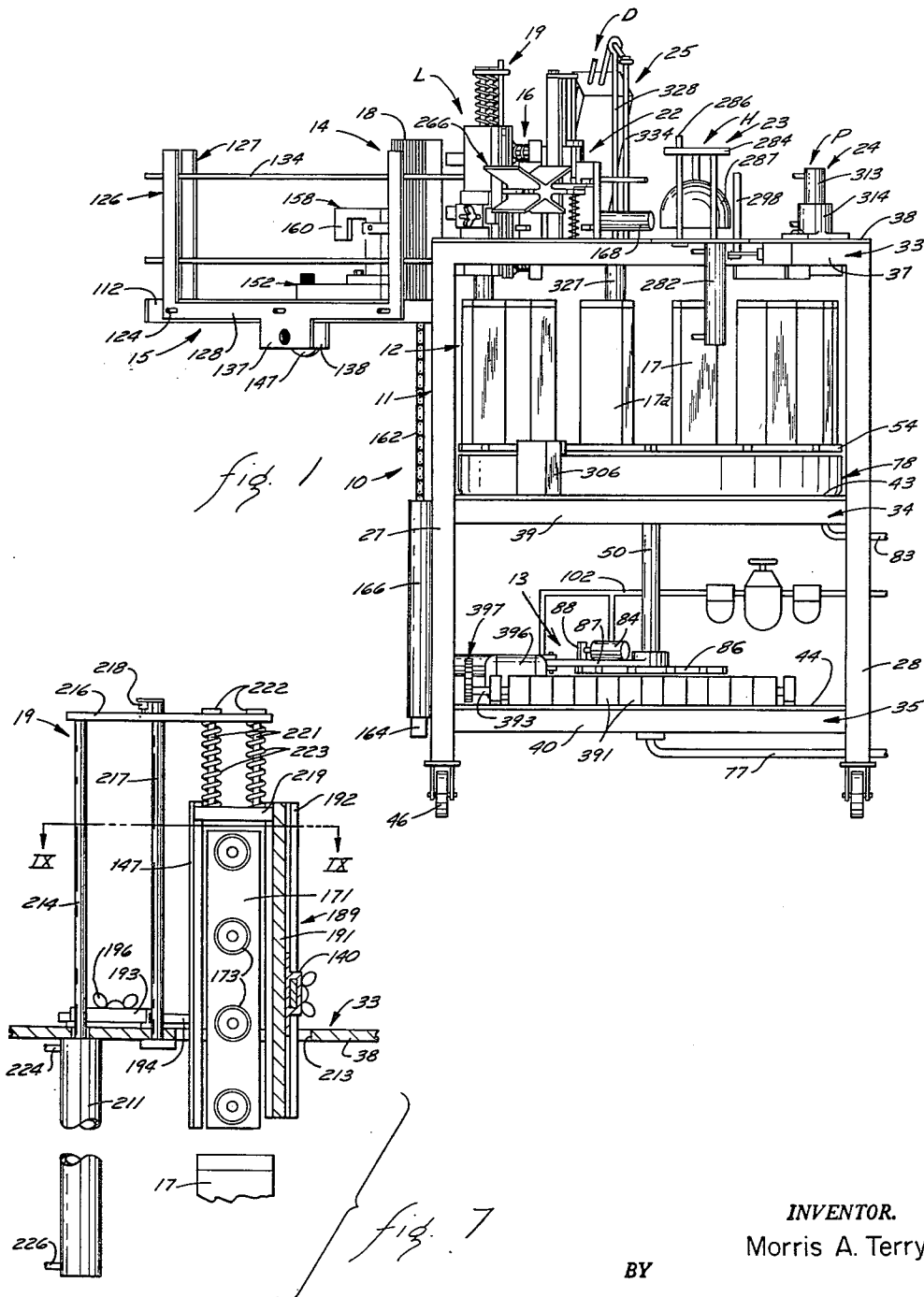
Nov. 20, 1962

M. A. TERRY
CARTON FORMING MACHINE

3,064,542

Filed Dec. 30, 1960

7 Sheets-Sheet 1



INVENTOR.
Morris A. Terry

BY

Woodhams Blanchard & Flynn
ATTORNEYS

Nov. 20, 1962

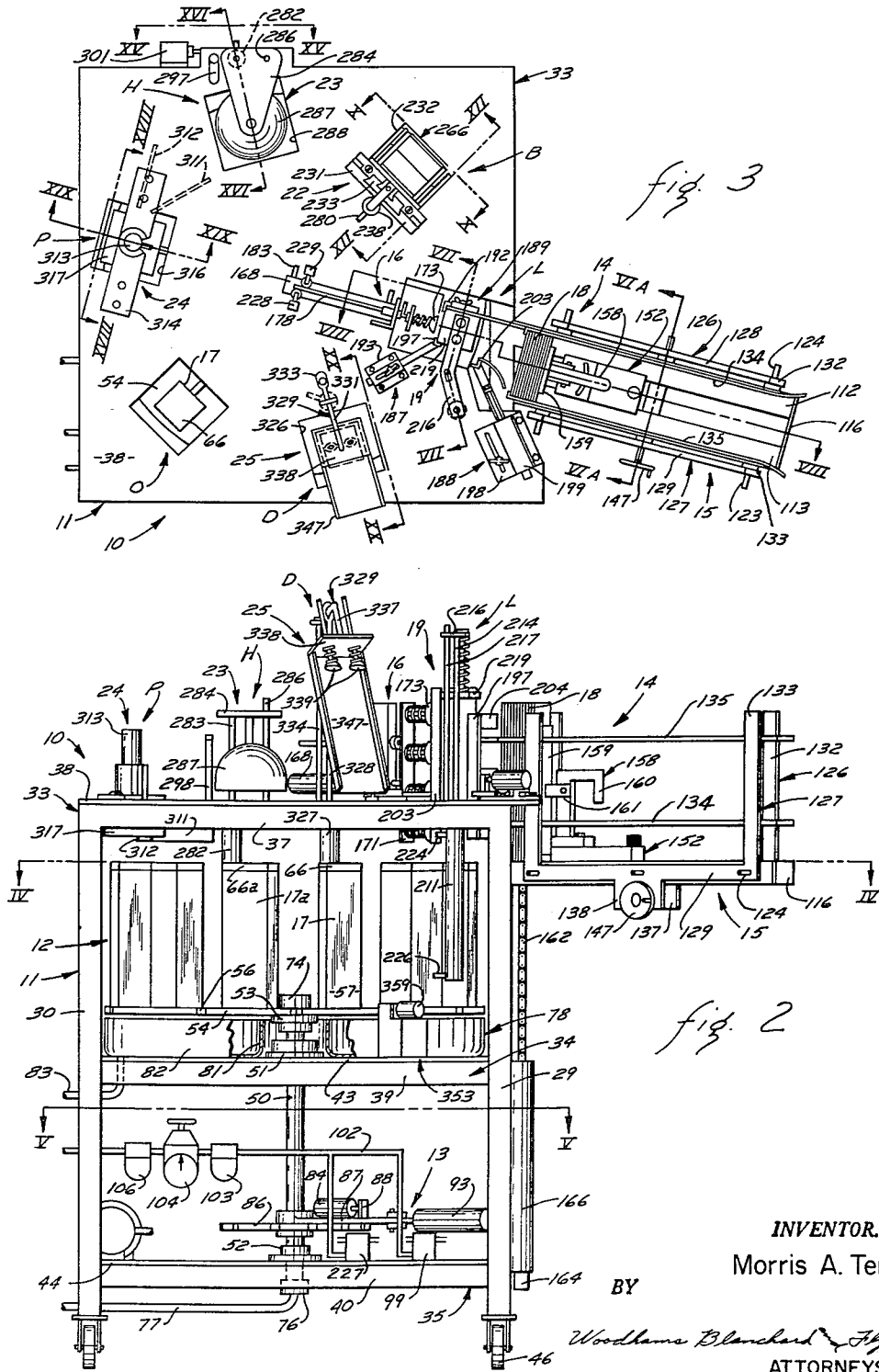
M. A. TERRY

3,064,542

CARTON FORMING MACHINE

Filed Dec. 30, 1960

7 Sheets-Sheet 2



Nov. 20, 1962

M. A. TERRY
CARTON FORMING MACHINE

3,064,542

Filed Dec. 30, 1960

7 Sheets-Sheet 3

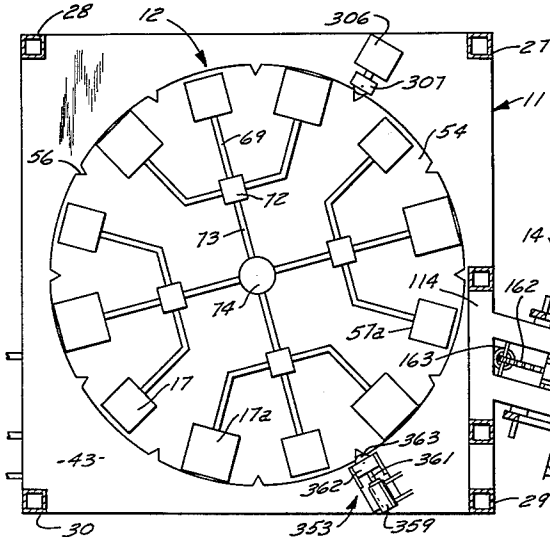


fig. 4

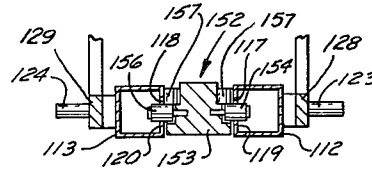


fig. 6

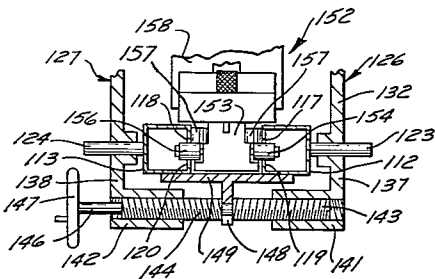


fig. 6A

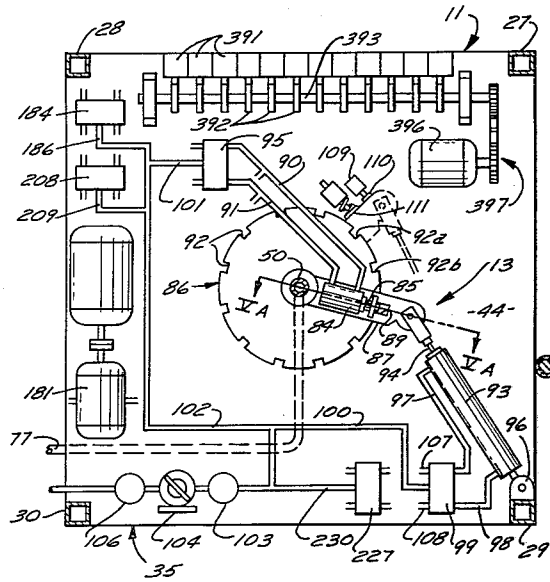


fig. 5

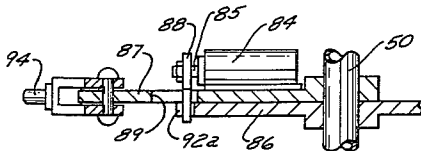


fig. 5A

INVENTOR.
Morris A. Terry

BY

Woodhams Blanchard & Flynn
ATTORNEYS

Nov. 20, 1962

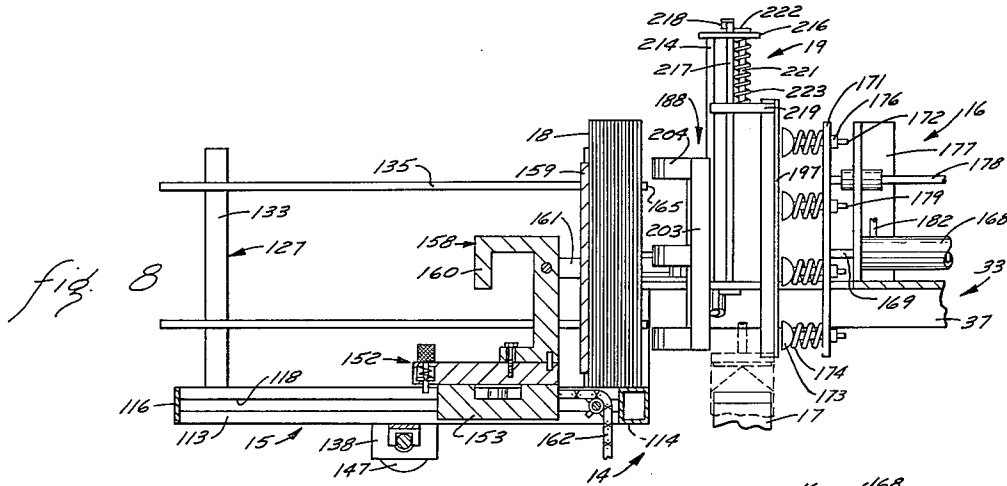
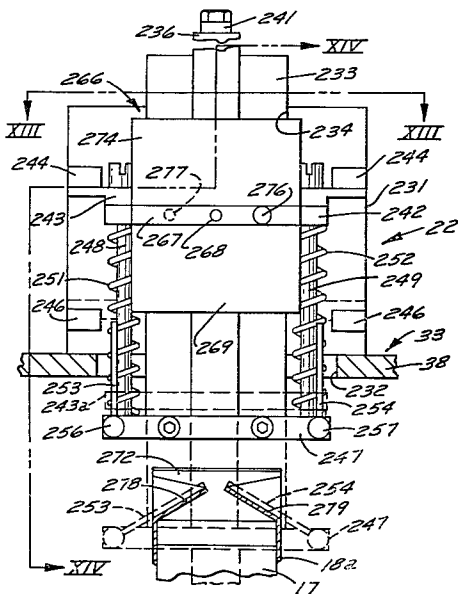
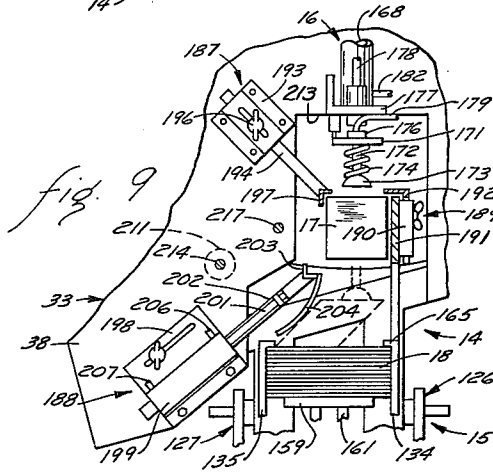
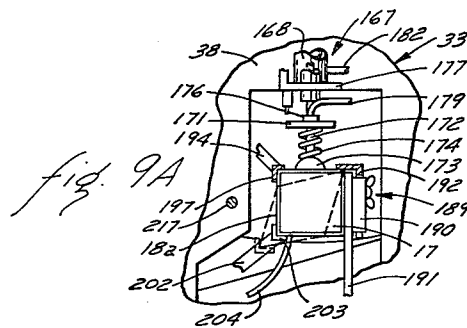
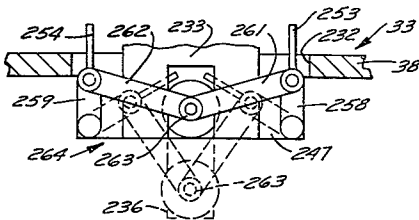
M. A. TERRY

3,064,542

CARTON FORMING MACHINE

Filed Dec. 30, 1960

7 Sheets-Sheet 4



INVENTOR.
Morris A. Terry

BY

Woodhams Blanchard & Flynn
ATTORNEYS

Nov. 20, 1962

M. A. TERRY
CARTON FORMING MACHINE

3,064,542

Filed Dec. 30, 1960

7 Sheets-Sheet 5

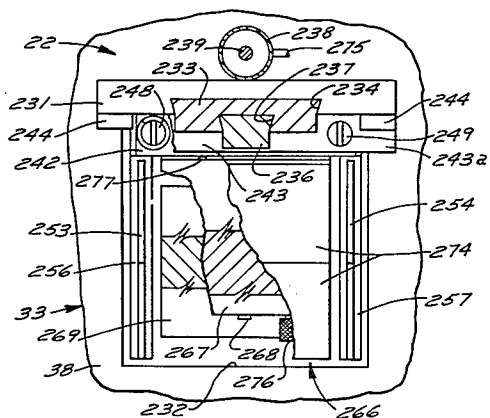


fig. 13

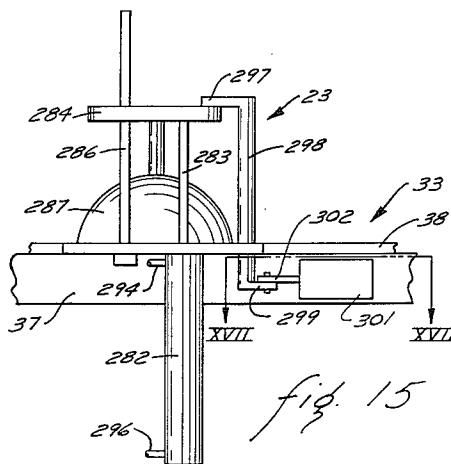


fig. 15

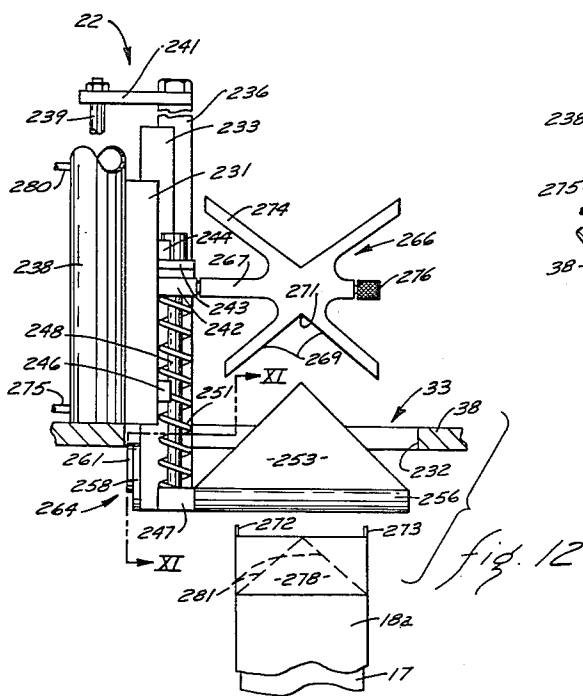


fig. 12

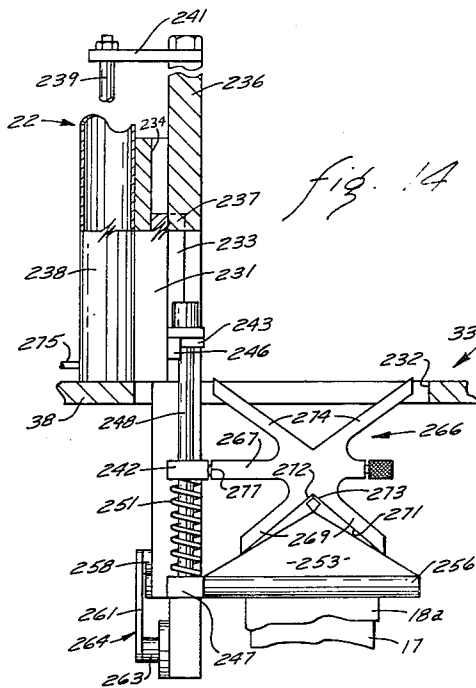


fig. 14

INVENTOR.
Morris A. Terry

BY

Woodhams Blanchard & Flynn
ATTORNEYS

Nov. 20, 1962

M. A. TERRY

3,064,542

CARTON FORMING MACHINE

Filed Dec. 30, 1960

7 Sheets-Sheet 6

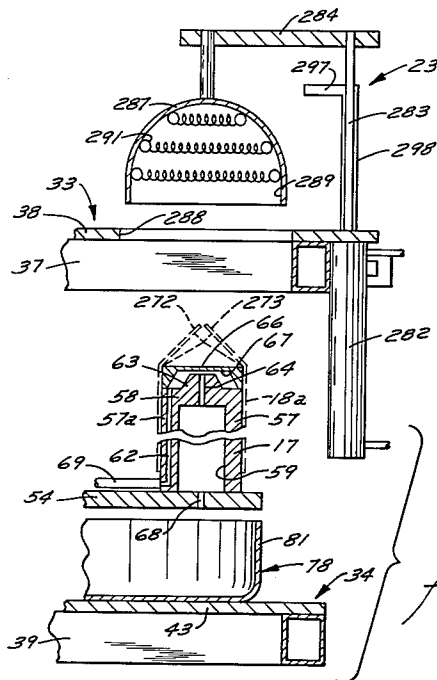


fig. 16

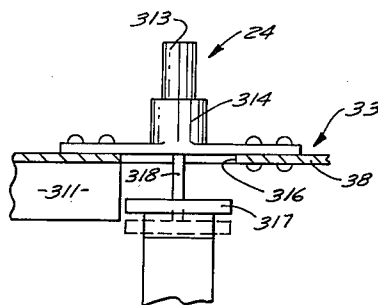


fig. 18

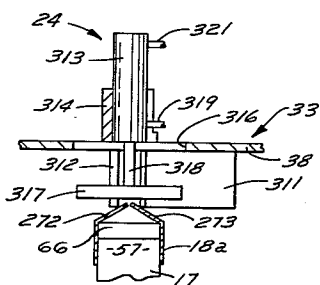


fig. 19

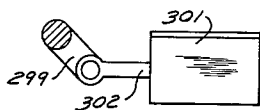


fig. 17

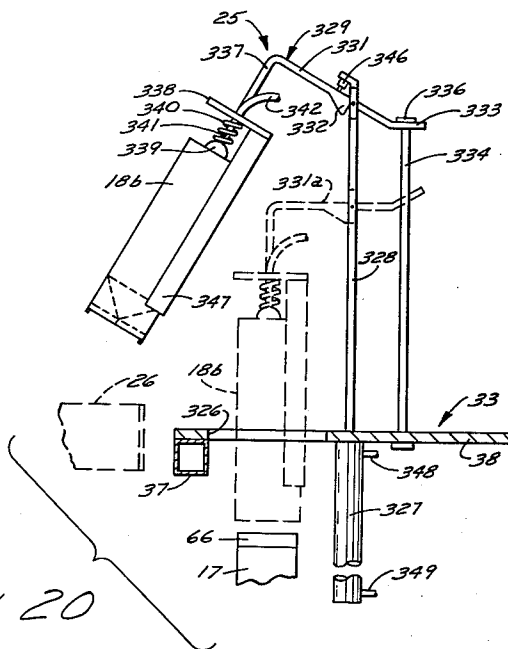


fig. 20

INVENTOR.
Morris A. Terry

BY

Woodhams Blanchard & Flynn
ATTORNEYS

Nov. 20, 1962

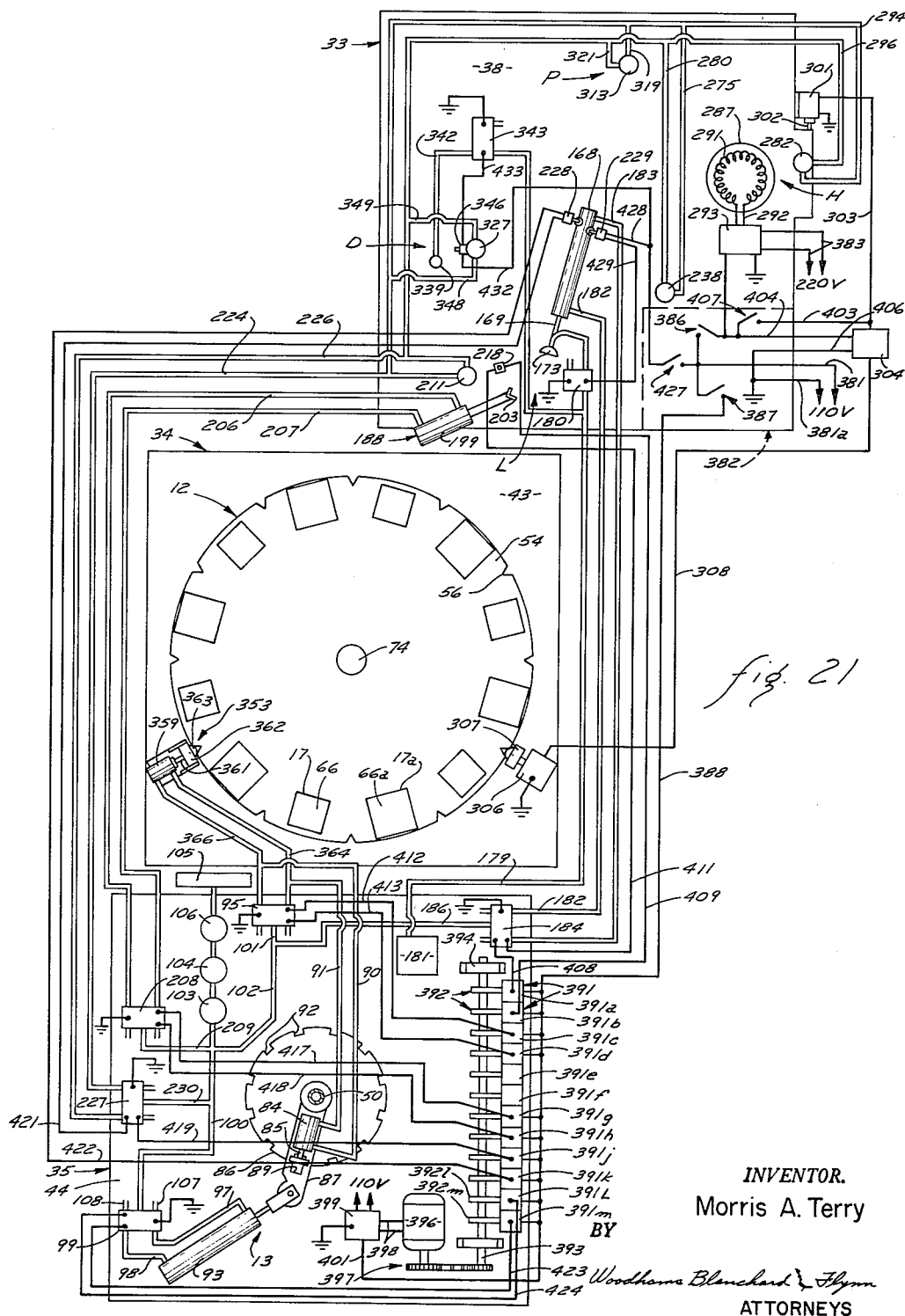
M. A. TERRY

3,064,542

CARTON FORMING MACHINE

Filed Dec. 30, 1960

7 Sheets-Sheet 7



1

3,064,542

CARTON FORMING MACHINE

Morris A. Terry, Portage Township, Kalamazoo County, Mich., assignor to Auto-Pak, Inc., Warsaw, Ind., a corporation of Indiana

Filed Dec. 30, 1960, Ser. No. 79,880

24 Claims. (Cl. 93—44.1)

This invention relates in general to a machine for preforming cartons and, more particularly, to a type thereof for erecting flattened tubular carton blanks having side-walls with integral end panels thereon, and for forming a liquid tight end wall with the end panels at one end thereof.

It has been common practice for many years to use paper or cardboard cartons of various sizes and shapes to package and transport various products, including food. Where liquids, such as beverages, are to be packaged, it is also common practice to coat the carton with a water-proof substance such as wax, plastic material or the like. Heretofore, most milk cartons, for example, have been preformed and coated with wax by large machines which even the larger dairies lease, because of the high initial cost, and which the small dairies cannot afford to even lease. These smaller dairies purchase the preformed and wax-coated cartons from establishments who specialize in preforming and coating the carton blanks. Thus, the milk cartons used by the small dairies are manufactured by carton converters who ship the flattened, tubular carton blanks to a preforming establishment where the blanks are opened or erected and have bottoms formed therein, after which they are shipped to the small dairy. This procedure is costly, time consuming, and requires an excessive amount of storage space for even a small supply of cartons in advance of their need.

For convenience of illustration, reference will be made herein to the adaptation of applicant's invention, which is intended to be used in the preforming of milk or other beverage cartons, because it was this particular type of use which gave rise to the invention. However, it will be recognized that the invention can also be adapted to the preforming of cartons used in many other fields and for many other purposes.

Plastic-coated, cardboard cartons have long been used in packaging operations of various types. However, they have not been widely used as milk cartons and it is applicant's belief that this is largely due to the lack of a suitable, inexpensive preforming machine for converting the plastic coated milk carton from a flattened tubular blank into a container open at one end only. Present preforming machinery has been designed for the purpose of receiving uncoated, carton blanks (i.e. the flattened tubular blanks), erecting the blank into a tubular shape and closing one end of the blank after which a wax coating is applied to the blank. Customarily, some type of glue is applied to the end panels of the uncoated carton to hold them in a position which forms the bottom of the carton. Clearly, this type of machine is not adapted for operation upon a plastic-coated carton wherein the thermoplastic used as a coating also serves as a heat activated adhesive.

It has been recognized by the manufacturers of carton blanks that small dairies might achieve a saving by using a plastic-coated carton which can be shipped directly to the dairy and preformed by the dairy, thereby eliminating the intermediate preforming and waxing operation, and avoiding the present need for excessive storage space. However, the unavailability of an inexpensive machine for effecting the preforming of the plastic-coated cartons is believed to have discouraged the use of plastic cartons, particularly in the small dairies.

The plastic-coated cartons are more desirable than the wax-coated cartons not only because they require less

2

storage space and they can be preformed at the dairy, but also because they do not shed wax particles which give the milk an unpalatable appearance. Moreover, the wax coating creates a fire hazard which is not present in modern plastic coatings for cartons.

Accordingly, a primary object of this invention has been the provision of an automatic machine for receiving a plurality of flattened, tubular carton blanks, which are coated with a thermoplastic and have end panels, and for forming from said end panels an end wall which is held in position by the thermoplastic after heat and pressure are applied thereto.

A further object of this invention has been the provision of a relatively small machine, as aforesaid, for preforming a plurality of milk cartons from flattened, tubular and plastic-coated carton blanks in rapid succession so that said cartons can be stored in their space saving, flattened condition and quickly preformed in a minimum of space and time for immediate use.

A further object of this invention has been the provision of a preforming machine, as aforesaid, which can be efficiently operated with little or no attention, which requires a minimum of cost for operation, which is easy to maintain and keep clean, and which completely satisfies the long standing need for a preforming machine of this type.

Other objects and purposes of this invention will become apparent to persons familiar with this type of equipment upon reading the following specification and examining the accompanying drawings, in which:

FIGURE 1 is a front elevational view of a preforming machine embodying the invention.

FIGURE 2 is a rear elevational view of said preforming machine.

FIGURE 3 is a top plan view of said preforming machine.

FIGURE 4 is a sectional view taken along the line IV—IV in FIGURE 2.

FIGURE 5 is a sectional view taken along the line V—V in FIGURE 2.

FIGURE 5A is a sectional view of FIGURE 5 taken along the line VA—VA of FIGURE 5.

FIGURE 6 is a sectional view taken along the line VI—VI in FIGURE 4.

FIGURE 6A is a sectional view taken along the line VIA—VIA in FIGURE 3.

FIGURE 7 is a sectional view taken along the line VII—VII in FIGURE 3.

FIGURE 8 is a sectional view taken along the line VIII—VIII in FIGURE 3 and rotated approximately 180°.

FIGURE 9 is a sectional view taken along the line IX—IX in FIGURE 7.

FIGURE 9A is a fragment of FIGURE 9 showing a different operating position.

FIGURE 10 is a sectional view taken along the line X—X in FIGURE 3 and rotated approximately 135° clockwise.

FIGURE 11 is a sectional view taken along the line XI—XI in FIGURE 12.

FIGURE 12 is a broken, sectional view taken along the line XII—XII in FIGURE 3.

FIGURE 13 is a broken, sectional view taken along the line XIII—XIII in FIGURE 10.

FIGURE 14 is a broken, sectional view taken along the line XIV—XIV in FIGURE 10.

FIGURE 15 is a fragment of the preforming machine as viewed from the cutting line XV—XV in FIGURE 3.

FIGURE 16 is a broken sectional view taken along the line XVI—XVI in FIGURE 3.

FIGURE 17 is a sectional view taken along the line XVII—XVII in FIGURE 15.

FIGURE 18 is a sectional view taken along the line XVIII—XVIII in FIGURE 3.

FIGURE 19 is a sectional view taken along the line XIX—XIX in FIGURE 3.

FIGURE 20 is a sectional view taken along the line XX—XX in FIGURE 3.

FIGURE 21 is a diagrammatic illustration of the pressure fluid system and electrical circuitry for said preforming machine.

For convenience in reference, the terms "upper", "lower" and words of similar import will have reference to the preforming machine and parts thereof as appearing in FIGURES 1 and 2. The terms "front" and "rear" will have reference to the sides of the machine shown, respectively, in FIGURES 1 and 2. The terms "inner", "outer" and derivatives thereof will have reference to the geometric center of the preforming machine and the axis around which the mandrels thereof are rotated.

General Description

The objects and purposes of the invention, including those set forth above, have been met by providing a portable preforming machine having a magazine for receiving a supply of flattened, tubular carton blanks which have integral end or closure panels from which a bottom wall is formed. A plurality of mandrels are arranged in a circle and supported within the machine by a carrier which is rotated around the axis of said circle. Mechanism is provided for extracting a carton blank from the magazine and for erecting the carton blank while moving it into a loading station directly above a portion of the path of movement of the mandrels. Each mandrel is shaped so that it can slidably and snugly receive an erected carton blank, which is moved downwardly onto the upright mandrel from the loading station. Drive mechanism mounted upon the frame of the machine effects step-by-step unidirectional movement of the mandrels along the circular path so that one mandrel is moved into and out of the loading station with each movement of the mandrels.

Additional stations are disposed in the upper end of the machine frame directly above and uniformly spaced along the path of movement of the mandrels. In this particular embodiment, the first station includes a device for breaking the end panels at the upper end of the erected carton along the scored lines provided therein at the time that the carton blank is manufactured. The second station includes heating mechanism for melting or softening a coating, which may be a thermoplastic coating, on the upper end panels. The third station includes guide means for moving the upper end panels into a substantially horizontal position after which a pressure pad is caused to press the panels firmly against the upper end of the mandrel. A fourth station is equipped with apparatus for automatically removing the preformed cartons from their mandrels.

A cooling system is provided in the machine for cooling the mandrels in order to facilitate the solidification of the plastic coating which is softened during the heating and bottom forming operation. Generally speaking, the various functions of the machine are performed by mechanisms including pressure fluid operated cylinders which are electrically controlled by a central, cam-actuated switch bank.

Detailed Construction

The preforming machine 10 (FIGURES 1, 2 and 3), which has been selected to illustrate a preferred embodiment of the invention, is comprised of a frame structure 11 in which a carrier or conveyor assembly 12 is supported for rotation around a substantially vertical axis. The carrier assembly includes a plurality of upright mandrels 17 arranged in a circle concentric with said vertical axis. Drive mechanism 13 (FIGURE 2) is supported upon the frame structure 11 for the purpose of effecting step-by-step, rotational movement of the carrier assembly 12. A

carton dispensing device 14 is mounted upon and extends sidewardly from the upper portion of the frame structure 11 adjacent the circular path defined by the mandrels 17. The dispensing device includes a magazine 15 for receiving a plurality of flattened, tubular carton blanks 18 in parallel, adjacent and vertical positions. The dispensing device 14 also includes an extracting mechanism 16 for moving one carton at a time from said magazine into the loading station L adjacent the inner end of said magazine and directly above the circular path of said mandrels. Loading mechanism 19 is located adjacent the loading station L for moving an erected carton blank 18a downwardly from the dispensing device 14 onto a mandrel 17.

A prebreaking mechanism 22 (FIGURES 1 and 3) is provided at the prebreaking station P for bending the upper end panels of an erected carton blank 18a along the fold lines provided therein when the blank is fabricated. Heating mechanism 23 is provided at the heating station H for softening the thermoplastic coating on the upper end panels of the erected blank 18a so that said thermoplastic can serve as an adhesive in securing the end panels together to form a bottom wall on the preformed carton 18b (FIGURE 20). A pressure mechanism 24 is located at the pressure station P for the purpose of pressing the bent and heated end panels against the upper end of the mandrel to form the bottom wall on the carton.

Station O (FIGURE 3), which is unused in this particular embodiment, is available for another operation, as may be desired or required. For example, under some circumstances additional pressure and intensified cooling may be effected at this station.

A discharge mechanism 25 is provided at station D for removing a preformed carton 18b (FIGURE 20) from a mandrel 17 and depositing same into a conveniently located receptacle 26.

The various, above-mentioned mechanisms are preferably, but not necessarily powered, by pressure fluid actuated devices, such as those disclosed schematically in FIGURE 21, which are in turn controlled by an electrical circuit such as that also shown in FIGURE 21. For convenience of disclosure, the description of the machine 10 will follow generally the order in which the principal components thereof have been set forth in the preceding paragraphs. Accordingly, the frame structure will be considered first.

Frame Structure

The frame structure 11 (FIGURES 1 and 2) is substantially rectangular and includes four, upright corner legs 27, 28, 29 and 30 which are secured to and support the corners of a top platform 33, a middle platform 34 and a bottom platform 35. The top platform 33 has a plurality of substantially horizontal side bars 37 which extend between and are secured to respective ones of the legs 27, 28, 29 and 30 near the upper ends thereof for the purpose of supporting a plate 38. In a similar manner, the middle platform 34 and bottom platform 35 have side bars 39 and 40, respectively, for the purpose of supporting plates 43 and 44. The corners legs 27, 28, 29 and 30 are preferably, but not necessarily, supported upon casters 46 for easy movement of the machine 10 along a supporting surface.

Carrier Assembly

The carrier assembly 12 includes a preferably hollow shaft 50 (FIGURE 2) which is rotatably supported by, and extends through, the bearings 51 and 52 which are coaxially and centrally supported upon the platforms 34 and 35, respectively. Suitable openings are provided in plates 43 and 44 of said platforms to receive the shaft 50 therethrough. A flanged coupling 53 is mounted upon the upper end of the shaft 50 near to but spaced upwardly from the bearing 51 for securement to and support of the circular carrier plate 54 (FIGURE 2) upon which the upright mandrels 17 are rigidly supported at uniform intervals near the periphery thereof. The mandrels 17

5

are of size and shape to receive an erected blank 18a of the conventional quart size, whereas the mandrels 17a, which are alternated with said mandrels 17, are of size and shape suited to receive an erected carton of the half-gallon size. It follows that mandrels of different sizes and shapes than those specifically mentioned above can be provided at intervals around and upon the carrier plate 54. In this particular embodiment, there are six stations on the top platform 33 identified as L, B, H, P, O and D, thus, to simplify the operation there are 12 mandrels on the carrier plate 54, six of which are the quart size mandrels 17 and six of which are the half-gallon size mandrels 17a, said mandrels being uniformly and alternately located around said carrier plate.

The carrier plate 54 (FIGURE 4) has a plurality, here 12, of notches 56 in the periphery thereof at uniform intervals around said plate, said notches preferably being located between pairs of adjacent mandrels 17 and 17a.

Each mandrel 17 or 17a (FIGURE 16) is substantially rectangular in shape and has four substantially vertical side walls 57 which are secured to and extend upwardly from the carrier plate 54. A top wall 58 is secured to the upper edges of the side walls 57 to define with said sidewalls and the carrier plate 54 the chamber 59 within the mandrel 17. The inner side wall 57a has a vertical passageway 62 which opens sidewardly near the lower end thereof and extends upwardly through the top wall 58. The top wall 58 has a centrally located, upward projection 63 through which an opening 64 extends for communication with the chamber 59. A cap 66 is mounted upon and has the same peripheral shape as the top wall 58. Said cap 66 has a recess 67 in its lower side into which the projection 63 extends and with which the opening 62 and the opening 64 communicate to provide a passageway therebetween. Thus, a coolant can be forced upwardly through the passageway 62 into the recess 67 and then downwardly through the opening 64 into the chamber 59. An opening 68 in the carrier plate 54 communicates with the chamber 59 to permit the outflow of coolant therefrom.

The lower end of the passageway 62 (FIGURE 16) is connected to a conduit 69 which is connected through a distributor 72 (FIGURE 4) and conduit 73 to a fixture 74 on the upper end of the shaft 50 whereby said passageway 62 is connected to the passageway in the hollow shaft 50. The lower end of the hollow shaft 50 (FIGURE 2) is connected by a fixture 76 and a supply conduit 77 to any convenient source, not shown, of coolant under pressure. The fixture 76 is mounted upon the shaft 50 so that said shaft may rotate with respect to said fixture 76 without causing leakage therebetween.

An annular tray 78 (FIGURE 2) has upwardly projecting, inner and outer walls 81 and 82 and is supported upon the middle platform 34 beneath the carrier plate 54 to receive coolant which passes through the coolant outlet openings 68 in said plate 54. A discharge conduit 83 is connected to the tray 78 for draining the coolant therefrom in any convenient manner, or returning same to the supply thereof.

Drive Mechanism

The drive mechanism 13 (FIGURES 1, 2 and 5) for effecting rotation of the carrier assembly 12 is comprised of a ratchet wheel 86 coaxially mounted upon and secured to the shaft 50 near and above the bottom platform 35. A ratchet arm 87 is rotatably supported near one end thereof upon said shaft 50 adjacent the upper surface of the ratchet wheel 86 and extends radially outwardly therefrom to a point beyond the periphery of said ratchet wheel 86.

A pressure fluid actuated cylinder 84 (FIGURE 5A) is mounted upon the arm 87 so that the piston rod 85 of said cylinder is reciprocable lengthwise of said arm and extends from the outer end of the cylinder. The pawl 88 is rigidly secured to the outer end of the piston rod 85 and extends therefrom downwardly through a lengthwise

6

slot 89 in the ratchet arm 87. The ratchet wheel 86 has a plurality of uniformly spaced recesses 92 in the periphery thereof into and out of which the lower end of the pawl 88 is movable by the cylinder 84. A pressure fluid actuated cylinder 93 having a piston rod 94 extending from one end thereof is pivotally supported at its other end by the bracket 96 upon the leg 29. The free end of the piston rod 94 is pivotally secured to the outer end of the ratchet arm 87 whereby actuation of the cylinder 93 effects pivotal movement of the ratchet arm 87.

In this particular embodiment, the ratchet wheel 86 has twelve recesses 92 and the cylinders 84 and 93 are so controlled that they cause the pawl 88 to engage every other recess as said pawl 88 rotates the ratchet wheel in a step-by-step movement. Thus, by causing the pawl 88 to engage initially any one of the six recesses 92a on the wheel 86, the small mandrels 17 will be moved sequentially into and out of positions directly below the stations on the platform 33. By moving the pawl into engagement with one of the six recesses 92b, the large mandrels 17a will be moved sequentially into and out of the various stations. Where three different sizes of mandrels are provided, then the pawl 88 will engage every third recess on the wheel 86.

The ratchet cylinder 93 is connected by conduits 97 and 98 to a solenoid valve 99 which is in turn connected by the conduit 100 to the main conduit 102. An oiler 103, a pressure regulator 104 and a filter 106 are connected by the conduit 102 in series with a source 105 (FIGURE 21) of pressure fluid, such as compressed air. The solenoid valve 99, which may be of a conventional type, has a pair of exhaust ports 107 and 108 selectively connected with the conduits 97 and 98.

The pawl cylinder 84 (FIGURE 5A) is connected by a pair of conduits 90 and 91 to a solenoid valve 95 which is connected by the conduit 101 to the main pressure line 102.

The extending of the piston rod 94 (FIGURE 5), whereby the ratchet wheel 86 is rotated, is positively controlled by engagement between the arm 87 and the adjustable stop 109 mounted upon the bottom platform 35. In this embodiment, the arm 87 engages the adjustable element 110 on the stop 109 when the ratchet wheel has been moved by the pawl 88 to a position where the mandrels 17 are properly aligned with the stations on the top platform 33. A spring loaded pin 111 is also supported upon the bottom platform 35 adjacent the stop 109 for engagement by said arm 87 to cushion its approaching engagement with the stop element 110.

Dispensing Device

The dispensing device 14 (FIGURES 2, 3, 8 and 9) is comprised of an elongated, substantially horizontal and channel shaped magazine 15 including a pair of spaced parallel and horizontal support rails 112 and 113, which are secured at their inner ends to a downwardly offset portion 114 on one of the side bars 37 of the top platform 33. The outer ends of said rails 112 and 113 are connected by a plate 116. The support rails 112 and 113 are preferably tubular with substantially rectangular cross sections, and they have lengthwise slots 117 and 118 in their opposing side walls 119 and 120, respectively (FIGURES 6 and 6A). The rails have a plurality, here three, of horizontal, parallel guide pins 123 and 124 extending sidewardly therefrom.

A pair of substantially U-shaped side members 126 and 127 have horizontal base bars 128 and 129, respectively, with appropriate openings therein through which the guide pins 123 and 124 are slidably received for supporting said side members 126 and 127 in upright positions. The side members 126 and 127 have upwardly extending arms 132 and 133, respectively, to the inner surfaces of which are secured the horizontal, parallel guide rods 134 and 135 for the purpose of engaging and guiding a supply of carton blanks 18 (FIGURE 3) disposed therebetween.

The base bars 128 and 129 (FIGURE 6) have downwardly extending projections 137 and 138 (FIGURES 2 and 6A) between the ends thereof to which a pair of inwardly extending, substantially coaxial and internally threaded sleeves 141 and 142 are connected, respectively. A pair of screws 143 and 144 which have righthand and lefthand threads, respectively, are threadedly received into the sleeves 141 and 142 and are coaxially connected together by a rod 146 which extends through the downward projection 137 where it is secured to a hand wheel 147. The portion of the rod 146 between the screws 143 and 144 is received into a downwardly opening slot in the T-shaped bracket 149 which is secured to, and extends between, the support rails 112 and 113. Accordingly, rotation of the rod 146 by the hand wheel 147 effects rotation of the screws 143 and 144 whereby the sleeves 141 and 142, hence the side members 126 and 127 are simultaneously moved toward or away from each other to adjust the width of the magazine 15 to the carton blanks 18 held therein.

A slider 152 (FIGURES 4, 6 and 6A) is supported upon and substantially between the support rails 112 and 113 for movement lengthwise thereof. Said slider 152 has a body member 153 upon which two pair of rollers 154 and 156 are rotatably mounted for reception into the slots 117 and 118, respectively, whereby said slider 152 is supported upon the support rails 112 and 113 for movement lengthwise thereof. A pair of rollers 157 are mounted upon the upper surface of the body member 153 for engagement with the opposing side walls 119 and 120, respectively, of said rails. An upright pedestal 158, having a manually engageable handle 160, is supported upon the body member 153 so that it overlies, but is spaced slightly above, the upper surfaces of the support rails 112 and 113.

A substantially vertical pressure plate 159 is pivotally supported upon the pedestal 158 by the links 161 for engaging the outer blank in a group of parallel, adjacent carton blanks 18 supported upon and within the magazine 15. An elongated flexible element, such as the chain 162 (FIGURES 2 and 4), is secured at one end to the inner side of the slider 152 and extends over pulley means 163 and downwardly therefrom where it is connected to a weight 164 for continuously urging the slider 152 inwardly toward the frame structure 11. A tube 166 is mounted upon the frame structure 11 directly below the inner end of the magazine 15 for slidably receiving the weight 164 and guiding its upward and downward movement in response to the inward and outward movement of the slider 152. The inner ends of the guide rods 134 and 135 are bent toward each other to provide stop means 165 (FIGURE 9) for engaging the opposite edges of the carton blanks 18 (FIGURE 3) so that the pressure plate 159, under the urging of the weight 164, will not push the blanks through the inner end of the magazine 15.

Extracting Mechanism

The dispensing device 14 also includes a blank extracting mechanism 16 which is mounted upon the top platform 33 adjacent to, and spaced inwardly from, the inner end of the magazine 15. The extracting mechanism 16 (FIGURES 3, 8 and 9) includes a pressure fluid actuated cylinder 168 supported upon the platform 33 so that an extension of its lengthwise axis preferably passes lengthwise through the magazine 15. The cylinder 168 has a piston rod 169 secured to an upright mounting plate 171 through which a plurality of substantially parallel and horizontal suction cup pipes 172 are slidably received for movement toward and away from the magazine 15. A plurality of suction cups 173 are mounted upon the outer ends of the pipes 172, and spiral springs 174 encircle the pipes between the cups 173 and the mounting plate 171 for resiliently urging the cups 173 away from said mounting plate. The pipes 172 have heads 176 on their inner ends for limiting outward movement of the rods 172, hence the cups 173, away from the mounting plate 171.

An upright guide plate 177 is mounted adjacent the outer end of the cylinder 168, and both the piston rod 169 and a guide rod 178, which is rigidly secured to the mounting plate 171, are slidably received through the plate 177. The stroke of the piston rod 169 and the length of the guide rod 178 are such that the suction cups 173 can be moved by said cylinder 168 into engagement with a carton blank 18 held in the magazine 15 by the stops 165 on the rods 134 and 135. Thereafter, said carton blank is moved by said cups 173 from its position within the magazine 15 into the loading station L directly above the path defined by the circular movement of the mandrels 17. The pipes 172 are connected by conduits 179 to a source 181 (FIGURE 21) of suction pressure. The cylinder 168 is connected by a pair of conduits 182 and 183 to a solenoid valve 184 which is in turn connected to the main pressure conduit 102 (FIGURE 5) by the conduit 186.

Erecting Units

The dispensing device 14 also includes a pair of erecting units 187 and 188 (FIGURES 8 and 9) which cooperate with a positioning mechanism 189 for erecting the carton blank 18 as it is moved from its flattened position in the magazine 15 into the loading station L (FIGURE 9).

The positioning mechanism 189 is comprised of a substantially upright backing plate 191 (FIGURE 9) which is mounted upon and extends inwardly from the side member 126 so that it extends substantially vertically upwardly from the circular path defined by the mandrels 17 adjacent the loading station L and substantially parallel with the leading surface of the mandrel 17 disposed directly below said loading station. An upright stop bar 192 is adjustably mounted upon the backing plate 191 by the guide device 190 so that said stop bar extends sideways from said backing plate 191 directly above an inner corner of the mandrel 17 therebelow. Thus, the bar 192 will engage one edge of a carton blank as it is moved by the extracting mechanism 16 inwardly from the magazine 15.

The erecting unit 187 (FIGURE 9) includes a slide guide 193 in which a guide bar 194 is adjustably supported in a substantially horizontal position upon and adjacent the upper surface of the top platform 33. Said bar 194 is rigidly held in a selected position by the wing nut 196. The inner end of the guide bar 194 is connected to an upright corner member 197 which is movable with said bar 194 into a position directly above the other inner corner of the mandrel 17 below the loading station for cooperation with the stop bar 192. That is, when a carton blank 18 is moved from its flat position (FIGURE 9) into its erected position 18a (FIGURE 9A) the inner corners of the erected carton are engaged by the stop bar 192 and corner member 197 to limit such inward movement.

The erecting unit 188 (FIGURE 9) is comprised of a base member 198 which is adjustably supported upon the top platform 33 for movement toward and away from the loading station L. A pressure fluid actuated cylinder 199 is supported upon the base member 198 and has a piston rod 201 connected to a guide bar 202 which is slidably supported within the base member 198 and is substantially parallel with and below the piston rod 201 for movement therewith. An upright corner member 203 is secured to the inner end of the guide bar 202 for movement, as shown in FIGURE 9A, into and out of a position defining with the corner member 197 and the stop bar 192 a square area substantially identical with the cross-sectional area of the erected carton 18a. A plurality of arcuate guide strips 204 are secured to the corner member 203 and curve outwardly therefrom toward the side member 126. The cylinder 199 is connected by a pair of conduits 206 and 207 (FIGURE 21) to a solenoid

valve 208 which is in turn connected by the conduit 209 to the main pressure conduit 102.

Loading Mechanism

The loading mechanism 19 (FIGURES 3, 7 and 8) is supported by fluid actuator cylinder 211 supported in an axially vertical position on the top platform 33 adjacent to the loading opening 213 in the plate 38, which is in the loading station L directly above a mandrel 17. The loading mechanism includes an axially vertical, pressure fluid actuated cylinder 211 having a piston rod 214, which extends upwardly through the plate 38. A substantially horizontal arm 216 is connected to the upper end of the piston rod 214 and extends between the corner members 197 and 203 (FIGURE 9) directly over the opening 213. A guide rod 217 (FIGURE 7) is secured to the plate 38 and extends upwardly therefrom parallel with the piston rod 214 for slidable reception through an opening in the arm 216. A microswitch 218 is mounted upon the upper end of the rod 217 for engagement by said arm 216 when the piston rod 214 is in its substantially fully extended position, as appearing in FIGURE 7.

The switch 218 (FIGURE 21) is electrically connected in the circuit of the solenoid valve 184 so that the cylinder 168 cannot be operated until the arm 216 is in its raised position.

A flat substantially horizontal loading plate 219 (FIGURES 7 and 8) is supported upon the arm 216 near its free end by a pair of substantially parallel support rods 221 which are secured to the loading plate 219 and extend upwardly and slidably through openings in the arm 216. The rods 221 have heads 222 on their upper ends which limit their downward movement with respect to the arm 216 by engaging the upper surface thereof. Spiral springs 223 encircle the rods 221 between the arm 216 and the plate 219 whereby said plate is continuously urged downwardly from the arm 216. The loading plate 219 is preferably shaped and held so that it is engaged by the upper portions of the corner member 197 and stop bar 192 which help to guide said plate 219 into engagement with the upper edges of an erected carton blank 18a disposed in the loading position and engaged by the corner member 203.

The cylinder 211 (FIGURE 21) is connected by conduits 224 and 226 to the solenoid valve 227, which is in turn connected to the main pressure supply conduit 102 by the conduit 230. A switch 228 (FIGURE 3) is mounted upon the top platform 33 adjacent the cylinder 168 for engagement by the guide rod 178 of the extracting mechanism 16 when the piston rod 169 is substantially fully retracted. The switch 228 (FIGURE 21) is electrically connected in series with the solenoid valve 227 and its input terminal so that the cylinder 211 cannot be operated until the piston rod 169 is nearly fully retracted. A switch 229 is mounted upon the top platform 33 adjacent the cylinder 168, also for engagement by the guide rod 178 when the piston rod 169 is in a substantially retracted position. The switch 229 is electrically connected in series with the solenoid valve 180 to control the operation thereof.

Prebreaking Mechanism

The prebreaking mechanism 22, which is located at the prebreaking or bending station B (FIGURE 3) is comprised of an upright mounting plate 231 (FIGURES 10 and 12), which is secured to and extends upwardly from the top platform 33 adjacent the prebreak opening 232 in the plate 38. An inner slide 233 (FIGURE 13) is slidably and snugly disposed within the vertical groove 234 in the outer face of the mounting plate 231 so that said slide can move downwardly into the prebreak opening 232 adjacent its inner edge. An outer slide 236 is slidably disposed within a groove 237 in the outer face of the inner slide 233 for vertical movement with respect thereto. A pressure fluid actuated cylinder 238 is mount-

ed in an axially vertical position upon the top plate 38 adjacent the inner side of the mounting plate 231. The upper end of the piston rod 239 on said cylinder 238 is connected by a substantially horizontal arm 241 to the upper end of the outer slide 236 (FIGURE 12) for effecting upward and downward movement of the outer slide 236 with respect to both the inner slide 233 and the mounting plate 231.

A substantially horizontal cross bar 242 is secured between the ends thereof to the outer slide 236 and it extends sidewardly beyond both vertical edges of the inner slide 233. The inner slide 233 has a horizontal cross bar 243 secured to the outer face thereof and extending sidewardly therefrom so that it overlies the cross bar 242. A pair of upper stops 244 and lower stops 246 are mounted upon the outer face of the mounting plate 231 near the opposite vertical edges thereof. The stops 244 and 246 are arranged upon the mounting plate 231 so that they are engaged by the outer ends of the bar 243 to limit upward and downward movement of said bar and, accordingly, upward and downward movement of the inner slide 233 to which said bar 243 is connected. However, the cross bar 242 is not engageable with the stops 244 or 246.

A horizontal cross bar 247 is mounted upon the outer face of the inner slide 233 near the lower end thereof, so that it extends sidewardly to about the same extent as the cross bar 242. A pair of parallel, vertical guide rods 248 and 249 are secured at their lower ends to the cross bar 247 near the opposite ends thereof and extend upwardly and slidably through appropriate openings in the opposite ends of the cross bar 242. The upper ends of the guide rods 248 and 249 are secured to the cross bar 243. A pair of spiral springs 251 and 252 are sleeved upon the guide rods 248 and 249, respectively, between the cross bars 242 and 247. Accordingly, the cross bar 242 is resiliently urged upwardly against the cross bar 243, whereby vertical movement of the outer slide 236 results in corresponding movement of the inner slide 233, within the limits imposed by the upper and lower stops 244 and 246, respectively. However, when the bar 243 is against the lower stops 246, as indicated in broken lines at 243a in FIGURE 10, the outer slide 236 can continue its downward movement, even though the inner slide 233 is stopped, by compressing the springs 251 and 252 between the cross bars 242 and 247.

A pair of triangularly shaped blades 253 and 254 are secured to and extend upwardly from the parallel spaced, and substantially horizontal shafts 256 and 257 (FIGURE 10). The corresponding inner ends of the shafts 256 and 257 are rotatably supported upon and extend through the opposite ends of the cross bar 247 for engagement with a pair of links 258 and 259 (FIGURE 11), whereby rotation of said links around the axes of said shafts will effect corresponding pivotal movement of said blades 253 and 254 as shown in solid and broken lines in FIGURE 11. The outer ends of the links 258 and 259 are pivotally connected to link bars 261 and 262 which are in turn connected at their opposite ends by the pivot pin 263 to the lower end of the outer slide 236 on the inner side thereof. Accordingly, relative movement between the inner and outer slides operates through the linkage 264, including the links 258 and 259 and the link bars 261 and 262, to effect pivotal movement of the blade 253 and 254.

A forming head 266 has a central, substantially horizontal plate 267 which is pivotally supported near the center of one edge thereof upon the outer face of the cross bar 242, midway between its edges, by a pivot pin 268. A pair of downwardly diverging plates 269 (FIGURE 12) are integral with (or secured to) the upper side of the plate 267 so that the center of the V-shaped groove 271 defined thereby is substantially parallel with the lengthwise extent of the cross bar 242. The amount of divergence in said lower plates 269 is dependent upon the amount of bending which will be applied to the closure

panels 272 and 273 on the erected blank 18a (FIGURE 14) by the head 266 during the prebreak operation. The lower plates 269 are designed in this particular embodiment for engaging the panels 272 and 273 on a quart size milk carton.

A pair of upwardly diverging plates 274 (FIGURE 12) are secured to the upper side of the plate 267 for engaging the side panels on a half-gallon carton. A handle 276 is mounted on the outer edge of the plate 267 for rotating same around the pivot pin 268 to move the upper plates 274 into the downwardly diverging position, which is occupied by the lower plates 269 in FIGURE 12. Detent means indicated in broken lines at 277 in FIGURE 10 is provided on the adjacent sides of the cross bar 242 and the plate 267 for releasably holding the plate 267 in the horizontal position with the plates 269 and 274 in their FIGURE 10 position or in their reversed positions.

The blades 253 and 254 are engageable with the end closure panels 278 and 279 (FIGURE 10) extending between the side closure panels 272 and 273 for bending said end panels toward each other along the score lines 281 therein, which simultaneously causes the side panels 272 and 273 to be bent or broken toward each other. The power cylinder 238 is connected by a pair of conduits 275 and 280 (FIGURE 21) to the conduits 224 and 226, respectively, which are connected, as stated above, to the solenoid valve 227, whereby operation of the power cylinder 238 is controlled.

Heating Mechanism

The heating mechanism 23 (FIGURES 1 and 3), which is located at the heating station H, includes a pressure fluid actuated cylinder 282 (FIGURE 15) which is supported beneath the platform 33 and has a piston rod 283 extending vertically upwardly through the plate 38. The upper end of the piston rod 283 is secured to a support plate 284. A guide rod 286 is secured to the plate 38 and extends upwardly therefrom parallel with the piston rod 283 for slidable reception through an opening in the support plate 284. A downwardly opening, heating shell 287 (FIGURE 16) is mounted upon and suspended from the inner end of the support plate 284 for vertical movement through a heating opening 288 in the plate 38 in response to vertical movement of said piston rod 283. The heating shell 287 has a downwardly opening chamber 289 which, in this particular embodiment, is lined with heating elements 291 (FIGURE 21) electrically connected by conductors 292 to a heating relay 293, which is connected to a 220 volt potential.

The cylinder 282 is connected by conduits 294 and 296 to the conduits 275 and 280, respectively, which, as stated above, are connected by the conduits 224 and 226 to the solenoid valve 227. Accordingly, the solenoid valve 227 also controls the operation of the power cylinder 282.

The upward movement of the piston rod 283, hence the heating shell 287, is limited by the sidewardly extending finger 297 on the vertical post 298 which is mounted upon the plate 38 adjacent the power cylinder 282 (FIGURE 15) for rotation around its lengthwise, vertical axis. The lower end of the post 298 extends downwardly below the plate 38 and has a sidewardly extending crank arm 299 integral therewith. A solenoid 301 is mounted below the platform 33 (FIGURES 15 and 17) adjacent the post 298 and has a core bar 302 pivotally secured at its outer end to the outer end of the crank arm 299. Thus, lengthwise movement of the core bar 302 in response to electrical energization of the solenoid 301 effects a pivotal movement of the post 298 around its vertical axis whereby the finger 297 is moved away from its position above the support plate 284. This permits the cylinder 282, acting through the piston rod 283, to move the support plate 284, hence the heating shell 287, upwardly from the FIGURE 15 position thereof into the FIGURE 16 position thereof to prevent burning of a carton 18a

mounted upon the mandrel 17. The solenoid 301 is connected by a conductor 303 (FIGURE 21) to a time delay relay 304 which energizes the solenoid after a selected time interval.

Movement of the heating shell 287 from its FIGURE 15 position to its FIGURE 16 position is dependent upon the duration of the time interval during which the carrier plate 54 (FIGURE 21) is standing motionless. Thus, a plunger operated switch 306 is mounted upon the middle platform 34 so that its plunger 307 is engageable with the periphery of the carrier plate 54. Whenever the plunger 307 is disposed within one of the notches 56 in said plate 54, the switch 306 is closed and causes the time delay relay 304 to initiate a timing cycle. As soon as the plunger 307 is moved out of a notch 56, by rotation of the carrier plate 54, the switch 306 opens and thereby stops the timing cycle of the time delay relay, which cycle is restarted as soon as the plunger 307 is received into another notch 56.

Pressure Mechanism

A pressure mechanism 24 is located upon the top platform 33 adjacent the pressure station P for pressing the side panels 272 and 273, hence the end panels 278 and 279, of the erected carton blank 18a against the upper end of the mandrel 17, upon which the carton blank is supported. The side panels 272 and 273, as well as the end panels 278 and 279, are placed in the proper position for the application of pressure thereto, as described above, by means of the two guide bars 311 and 312 (FIGURES 3 and 19) which are secured to the lower surface of the plate 38 between the heating station H and the pressure station P directly over the path of movement of the mandrels 17. Said guide bars, which converge toward each other in the direction of movement of mandrels, extend downwardly from the plate 38 so that they clear the upper ends of the mandrels 17 passing thereunder while forcing the panels 272, 273, 278 and 279 (FIGURE 19) to be moved as close to the top of the mandrel as possible.

The pressure mechanism 24, which is located directly adjacent the converged ends of the guide bars 311 and 312, is comprised of a pressure fluid actuated cylinder 313 which is supported upon the plate 38 by the bracket 314 directly over the pressure pad opening 316 in said plate 38. A pressure pad 317 is mounted upon the lower end of the piston rod 318 of said cylinder 313 for movement upwardly and downwardly thereby between a position slightly above the lower edges of the guide bars 311 and 312 and a position adjacent the upper surface of the cap 66 on a mandrel 17. The pressure pad 317 is preferably slightly larger than the surface area of the cap 66 (or 66a on a large mandrel 17a).

The cylinder 313 is connected (FIGURE 21) by a pair of conduits 319 and 321 to the conduits 275 and 280, respectively, which are connected by the conduits 224 and 226, respectively, to the solenoid valve 227.

An additional, unused or open station O (FIGURE 3) is provided in the machine 10 for expansion or modification of the functions performed thereby.

Discharge Mechanism

The discharge mechanism 25 (FIGURE 3) is located at the discharge station D on the top platform 33 adjacent the discharge opening 326 in the plate 38. The discharge mechanism 25 (FIGURE 20) is comprised of a pressure fluid actuated cylinder 327 which is supported from the plate 38 in an axially vertical position and which has a piston rod 328 extending upwardly through the plate 38. A substantially L-shaped member 329 has a substantially horizontal arm 331 which is pivotally mounted intermediate the ends thereof upon the upper end of the piston rod 328. A downwardly extending stop 332 on the arm 331 is engageable with the piston rod 328 for stopping counterclockwise rotation of the

13

arm 331, as appearing in FIGURE 20, when said arm 331 reaches the substantially horizontal position shown in broken lines at 331a. The inner end of the arm 331 is provided with a loop 333 through which an actuating rod 334 is slidably received. The lower end of the rod 334 is secured to the plate 38 so that said rod is substantially parallel with the lengthwise extent of the piston rod 328. The upper end of the rod 334 has a head 336 which is engageable with the upper side of the loop 333, when the piston rod 328 is in its fully extended position, for the purpose of pivoting said horizontal arm 331 around its point of support upon said piston rod.

The pivot member 329 (FIGURE 20) also has an arm 337 which is secured to and extends downwardly and substantially at right angles from the horizontal arm 331 near its outer end. A support plate 338 is secured to the lower end of, and is substantially perpendicular to, the vertical arm 337. A pair of suction cups 339 are secured to, and communicate with the lower ends of, a pair of substantially parallel pipes 341, which are slidably supported upon the support plate 338 for limited lengthwise movement with respect to said plate 338. The pipes are encircled by a pair of spiral springs 340 which urge the cups 339 away from the plate 338. The upper ends of said pipes 341 are connected by conduits 342 (FIGURE 21) to a solenoid valve 343 which is connected to the suction line 179 leading to the suction pump 181.

A switch 346 (FIGURE 20), which is mounted upon the upper end of the piston rod 328 for operation by the arm 331, is connected in series with the solenoid valve 343 (FIGURE 21) to terminate the suction through the solenoid valve 343 (FIGURE 21) when the piston rod 328 is fully extended.

A channel-shaped chute 347 is secured to, and extends downwardly from the support plate 338 along the inner edge thereof for engaging the inner side wall of a formed carton 18b which is engaged and supported by the suction cups 339. Thus, when the chute 347 is in its solid line position (FIGURE 20) and the suction pressure is released at the cups 339, the chute 347 will guide the formed carton 18b as it moves downwardly away from the suction cups 339 into a receptacle 26. The cylinder 327 is connected by the conduits 348 and 349 to the conduits 275 and 280, respectively, which are connected by conduits 224 and 226 to the solenoid valve 227.

Braking Mechanism

In order to effect exact positioning of the carrier assembly 12 after each rotational movement thereof, a brake mechanism 353 (FIGURE 4) is provided in association with the carrier plate 54.

The brake mechanism 353 (FIGURES 4 and 21) includes a fluid pressure actuated cylinder 359 which is supported upon the middle platform 34 adjacent the periphery of the carrier plate 54 and it has a piston rod 361 movable toward and away from the carrier plate 54 along an extended radius of the carrier plate. A braking head 362 is mounted upon the free end of the piston rod 361 for engagement with the periphery of the carrier plate 54. A projection 363 on the head 362 is receivable into any one of the notches 56 for positively positioning the carrier plate 54 and holding same against an accidental movement with respect to the platform 34 after the pawl 88 is disengaged from the ratchet wheel 86. The cylinder 359 (FIGURE 21) is connected by a pair of conduits 364 and 366 to the conduits 90 and 91, respectively, which are connected to the solenoid valve 95.

Electrical System

The electrical circuitry and pressure fluid system are disclosed diagrammatically in FIGURE 21, which shows the circuit and system in association with the components on the platforms 33, 34 and 35 of the machine 10 to which the circuit and system are connected. The electrical circuitry includes input conductors 381 and 381a

14

which lead from any convenient source of 110 volt A.C. electrical potential to a control panel 382 on the upper platform 33. A pair of conductors 383 lead from a convenient source of 220 volt electrical potential to the heater relay 293, which is connected between the heating elements 291 in the heating shell 287 and the input conductor 381, through a heater control switch 386 on the control panel 382.

The input conductor 381 is connected through the main machine switch 387 by the conductor 388 to each of the microswitches 391 in the bank of such switches which is supported upon the bottom platform 35. Each of said switches 391 is engaged by a cam 392 supported upon a shaft 393 for rotation thereby to effect the desired operation of the switches 391. The shaft 393 is supported by bearings 394 and connected to a motor 396 by a drive assembly 397. Adjustment in the rotational speed of the cam shaft 393 may be effected by changing the belt and pulleys of the drive assembly 397. The motor 396 is connected by conductors 398 to a relay 399 which is connected to a 110 volt source. The relay 399 is also connected to the conductor 401 to the conductor 388 for control by the machine switch 387.

The time delay relay 304 is electrically connected by the conductors 404 and 406 to the input conductors 381 and 381a, respectively, through heater switch 386. A solenoid control switch 407 is provided in the conductor 404 at the control panel 382 for manual control over the solenoid 301.

The switch 391b is connected in series with the switch 218 and the solenoid valve 184 by the conductors 409 and 411, respectively. Switch 391a is connected to the solenoid 184 by conductor 408 to control the flow of pressure fluid through the conduit 182 for retracting the piston rod 169. Switch 391b and switch 218 control the flow of pressure fluid through the solenoid valve 184 into the conduit 183 whereby the piston rod 169 is extended. Thus, this latter operation of the solenoid valve cannot be effected unless the switch 218 is closed, which closure is dependent upon the full extension of the piston rod on the pressure fluid cylinder 211.

Switches 391c and 391d (FIGURE 21) are connected by conductors 412 and 413 to the solenoid valve 95 for the purpose of controlling the flow of pressure fluid through the conduits 90 and 91 whereby the pawl cylinder 84 is actuated. The valve 95 also controls fluid flow through the conduits 364 and 366, whereby the brake mechanism 353 is operated.

The switches 391e and 391f (FIGURE 21) are unused in this embodiment. The switches 391g and 391h are connected by conductors 417 and 418 to the solenoid valve 208 whereby the flow of pressure fluid to the cylinder 199 is controlled.

The switch 391j is connected by a conductor 419 to the solenoid valve 227, whereby the flow of pressure fluid through the conductor 224 is controlled. The switch 391k is connected through the switch 228 to the solenoid valve 227 by the conductors 421 and 422 for the purpose of controlling the flow of pressure fluid through the solenoid valve 227 into the conduit. Thus, the pressure fluid cannot flow into the conduit 226 until the switch 228 is closed by the substantially full retraction of the piston rod 169 of the cylinder 168 by which the switch 228 is operated.

Since the power cylinders 211, 327, 313, 282 and 238 are all supplied for operation in one direction by the pressure fluid flowing through the conduit 226, the operation of these power cylinders is dependent upon the operation of the switch 228 and 391j. Reverse operation of these cylinders is effected by operation of switch 391k, only.

The switches 391m and 391l are connected, respectively, by the conductors 423 and 424 to the solenoid valve 99 which controls the flow of pressure fluid to the ratchet cylinder 93.

15

The suction developed in the suction cups 173 (FIGURE 21) is controlled by the solenoid valve 180 which is electrically connected to the source by the conductors 428 and 429 through the switch 229 and the control switch 427 on the control panel 382. The control switch 427 connects the conductor 428 to the power input line 381.

The suction developed in the cups 339 is controlled by the solenoid valve 343 which is electrically connected to the switch 346, associated with the power cylinder 327, by the conductor 433. The switch 346 is connected to the conductor 428 by the conductor 432.

Operation

The preforming machine 10 (FIGURE 1) by which the applicant discloses his invention, is placed in condition for operation by manually grasping the handle 160 on the slider 152, which is disposed within the magazine 15, and moving same along the support rails 112 and 113 away from the loading station L. A supply of flattened carton blanks 18 is placed in the magazine 15 so that the innermost carton blank has its opposite vertical edges bearing against the stops 165 on the guide rods 134 and 135, as shown in FIGURES 3 and 9. The erecting units 187 and 188 and the positioning mechanism 189 are adjusted for the size of carton to be preformed, such as a quart size milk carton. Where both small and large mandrels 17 and 17a are provided on the same carrier plate 54, the carrier assembly 12 is adjusted so that the mandrels of the selected size will be moved sequentially into and out of the loading position beneath the loading station L, as well as the other stations B, H, P and D.

As shown in the drawings, the carrier assembly is arranged so that the small mandrels 17 move into the various stations. However, the carrier 12 and drive mechanism 13 can be adjusted so that the large mandrels 17a move into the above-mentioned stations by rotating the carrier assembly 12 so that the projection 363 is received into the next adjacent notch 56 in the carrier plate 54. As a result of this movement, the pawl 88 will now be received into the recess 92b in the ratchet wheel 86. This adjustment is advantageously accomplished when the machine 10 is de-energized so that the cylinder 359 of the brake mechanism 353 and the pawl cylinder 84 are inoperative and do not oppose such movement.

The cams 392 on the cam shaft 393 (FIGURE 21) are properly set so that they effect operation of their corresponding switches 391 to operate their related solenoid valves in the proper and desired sequence. The various connections are made to appropriate sources of electrical potential and a source of pressure fluid. The machine is energized for operation by closing the switches 386, 387 and 427 on the control panel 382. More specifically, closure of the switch 386 operates the relay 384 whereby the heating elements 291 are energized and also energizes the time delay relay 304 whereby said relay will pass current through the solenoid 301 within a predetermined period of time if, during that time, a signal is not sent to the timer through the conductor 303 by the switch 306 which resets the time delay relay. Closure of the switch 427 energizes the system including the solenoid valves 180 and 343 which are connected, respectively, to the switches 229 and 346.

Closure of the machine switch 387 energizes all of the microswitches 391 and initiates rotation of the cam shaft 393 by the motor 396, whereby the operation of the machine is commenced immediately. More specifically, the cylinder 168 of the extracting mechanism 16 is operated so that the suction cups 173 are moved through the loading station L into engagement with the first carton blank 18 disposed in the magazine 15. The cylinder 168 is then actuated in the opposite direction so that the suction cups 173 draw the carton 18 past, and be-

16

tween, the guide strips 204 on the corner member 203 and the backing plate 191 at the inner ends of the side member 126. The extracting mechanism 16 continues to move the carton blank toward the center of the machine 10 until the two leading corners of the carton blank engage the stop bar 192 and the corner member 197 whereupon the switch 229 is operated to terminate the suction in the cups 173. At substantially the same time, the cylinder 199 of the erecting unit 188 is operated to cause its corner member 203 to move into engagement with a third corner of the erected carton 18a and hold said carton in its loading position (FIGURE 9a).

The power cylinder 211 of the loading mechanism 19 is now automatically energized whereby the loading plate 219 is moved downwardly against the upper end panels 272 and 273 on the carton blank 18a for the purpose of moving said carton blank downwardly through the loading opening 213 in the plate 38 onto the mandrel 17 disposed therebelow. When the loading plate has been moved back upwardly by the cylinder 211 into a position where the switch 218 is operated, the power cylinder 93 is then operated to effect rotation of the carrier assembly 12 whereby a second mandrel is moved into the loading station L and the first above-discussed mandrel with an erected carton blank 18a thereon is moved into the bending station B, beneath the prebreak mechanism 22.

In the bending or prebreak station, the power cylinder 238 is operated so that the inner and outer slides 233 and 236, respectively, are moved downwardly through the opening 232 in the upper plate 38, whereby the blades 252 and 253 are caused to engage the end panels 278 and 279 to bend them inwardly after which the forming head 266 is caused to engage the side panels 272 and 273 to bend them downwardly toward the top of the mandrel. The power cylinder 238 is then actuated in the reverse direction, whereby the inner and outer slides are moved upwardly along with their blades and forming head.

At a selected, short interval following the full upward movement of the slides 233 and 236, the ratchet cylinder 93 is again operated whereby the carrier assembly 12 is rotated so that a third mandrel 17 is moved into the loading station L, the second above-mentioned mandrel is moved into the bending station B and the first above-mentioned mandrel is moved into the heating station H.

In this particular embodiment, the cam shaft 393 is rotated through 360 degrees between each operation of the ratchet cylinder 93, which is controlled by the operation of the switches 391L and 391m by their corresponding cams 392L and 392m. Accordingly, it follows that the functions initiated by the other cams 392, including those functions performed at the loading station L and bending station B, described above, are performed at their respective stations between each advancement of the carrier assembly by the drive mechanism 13. However, for the sake of convenience in description, the actual functions performed at the various stations are being considered in terms of one mandrel at a time and the carton blank thereon, it being understood that the other functions are being performed substantially simultaneously on other cartons on the other mandrels in the other stations.

After the said first mandrel moves into the heating station H, the cylinder 282 is operated in response to operation of the solenoid valve 227 whereby the heating shell 287 is moved downwardly over the upper end of the erected carton blank 18a. The heating elements 291, which are continuously energized, will radiate heat onto the panels 272, 273, 278 and 279 whereby the thermoplastic film coating these panels is heated to the point where it reaches a semimolten state and becomes adhesive. Thereafter, upon operation of the cylinder 282, the shell 287 is raised to a point where its supporting plate 284 is engaged by the finger 297 at the upper end of the post 298. Accordingly, the ratchet cylinder 93 can again be operated for the purpose of advancing the carrier as-

17

sembly a further step during which the first mandrel containing the heated panels is moved into the pressure station P.

It has been found that the upper end of the erected carton 18a may be burned if left in the heating station beyond the time required to soften the plastic material, even though the heating shell 287 is in its raised position of FIGURE 15, which permits the heated carton to move out of the heating station H. Thus, the post 298 is pivotally supported and connected by an arm 299 thereon to the solenoid 301 for the purpose of moving the finger 297 away from engagement with the support plate 284, whereby the cylinder 282 can move the heating shell 287 into its safe position of FIGURE 16 where the radiant heat therefrom will not burn a carton 18a disposed in the heating station. Operation of the solenoid 301 is effected by the time delay relay 304, which is reset for an additional timing period each time the switch 306 is actuated by movement of the plunger 307 on said switch 306 into and out of a notch 56 in the edge of the carrier plate 54. The normal rotational movement of the carrier plate 54 effects operation of said switch 306 with sufficient frequency to prevent the operation of the delay relay 304, as long as the machine is functioning properly. In case of an emergency, the switch 407 can be manually closed to operate the solenoid 301 whereby the post 298 is pivoted and the heating shell 287 is permitted to move upwardly into a safe position.

As the first mandrel 17 is moved from the heating station H into the pressure station P (FIGURE 3) by the operation of the ratchet cylinder 93, the panels 272 and 273 are engaged by and between the guide bars 311 and 312 which cause the panels 272 and 273 to be moved into their FIGURE 19 positions with the panels 278 and 279 bent downwardly therebetween. Before the panels 272 and 273 are released from the guide bars 311 and 312, they move under the pressure pad 317 adjacent the ends of said guide bars 311 and 312. Shortly after arriving in the pressure station P beneath the pressure pad 317, the cylinder 313 is operated whereby the pressure pad 317 is moved downwardly toward the upper surface of the cap 66 with the panels 272, 273, 278 and 279 disposed therebetween. By reasonable control of the heat applied by the shell 287 to the end panels on the upper end of carton 18a, and by reasonable control of the amount of coolant flowing into each mandrel 17, the bottom wall on the carton created by the panels 272, 273, 278 and 279 will be completed and said panels will be bonded together by the plastic film therebetween when the pressure pad 317 is again raised by appropriate operation of the cylinder 313. However, if further pressure and/or cooling mechanism are required, they may be provided at the open station O on the upper platform 33.

When the carrier assembly 12 is again advanced rotationally, the first mandrel 17 will be moved from the pressure station P into the open station O where the coolant within the mandrel will continue to cool the mandrel and the completed preform 18b thereon.

After the normal delay, the ratchet cylinder 93 is again operated whereby the carrier assembly 12 is again advanced so that the first mandrel 17 is moved from the open station O into the discharge station D for appropriate removal of the completed preform 18b from the mandrel 17 and the discharge thereof into a suitable receptacle 26. More specifically, cylinder 327 is actuated so that the support plate and its pivot member 329 are moved downwardly with the chute 347 on said plate 338 passing through the discharge opening 326 into a position adjacent the completed preform 18b. The suction cups 339 engage the bottom of the preform 18b which is formed by the panels 272 and 273. On appropriate reverse operation of the cylinder 327, the pivot member 329, as well as the support plate 338 and chute 347 supported thereon, are moved upwardly with the preform 18b thereon through the discharge opening 326 and above the top

18

plate 38. As the piston rod 328 approaches its fully extended position, the inner end of the pivot member 329 engages the head 336 on the rod 334 whereby the pivot member 329 is pivoted so that the chute 347 is moved outwardly from its substantially vertical position and the switch 346 is engaged and operated by the pivot member 329. This results in the opening of the switch 344 whereby the solenoid valve 343 is operated to terminate the suction at the cups 339 so that the preform 18b is released and permitted to move down the chute 347 into the receptacle 26.

The first mandrel 17, which is now empty, is moved by the next operation of the ratchet cylinder 93 back into the initial loading station L and the above-described sequence of operation with respect to the first mandrel is repeated.

In this embodiment, there are six stations located at uniform intervals around the top platform 33 and, therefore, there are six mandrels capable of receiving each size of erected carton 18a. Thus, the preforming operations, which produce a bottom wall in the erected carton 18a, can be simultaneously performed upon six cartons, and one carton is discharged from the carrier assembly after rotational movement of the carrier assembly.

It will be apparent, however, that additional stations may be provided so that additional mandrels can be utilized within the scope of this invention. Moreover, more than two sizes of mandrels may be provided in a single carrier assembly and properly indexed so that only one size of mandrel will be moved into the stations during the preforming operation. Also it will be recognized that the above-described sequence of operations performed by the mechanisms located at the various stations can be performed simultaneously and continuously as long as a supply of carton blanks 18 is maintained in the magazine 15.

When it becomes desirable to use the machine 10 for preforming half-gallon cartons, for example, the side members 126 and 127 on the magazine 15 are spread further apart by rotating the hand wheel 147 in the appropriate direction. The locations of the erecting units 187 and 188 and the positioning mechanism 189 are adjusted for the larger carton. The position of the switch 229 is also altered to allow for the larger carton. The carrier plate 54 is rotated so that a large mandrel 17a is disposed in the loading position below station L, which will automatically place large mandrels 17a below each of the other stations. A larger loading plate 219 is mounted upon the arm 216, and the forming head 266 is rotated 180° so that the upper plates 274 of FIGURE 12 are extending downwardly. A larger pressure pad 317 is mounted upon the piston rod 318 at the pressure station P. The discharge mechanism 25 is provided with a chute 347 of the appropriate size and shape for embracing the larger carton.

After the above adjustments have been made, the machine can now be used to carry out the preforming operation upon the larger carton blanks in substantially the same manner as set forth above with respect to the smaller carton blanks.

It will be recognized that by appropriate adaptation of the discharge mechanism 25, the operation of the machine 10 can be coordinated with a filling and sealing machine which receives the preformed cartons from the discharge mechanism. Thus, although a particular preferred embodiment of the invention has been disclosed herein for illustrative purposes, it will be understood that variations or modifications of such disclosure, which come within the scope of the appended claims, are fully contemplated.

What is claimed is:

1. A machine for receiving an erected tubular carton blank and forming an end wall from closure panel means at one end thereof, comprising:

a frame structure;

a first set of spaced mandrels upon each of which an erected carton blank of one size is snugly and slid-

ably receivable, said mandrels being arranged in a circle;

a second set of spaced mandrels upon each of which an erected carton blank of another size is snugly and slidably receivable, each mandrel in said second set being arranged in said circle;

carrier means supporting said mandrels upon said frame structure for movement along a circular path, said mandrels extending substantially parallel with the axis of said path;

drive means operably associated with said carrier means for effecting step-by-step movement of said carrier means whereby said mandrels are moved along said path and each of the mandrels in one of said first and second sets is moved into and out of a carton receiving position in said path;

means for holding an erected carton in a loading position located adjacent said carton receiving position;

loading means for moving said carton from said loading position onto a mandrel in said receiving position;

wall forming mechanism mounted upon said frame structure and arranged along said path for sequentially engaging the closure panel means of each carton and forming a closed end wall on said end thereof; and

means for effecting and coordinating the operation of said drive means, said loading means and said wall forming mechanism.

2. A machine for erecting a flattened, tubular carton blank and forming an end wall from closure panel means at one end thereof, comprising:

a frame structure;

a plurality of spaced mandrels upon each of which an erected carton blank is snugly and slidably receivable;

carrier means supporting said mandrels in upright positions upon said frame structure for movement along a circular path having a substantially vertical axis, said mandrels extending substantially parallel with the axis of said path;

drive means operably associated with and located below said carrier means for effecting step-by-step movement of said carrier means around said axis whereby each of said mandrels is moved into and out of a carton receiving position in said path;

a carton blank dispenser operably connected to said frame structure adjacent said receiving position for holding a plurality of carton blanks, said dispenser including means for erecting a flat carton blank and advancing said erected carton blank into a loading position located adjacent said carton receiving position;

loading means for moving said carton blank from said loading position onto a mandrel in said receiving position;

wall forming mechanism mounted upon said frame structure and arranged along said circular path for sequentially engaging the closure panel means of each carton blank and forming a closed end wall on said end thereof; and

means for effecting and coordinating the operation of said drive means, said dispenser, said loading means and said wall forming mechanism.

3. A machine for erecting flattened, tubular carton blanks of various sizes and forming on each erected blank an end wall from closure panel means, at one end thereof, comprising:

a frame structure;

a first set of upright spaced mandrels upon each of which an erected carton blank of one size is snugly and slidably receivable, said mandrels being arranged in a circle;

a second set of spaced, upright mandrels upon each of which an erected carton blank of another size is

snugly and slidably receivable, each mandrel in said second set being arranged in said circle adjacent a mandrel in said first set,

carrier means supporting said mandrels upon said frame structure for movement along a circular path around a substantially vertical axis;

drive means operably associated with said carrier means for effecting step-by-step rotational movement of said carrier means around said axis whereby each of the mandrels in one of said first and second sets is moved into and out of a carton receiving position in said path;

a carton blank dispenser mounted upon the said frame structure adjacent said receiving position for holding a plurality of carton blanks, said dispenser including means for erecting a flat carton and advancing said erected carton into a loading position located directly above said carton receiving position;

loading means for moving said carton from said loading position onto a mandrel in said receiving position;

wall forming mechanism mounted upon said frame structure and arranged along and above said circular path for sequentially engaging the upper end panels of each carton and forming a closed end wall on the upper end thereof; and means for effecting and coordinating the operation of said drive means, said dispenser, said loading means and said wall forming mechanism.

4. A machine for erecting a flattened, tubular carton blank having closure panels at one end thereof and for forming an end wall from said closure panels, comprising:

a rigid, upright frame structure;

a plurality of upright, spaced mandrels arranged in a circle within said frame structure, half of said mandrels being of a first size and the other half being of a second size, each mandrel being shaped for slidably receiving over the upper end thereof an erected carton blank with the closure panels thereof extending upwardly from said mandrel, and each mandrel of one size being disposed between two mandrels of the other size;

carrier means supporting said mandrels for movement along a circular path around a vertical axis through a carton receiving position in said path;

drive means operably connected to said carrier means for effecting step-by-step, unidirectional movement of said carrier means around said axis, whereby each of said mandrels of one of said first and second sizes is moved into and out of said carton receiving position;

a magazine mounted upon said frame structure adjacent said receiving position for holding a plurality of flattened carton blanks;

extracting means for engaging one carton blank at a time and moving same from said magazine into a loading position directly above said receiving position;

guide means on said frame structure engageable by said carton blank as it moves from said magazine to said loading position for erecting the carton blank;

loading means engageable with the upper end of the erected carton blank for moving same downwardly from said loading position onto the mandrel in the receiving position;

forming mechanisms arranged in a plurality of spaced stations located upon said frame structure above said circular path at intervals corresponding to the intervals between said mandrels, for engaging the closure panels on each carton and forming an end wall therefrom;

discharge means on said frame structure for engaging a carton having a completed end wall and removing said carton from said mandrel; and

control means on said frame structure for effecting and

21

synchronizing the operation of said drive means, said extracting means, said loading means, said forming mechanisms and said discharge means.

5. The structure of claim 2 wherein the closure panel means on each carton blank are coated with a heat activated adhesive;

wherein said wall forming mechanism includes a plurality of stations, one of said stations having a heating member for activating said adhesive and another one of said stations including pressure means for engaging said closure panel means and pressing them tightly together; and

wherein each of said mandrels has coolant circulating means therein.

6. The structure of claim 2 wherein said carrier means includes a shaft rotatably supported upon and within said frame structure and a circular table concentrically mounted upon said shaft for supporting said mandrels near the periphery thereof; and

wherein said drive means includes a circular toothed member concentrically secured to said shaft, an element engageable with the teeth on said toothed member and pressure fluid operated means connected to said element for effecting movement thereof whereby said toothed member is intermittently engaged and moved around said vertical axis by said element.

7. The structure of claim 2 wherein each mandrel has a coolant chamber therein and a coolant outlet opening extending from the lower end of said chamber through said carrier means; and

including an annular receptacle disposed below said carried means and beneath said path for reception of coolant from said coolant openings, and conduit means for connecting the coolant chambers within said mandrels to a source of coolant.

8. The structure of claim 4 wherein said magazine includes an elongated, substantially horizontal trough having lateral projections at the end thereof adjacent said loading position the spacing between said projections being slightly less than the width of a flattened carton;

wherein said guide means includes a lateral restriction between said projections and said loading position, adjustable stop means at the inner side of said loading position, and a reciprocable means engageable with one edge of a carton blank substantially within said loading position for moving same snugly against said stop means into a fully erected position, movement of said reciprocable means being effected by said control means.

9. The structure of claim 2 wherein said machine has a bending station near to said loading position into which a mandrel is moved from said receiving position, said bending station including first and second, vertically reciprocable members, the first member being supported upon said frame structure for vertical reciprocation with respect thereto, operating means for effecting simultaneous vertical movement of said members with respect to said frame structure and movement of the second member with respect to the first, and forming fixtures on said members for engaging and folding the closure panel means on a carton located at said bending station.

10. The structure of claim 4 wherein said discharge means includes a carton engaging member;

guide means on said frame structure connected to said engaging member and actuating means for vertically reciprocating said engaging member whereby a carton is raised from a mandrel, moved away from said vertical axis and discharged from said machine.

11. In a machine for erecting a flattened tubular carton blank having closure panels at one end thereof and forming a liquid tight end wall from said closure panels, the combination comprising:

a frame structure;

an upright mandrel shaped for snugly and slidably receiving an erected carton thereon;

22

dispenser means on said frame structure for erecting a carton and moving same downwardly onto said mandrel;

carrier means supporting said mandrel for movement around an axis substantially parallel with said mandrel into and out of a position below a bending station;

bending means at said bending station including first and second vertically and relatively reciprocable members mounted upon said frame structure for vertical movement with respect thereto, linkage connecting said first and second members whereby simultaneous downward movement thereof is followed by separate downward movement of said second member, a pair of spaced ears pivotally supported upon said first member for rotation around spaced, substantially horizontal and parallel axes toward each other from substantially upright positions to substantially horizontal positions in response to downward movement of said second member with respect to said first member, and a downwardly opening trough member mounted upon said second member for engaging said closure panels in response to said downward movement of said second member.

12. A machine for erecting flattened, tubular carton blanks of various sizes and forming on each erected blank an end wall from closure panel means at one end thereof, comprising:

a frame structure;

a first set of spaced upright, mandrels upon each of which an erected carton blank of one size is snugly and slidably receivable, said mandrels being arranged in a circle;

a second set of spaced, upright mandrels upon each of which an erected carton blank of another size is snugly and slidably receivable, each mandrel in said second set being arranged in said circle next to a mandrel in said first set;

carrier means supporting said mandrels upon said frame structure for movement along a path defined by said circle and around a substantially vertical axis;

drive means operably associated with said carrier means for effecting step-by-step rotational movement of said carrier means around said axis, whereby each of the mandrels in one of said first and second sets is moved into and out of a carton receiving position in said path;

a carton blank dispenser mounted upon the said frame structure adjacent said receiving position for holding a plurality of carton blanks, said dispenser including means for erecting a flat carton and advancing said erected carton into a loading position located directly above said carton receiving position;

loading means for moving said carton from said loading position onto a mandrel in said receiving position;

wall forming mechanism mounted upon said frame structure and arranged along and above said path for sequentially engaging the closure panel means of each carton and forming a closed end wall on the upper end thereof; and

means for effecting the operation of said drive means, said dispenser, said loading means and said wall forming mechanism.

13. A machine for erecting flattened, tubular carton blanks of various sizes and for forming on each erected blank an end wall from closure panel means at one end thereof, comprising:

a frame structure;

a first set of spaced, upright mandrels upon each of which an erected carton blank of one size is snugly and slidably receivable, said mandrels being arranged along a line defining a closed path;

a second set of spaced, upright mandrels upon each of

which an erected carton blank of another size is snugly and slidably receivable, each mandrel in said second set being located along said line defining said closed path and next to a mandrel in said first set; carrier means supporting said mandrels upon said frame structure for movement along said closed path and in a substantially horizontal direction; drive means operably associated with said carrier means for effecting step-by-step movement of said carrier means along said path, whereby each of the mandrels in one of said first and second sets is moved, one at a time, into and out of a carton receiving position in said path;

a carton blank dispenser mounted upon said frame structure adjacent said receiving position for holding a plurality of carton blanks, said dispenser including means for erecting a flat carton and advancing said erected carton into a loading position located directly above said carton receiving position;

loading means for moving said carton from said loading position onto a mandrel in said receiving position;

wall forming mechanism mounted upon said frame structure and arranged along and above said closed path for sequentially engaging the closure panel means of each carton and forming a closed end wall on the upper end thereof; and

means for effecting the operation of said drive means, said dispenser, said loading means and said wall forming mechanism.

14. In a machine for receiving an erected tubular carton blank and for forming an end wall on the tubular blank from closure panel means at one end thereof, the combination comprising:

a frame structure;

a first set of spaced, upright mandrels upon each of which an erected carton blank of one side is snugly and slidably receivable, said mandrels being arranged along a line defined by a closed path passing through a carton receiving position;

a second set of spaced, upright mandrels upon each of which an erected carton blank of another size is snugly and slidably receivable, each mandrel in said second set being located along said line and next to a mandrel in said first set;

carrier means mounted upon said frame structure for movement along said closed path and around a substantially vertical axis, said mandrels being supported upon said carrier means and substantially parallel with said axis for movement by said carrier means substantially in a horizontal direction and along said path;

drive means operably associated with said carrier means for effecting step-by-step movement of said carrier means along said path, whereby each of the mandrels in one of said first and second sets is moved, one at a time, into and out of said carton receiving position in said path;

mechanisms mounted upon said frame structure at spaced intervals along and above said path for sequentially performing operations upon the closure panel means, whereby the end wall is formed on the erected carton blank while it is in said path, said intervals being substantially equal to the distance along said path between two mandrels in said one set of mandrels; and

means for effecting the operation of said drive means and said mechanisms on said frame structure.

15. The machine of claim 14 wherein the closure panel means on each carton blank is coated with a heat-activated adhesive;

wherein said wall forming mechanisms mounted upon said frame structure include a prebreak device engageable with the closure panel means of the erected carton blank on each of the mandrels in said one

set of mandrels for moving the closure panel means of each carton blank toward its mandrel;

heating means spaced from said prebreak device for heating the adhesive on said closure panel means; and

pressure means spaced from said heating means and engageable with said closure panel means for moving same into an overlapping and contacting position, wherein said closure panel means forms said end wall, and for holding said closure panel means in said position until said adhesive sets.

16. The machine of claim 14 wherein the mandrels of said first set are arranged alternately with the mandrels of said second set along the line defined by the closed path and all of said mandrels are disposed at uniform intervals along said path; and

wherein said wall forming mechanisms are located at uniformly spaced intervals along and above said path, the spacing between said mechanisms corresponding to the distance between a pair of mandrels in said one set of mandrels.

17. The machine of claim 14 wherein said carrier means includes a circular table concentric with said vertical axis, and said path is circular and concentric with said axis;

wherein said drive means is located below said carrier means, and said drive means effects intermittent rotational movement of said carrier means, whereby each intermittent movement of said carrier means along said path causes each mandrel in said one set to move into a position previously occupied by another mandrel of said one set.

18. The machine of claim 14 wherein the closure panel means on each carton has a heat activated adhesive on the engageable surfaces thereof;

wherein the wall forming mechanisms include a heating member for heating said adhesive on said closure panel means, and pressure means for pressing the heated closure panel means against said mandrel and into a folded condition, whereby said end wall is formed on said carton blank; and

wherein each mandrel has cooling means associated therewith.

19. The machine of claim 14 wherein said wall forming mechanisms include a prebreaking device engageable with the closure panel means of the carton blank mounted upon each of the mandrels in said one set of mandrels for moving said closure panel means of each carton blank toward its mandrel; and

means supporting said prebreaking device for substantially vertical movement toward and away from said mandrels.

20. A machine according to claim 2 wherein the closure panel means on each carton blank is coated with a heat activated adhesive; and

wherein said wall forming mechanism includes heating means for activating said adhesive, and pressure means spaced from said heating means and arranged for moving said closure panel means into the position of said end wall and for holding same in said position until said adhesive sets.

21. A machine according to claim 20 wherein said heating means comprises a shell disposed above the upper ends of said mandrels, heating elements within said shell, and means for moving said shell vertically with respect to said mandrels between a lower position adjacent the upper end of said mandrels and an upper position wherein said shell is spaced a substantial distance from said mandrels.

22. The machine of claim 2 including discharge means mounted on said frame structure at a position along said path between said wall forming mechanism and said carton receiving position, said discharge means including carton gripping means, means for moving said carton gripping means vertically with respect to said mandrels

25

between a lower position wherein said carton gripping means grips an erected carton blank on said mandrel and an upper position wherein an erected carton blank gripped by said gripping means is above the upper end of the mandrel, and means for releasing said gripping means from an erected carton blank when said panel gripping means is in its upper position and directing said released carton blank away from the machine. 5

23. The machine of claim 2 wherein the closure panel means on each carton blank has a heat activated adhesive upon interengageable surfaces thereof; and 10

wherein said wall forming mechanism includes heating means arranged so that one and only one of said mandrels in said one set of mandrels is disposed directly beneath said heating means when another mandrel of said one set is in said carton receiving position. 15

26

24. The machine of claim 14 wherein the closure panel means on each carton blank is coated with a heat-activated adhesive;

wherein said wall forming mechanisms mounted upon said frame structure include a heating dome having a downwardly opening cavity and heating means within said cavity, said dome being vertically movable into and out of a position closely adjacent the upper end of a mandrel, whereby at least part of the closure panel means on said mandrel is within said cavity.

References Cited in the file of this patent

UNITED STATES PATENTS

2,957,289 Monroe et al. ----- Oct. 25, 1960

UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,064,542

November 20, 1962

Morris A. Terry

It is hereby certified that error appears in the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 21, line 32, for "carried" read -- carrier --;
column 23, line 36, for "side" read -- size --.

Signed and sealed this 25th day of June 1963.

(SEAL)

Attest:

ERNEST W. SWIDER
Attesting Officer

DAVID L. LADD
Commissioner of Patents