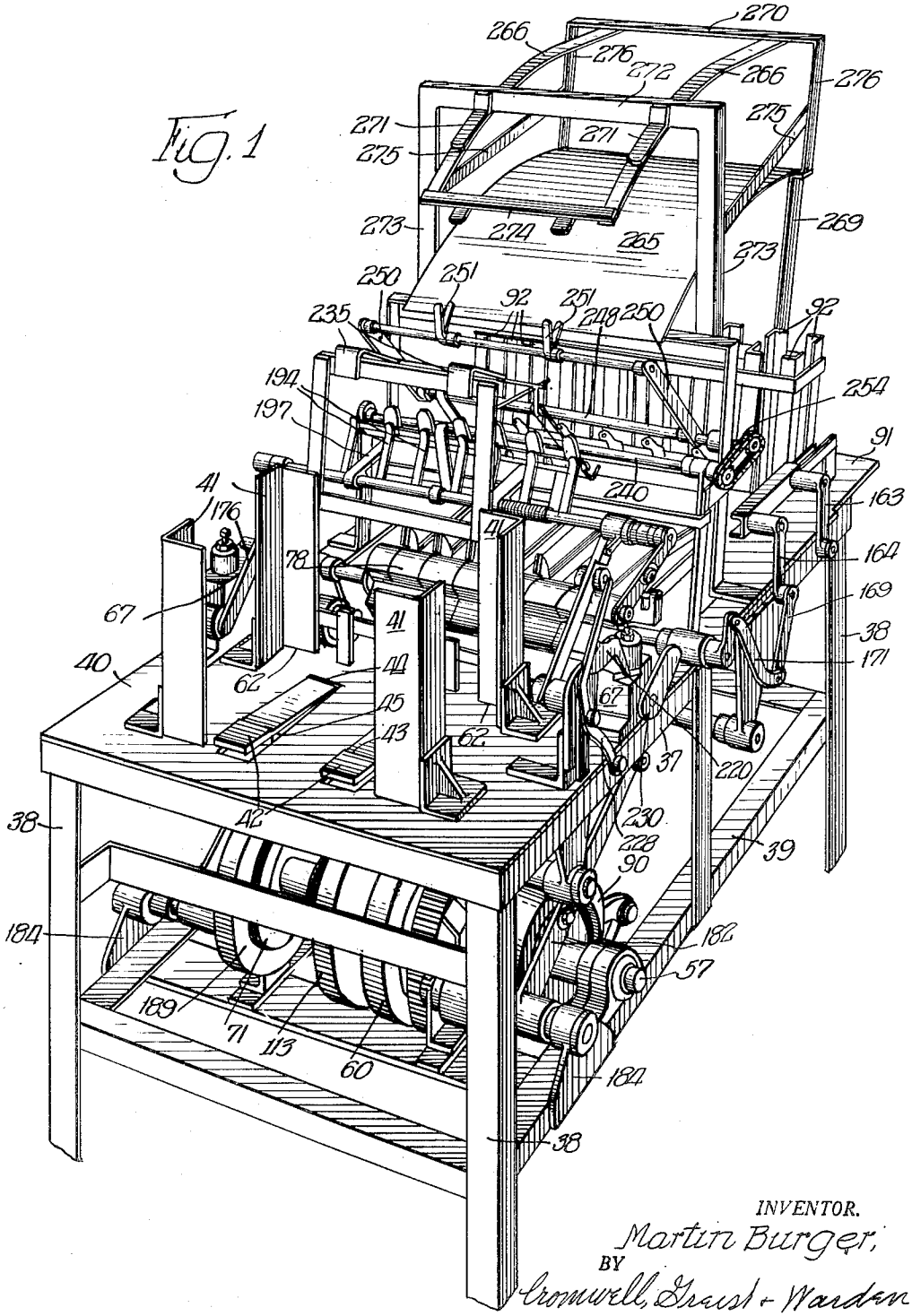
Oct. 13, 1953 M. BURGER 2,655,081

CARTON SETUP MACHINE

Filed July 20, 1948 10 Sheets-Sheet 1

Fig. 1



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CARTON SETUP MACHINE

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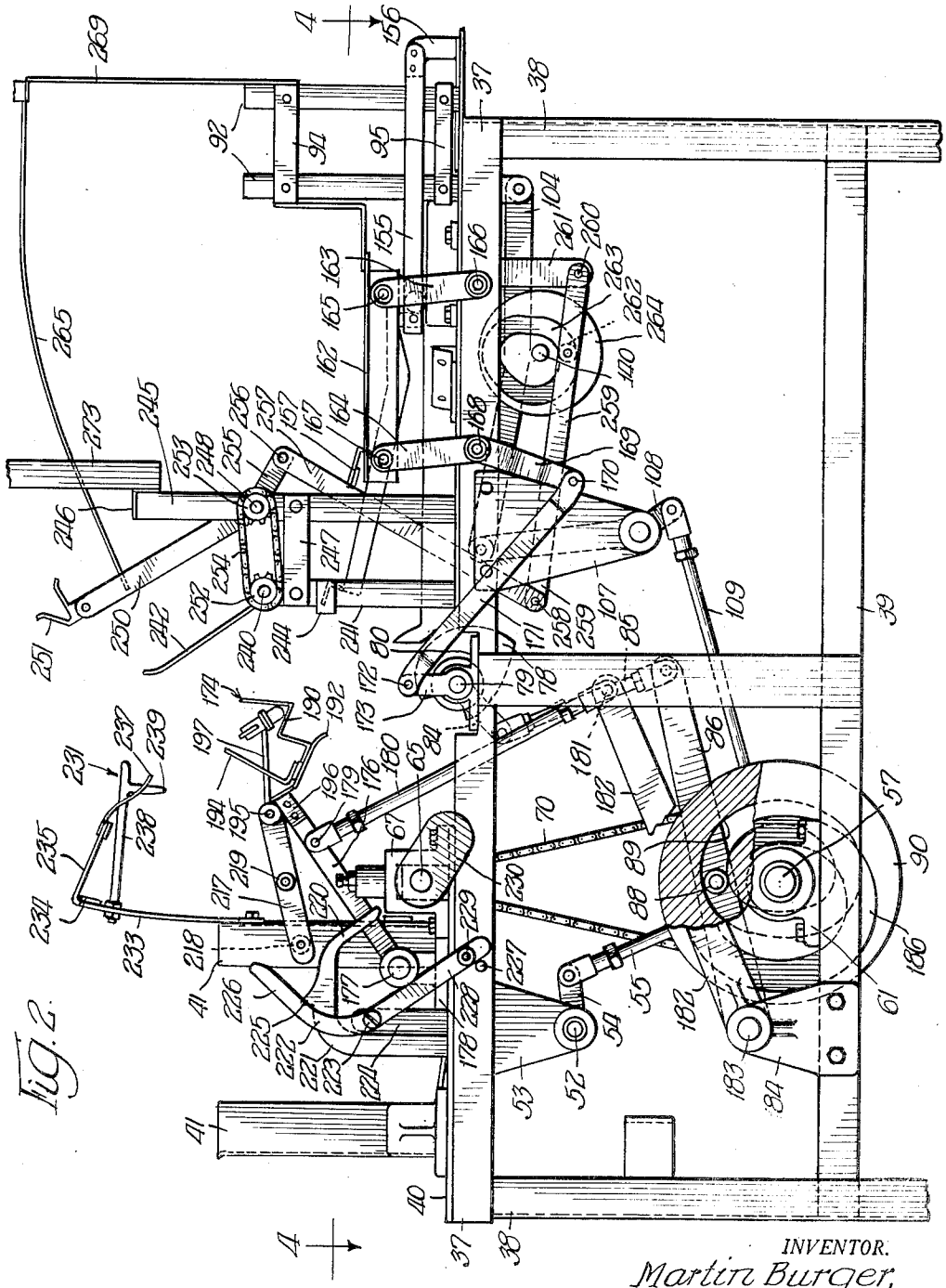


Fig. 2.

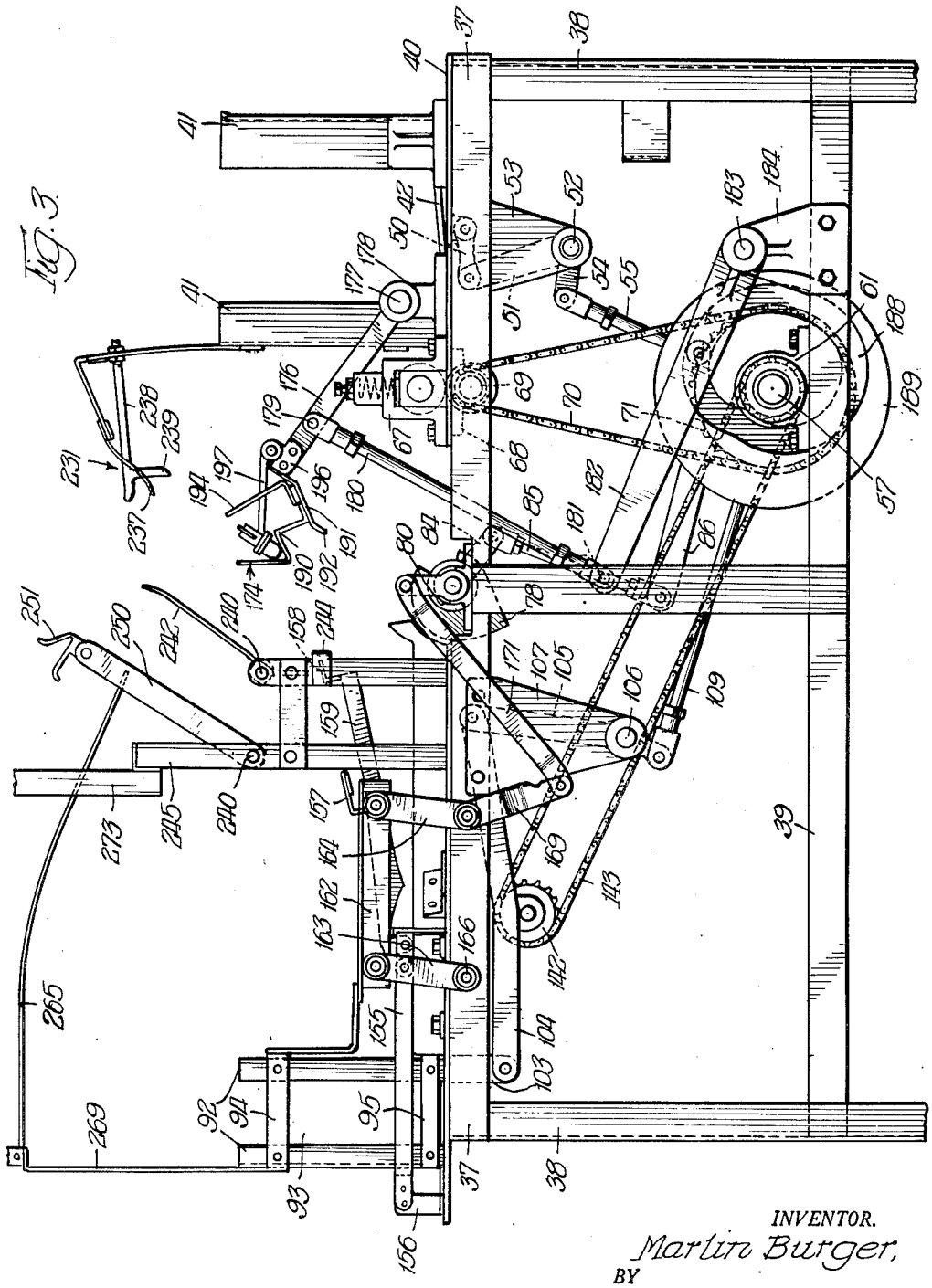
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CARTON SETUP MACHINE

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Fig. 3



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CARTON SETUP MACHINE

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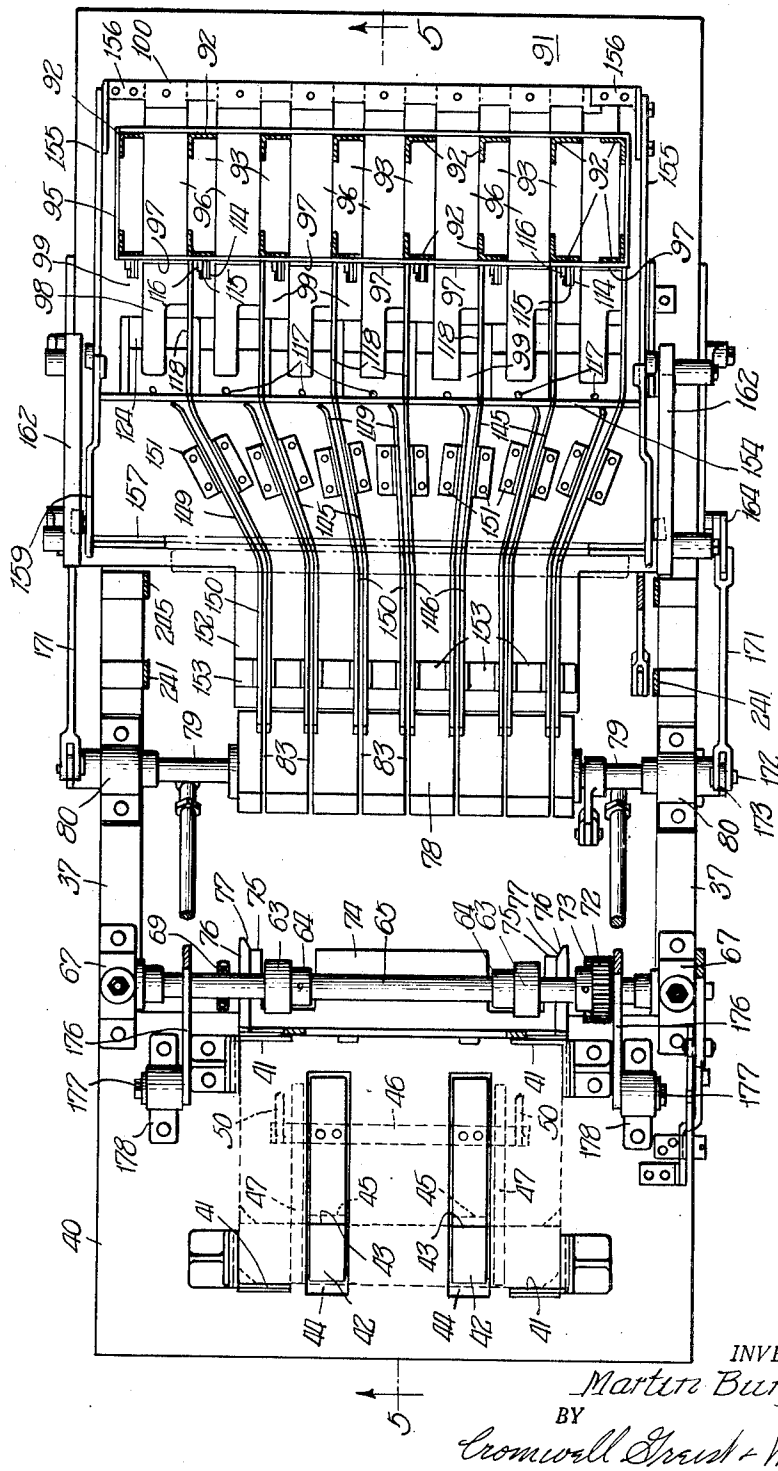


Fig. 4

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CARTON SETUP MACHINE

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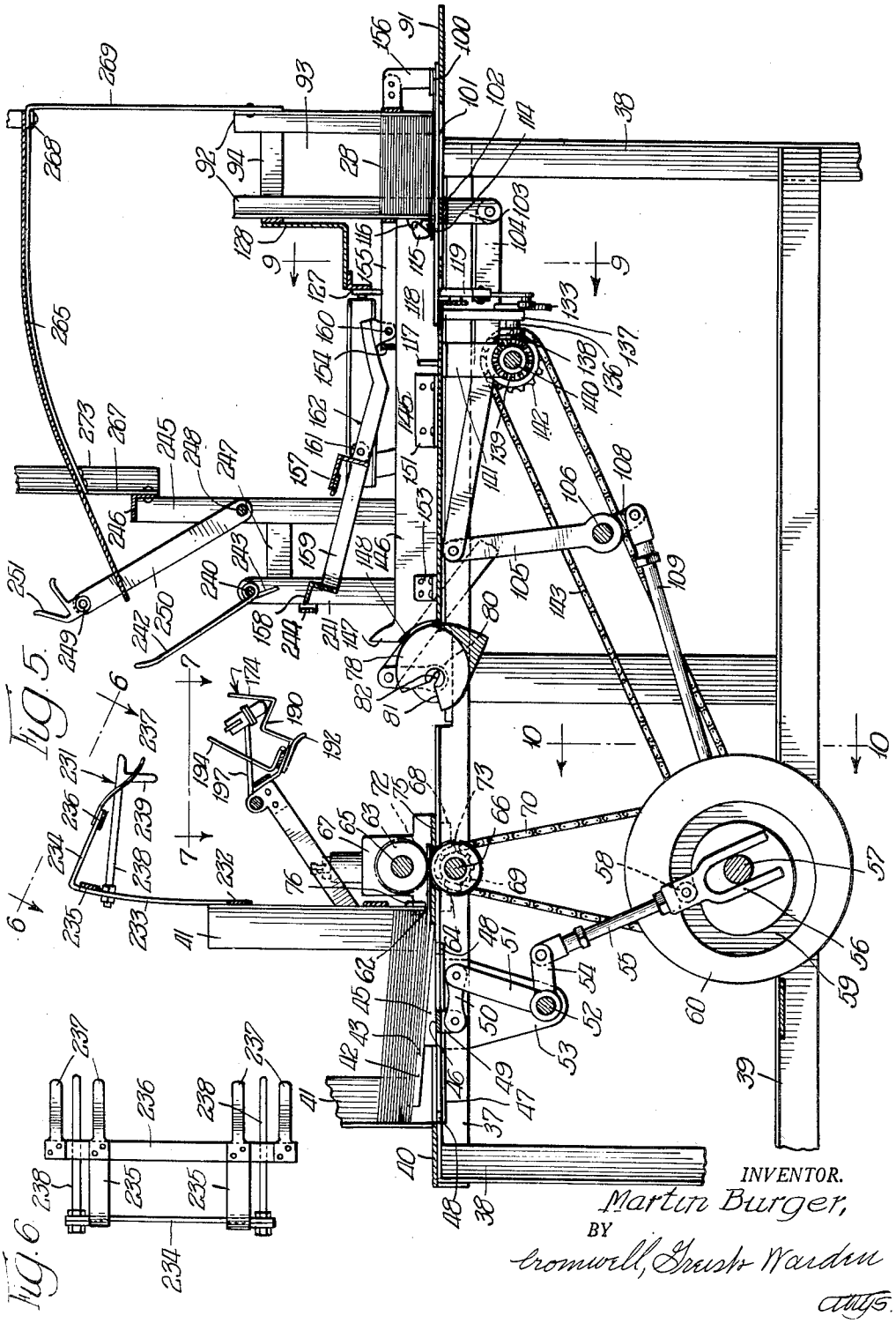


Fig. 5.

Fig. 6

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CARTON SETUP MACHINE

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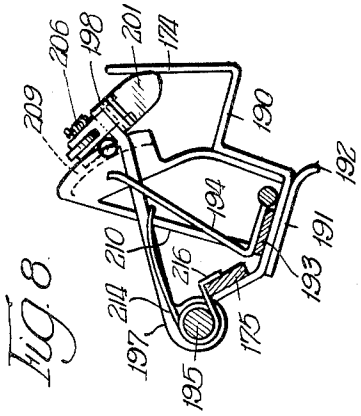


Fig. 8

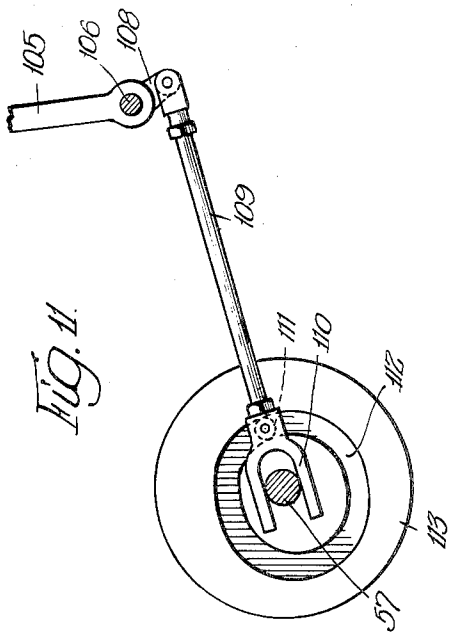


Fig. 11.

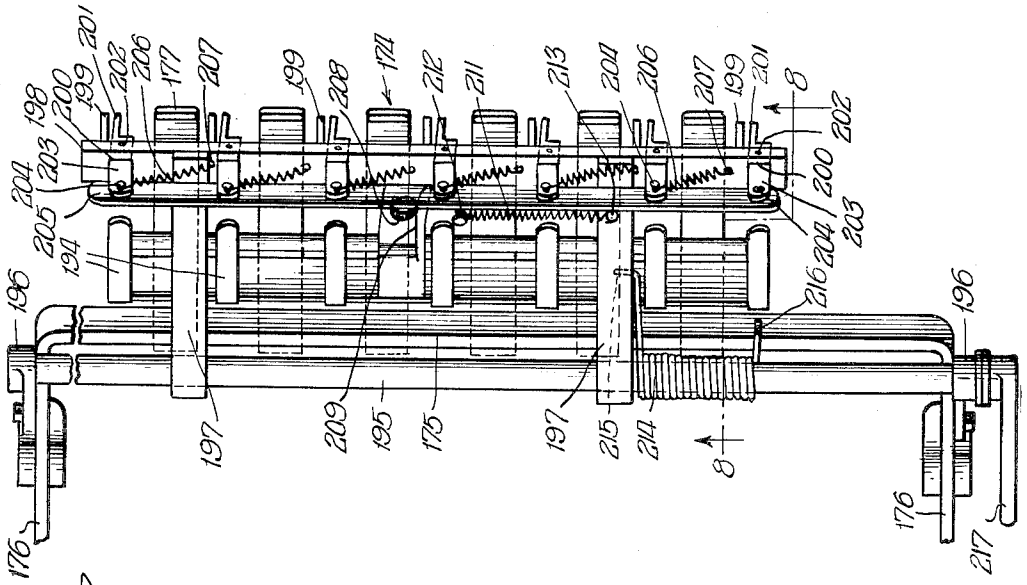


Fig. 7.

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CARTON SETUP MACHINE

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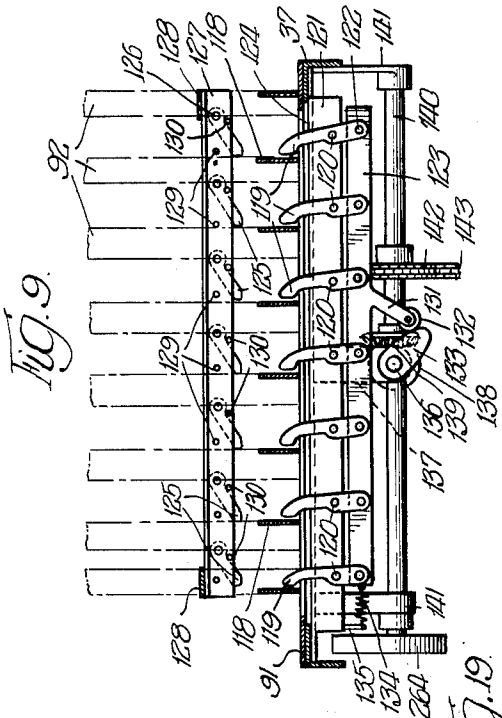


Fig. 9.

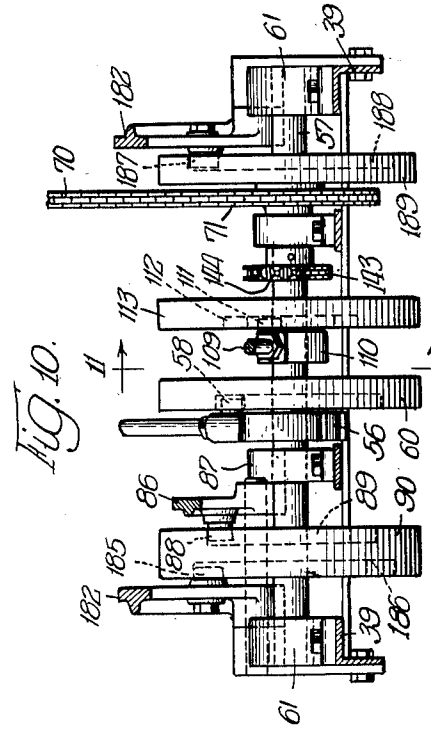


Fig. 10.

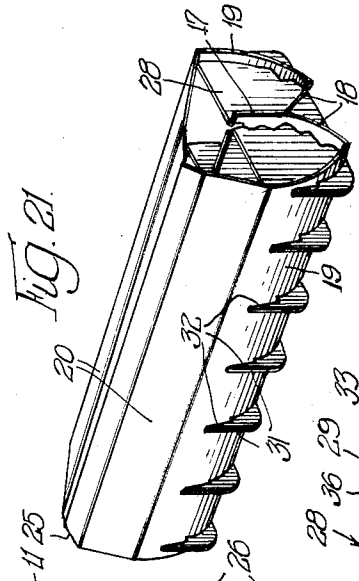


Fig. 21.

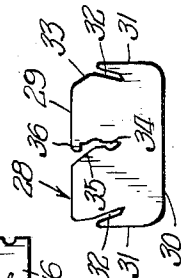


Fig. 20.

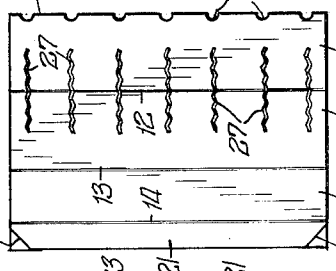


Fig. 19.

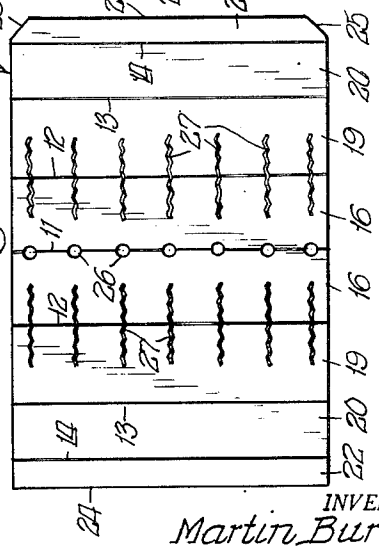


Fig. 18.

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CARTON SETUP MACHINE

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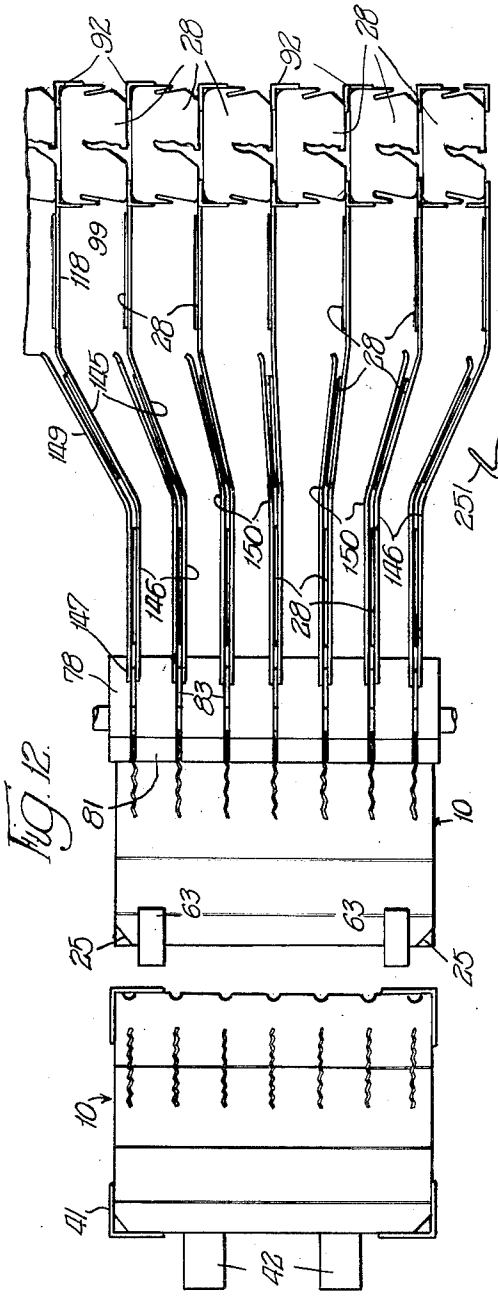


Fig. 12.

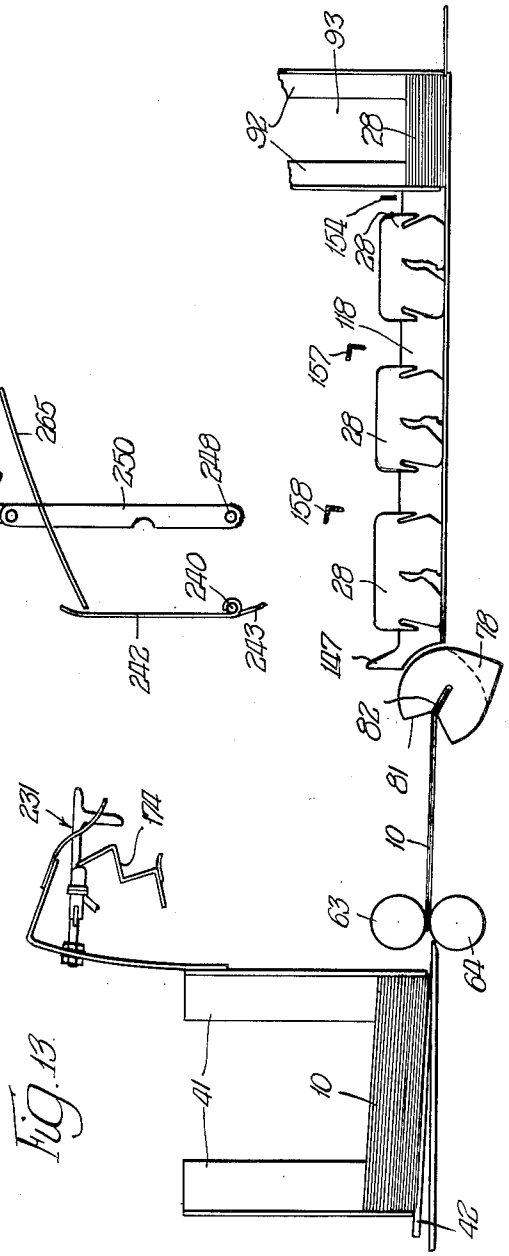


Fig. 13.

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CARTON SETUP MACHINE

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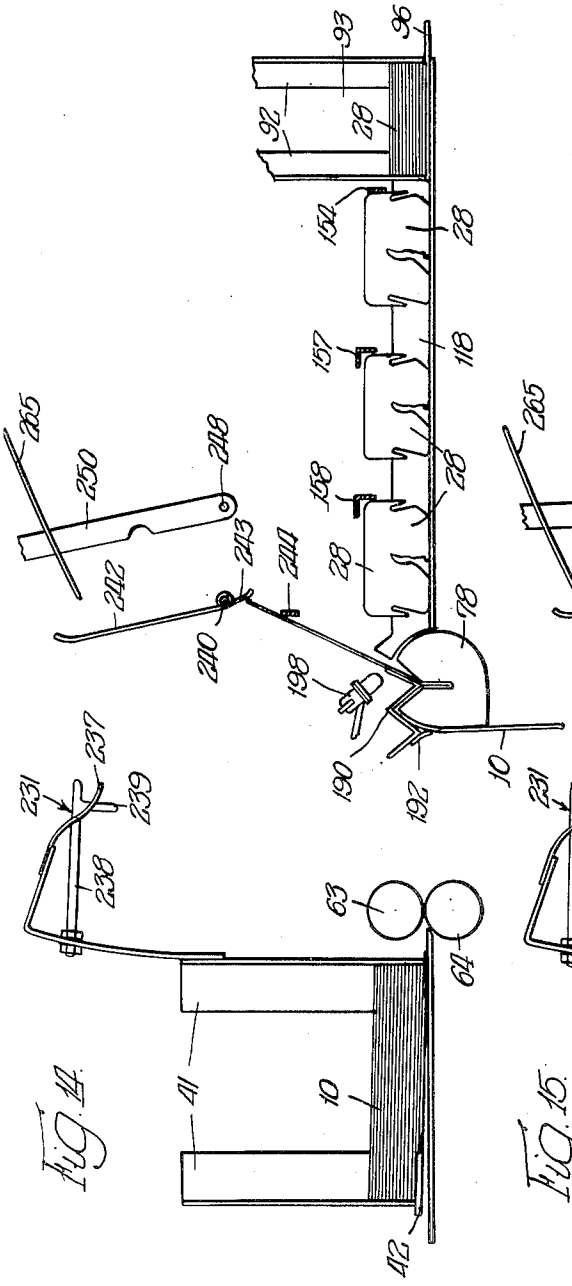


Fig. 14.

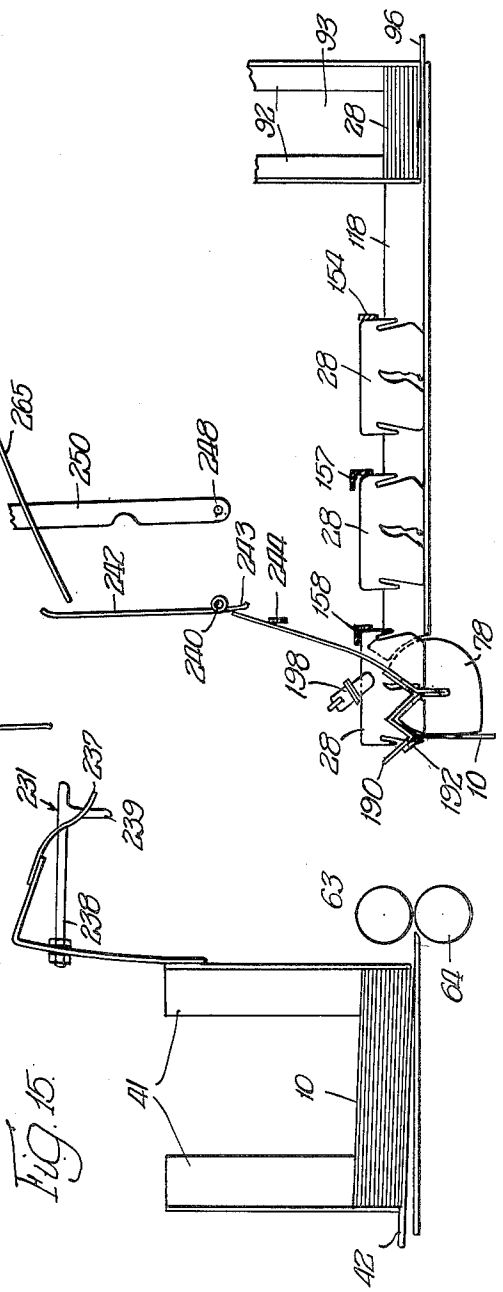


Fig. 15.

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CARTON SETUP MACHINE

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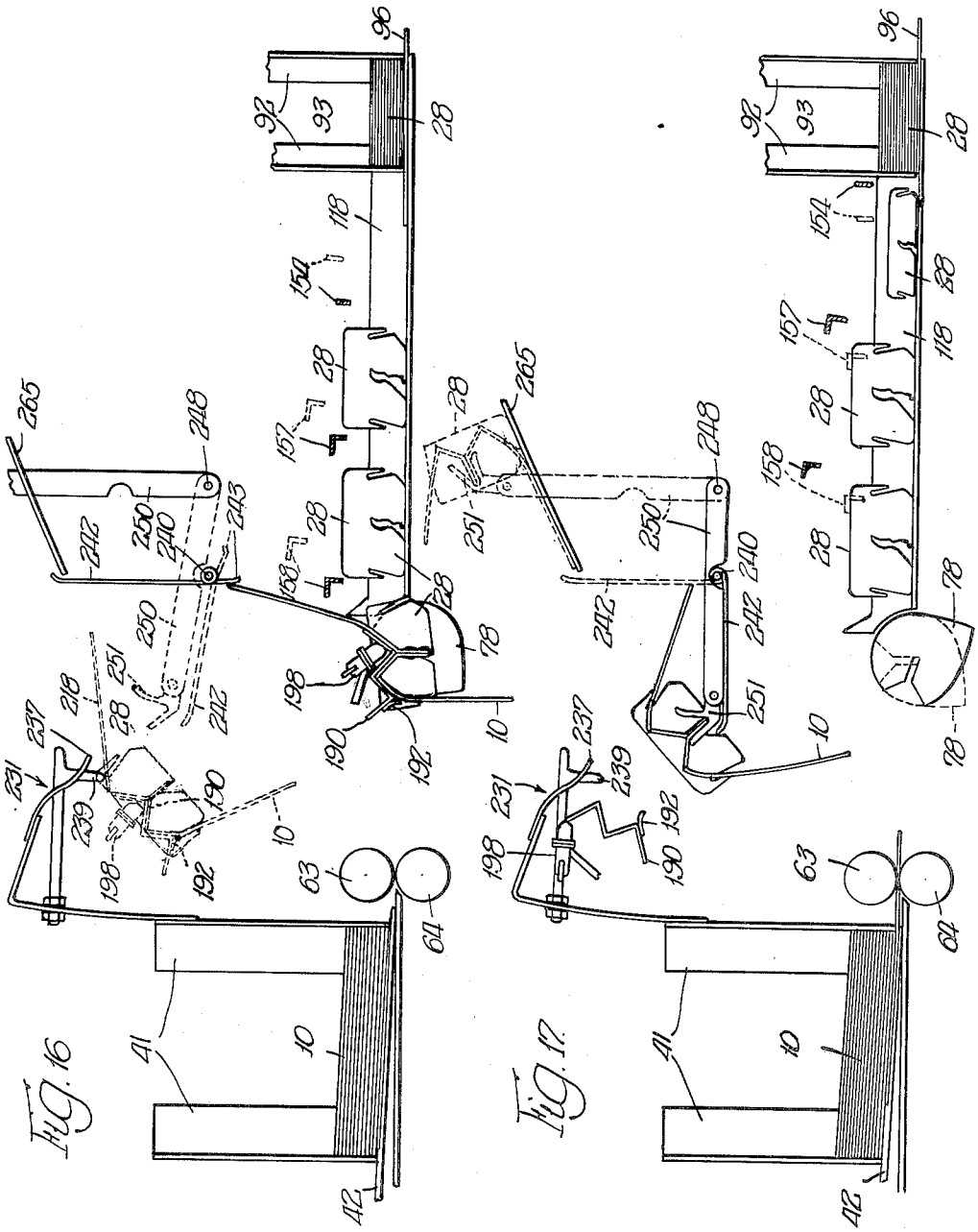


FIG. 16

FIG. 17

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Patented Oct. 13, 1953

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UNITED STATES PATENT OFFICE

2,655,081

CARTON SETUP MACHINE

Martin Burger, Morris, Ill., assignor to General Package Corporation, a corporation of Delaware

Application July 20, 1948, Serial No. 39,688

39 Claims. (Cl. 93—37)

1

This invention is concerned with mechanism for assembling and erecting egg cartons of the type which when set up provide two rows of egg receiving compartments arranged on opposite sides of a medial double walled partition, and closing flaps which are adapted to be folded over the respective rows of compartments to provide separate covers for the rows of eggs.

The carton which the mechanism of the present invention is particularly designed to assemble and erect comprises a body constructed from a single sheet of paperboard which is transversely scored to permit it to be folded to form a double medial partition wall, side walls and cover flaps, and which is provided with two rows of transversely spaced slots or apertures, each slot extending into the medial partition wall and one side wall, and a plurality of separate cross walls constituting the cross divisions which are adapted to be inserted through the rows of registering slots to separate the space on opposite sides of the medial partition into a plurality of individual egg receiving cells or compartments.

Heretofore in the shipment of cartons of this general character it has been customary to properly score and cut the body blanks, to fold each blank about a medial line and insert through the registering slots a set of cross partition members, to nest the cross partition members into flatwise overlapped relation and to fold back over the same the side wall and cover forming portions of the carton into flatwise or knocked-down relation so that a consignment of cartons will occupy but a small space during shipment. When received in this condition it has been necessary for the user to set up the carton by spreading the cross partition members into transverse relation and hooking the ends of the same into the side wall forming portions of the carton in the intended manner to provide the rows of compartments after which the eggs may be inserted and the cover members folded over the top to close the carton. Machines for automatically assembling the cartons and their cross partition members in knocked-down condition and separate machines for subsequently setting up the knockdown cartons have been deviseed.

It is a general object of the present invention to provide a single machine or mechanism for assembling the body blanks and the separate cross partition members and for simultaneously erecting the cartons in completely assembled and erected form ready for the egg filling operation whereby the carton supplier is enabled to ship the carton blanks and the cross partition members in completely flat and unassembled condition, which results in considerable saving of shipping space, and whereby the user of the cartons may be supplied with the machine for installation at the point of use to automatically assemble and completely erect the cartons in one operation.

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It is a more specific object of the invention to provide a single machine or mechanism for the purpose described which comprises means for receiving and successively feeding from a stack thereof the carton body forming blanks, means for feeding from a plurality of stacks the required number of cross partition forming blanks in the proper relation for assembly with the respective body forming blanks, means located intermediate the carton body blank and cross partition feeding means adapted to present the successive body blanks in partially folded condition with the slots in the medial partition and side walls in registry for receiving the cross partition blanks, and means for completing the insertion of the cross partition blanks and the erection of the carton.

It is a still more specific object of the invention to provide a machine for the purpose described which comprises a generally rectangular frame structure having an oscillatable mandrel extending transversely intermediate its ends, a feeding mechanism for successively delivering body blanks to the mandrel from one end of the frame, a feeding mechanism for successively delivering a plurality of partition forming blanks in edgewise transversely aligned and spaced relation to the mandrel from the other end of the machine and for thereafter inserting the partition blanks in aligned slots in a body blank on the mandrel and a folding head mounted for movement in timed relation toward and from the mandrel to hold successive body blanks on the mandrel for reception of the partition blanks and thereafter to fold the body blanks about the partition blanks in interlocking relation therewith and to transfer the completely assembled and erected cartons to a mechanism for delivery from the machine.

These and other objects of the invention will be apparent from a consideration of the preferred form of the machine which is shown by way of illustration in the accompanying drawings, wherein:

Fig. 1 is a perspective view of a carton erecting and assembling machine incorporating therein the principles of the invention;

Fig. 2 is a side elevation of the machine with portions thereof broken away;

Fig. 3 is an elevation of the machine on the side opposite that shown in Fig. 2;

Fig. 4 is a longitudinal horizontal section, taken generally on the line 4—4 of Fig. 2;

Fig. 5 is a longitudinal vertical section, taken on the line 5—5 of Fig. 4;

Fig. 6 is a detail view, taken on the line 6—6 of Fig. 5;

Fig. 7 is a detail view, taken on the line 7—7 of Fig. 5;

Fig. 8 is a section taken on the line 8—8 of Fig. 7;

Fig. 9 is a section taken on the line 9—9 of Fig. 5;

Fig. 10 is a section taken on the line 10—10 of Fig. 5;

Fig. 11 is a section taken on the line 11—11 of Fig. 10;

Fig. 12 is a schematic plan view showing the relative position of the carton body forming blanks and the transverse partition forming blanks at one stage in the operation of the machine;

Fig. 13 is a schematic elevation in a longitudinal direction showing the relative position of the carton forming members;

Figs. 14, 15, 16 and 17 are schematic views similar to Fig. 13 illustrating different stages of operation of the machine;

Fig. 18 is a plan view of a body forming blank which is adapted for use in the machine;

Fig. 19 is a plan view showing the body blank folded about the medial line;

Fig. 20 is a plan view of a cross partition forming blank which is adapted for use with the body blanks of Fig. 18; and

Fig. 21 is a perspective view of a completely assembled carton.

The machine of the present invention is particularly designed to assemble and reect a carton of the type which is disclosed in my copending application Serial No. 26,331, filed May 11, 1948. A carton of this general type, as illustrated in Figs. 18 to 21 of the drawings, includes a generally rectangular body forming blank 10 (Fig. 18) which is preferably scored and cut from paperboard stock.

The blank 10 is provided with a medial transverse score line 11, which permits it to be folded upon itself (Fig. 19) for shipment and also for insertion in the machine, and with spaced parallel score lines 12, 13 and 14 arranged on opposite sides of the medial score line 11. The blank 10 is adapted to be folded about the score lines when the carton is erected to provide a carton body having in cross section the general form of the letter W.

The portions 16 of the blank 10 between the medial score line 11 and the adjacent score lines 12 are adapted to be folded to form a double walled medial partition 17 (Fig. 21) and generally oblique diverging bottom walls 18. The portions 19 of the blank, between the score lines 12 and 13, are adapted to be folded to form upwardly and outwardly bowed side walls and the portions 20 of the blank, between the score lines 13 and 14, are adapted to be folded to form cover members for the two rows of egg receiving pockets. The portions 21 and 22 between the score lines 14 and the ends 23 and 24, respectively, of the blanks are adapted to provide tucking tongues or flaps for the cover members 20, the flap forming portion 21 having its corners cut away on an oblique line at 25. A plurality of circular apertures 26 are spaced along the

medial score line 11. Two rows of transversely spaced slots 27 are provided in the blank which slots extend longitudinally on opposite sides of the transverse score lines 12. The slots 27 are arranged on opposite sides of the medial partition forming portions of the blank so that the slots in one row are aligned or registered with the corresponding slots in the other row when the blank is folded about the medial line 11 (Fig. 19).

The carton also includes a plurality of cross partition or cross wall forming members 28 which are preferably formed of paperboard material. Each cross wall member 28 is of generally rectangular form having an upper edge 29 and a bottom edge 30, the latter being provided with rounded corners. The side edges extend vertically from the bottom at 31 and are notched or provided with inwardly and downwardly extending slots 32. The upper portion of one side edge 31 is cut away on an oblique line at 33. A vertical slot 34 extends downwardly in the center region from the upper edge 29. One edge of the material defining the slot 34 is cut along an oblique line 35 to provide a flared opening while the opposite edge of the material is provided with a lug formation or locking shoulder 36 which extends partly across the entrance to the slot 34.

In assembling the carton the cross wall forming members 28 are first aligned with and inserted in the slots 27 in the body forming blank 10, after which they are moved to position the medial partition forming portions of the body 10 in the slots 34 with the locking shoulders 36 extending into the semi-circular notches provided by the apertures 26, and finally the side wall forming portions 19 of the body 10 are positioned to bring the outer ends of the slots 27 into interengaging relation in the slots 32 of the cross wall members 28. The carton is then completely erected and ready to be filled with eggs.

Referring more particularly to Figs. 1 to 11 of the drawings, there is illustrated an automatic machine which is adapted to assemble the required number of cross wall members 28 with successively presented body forming blanks 10 and to deliver the completely set-up cartons in a continuous manner.

The machine comprises a rectangular top frame 37 supported on four legs 38 and a rectangular bottom frame 39 connected at the four corners to the legs 38. A top plate 40 at one end of the frame 37 supports four upstanding angle members 41 which form a vertical compartment for receiving a stack of the carton body blanks 10 in the folded condition illustrated in Fig. 19, the blanks 10 being positioned with the folded edges in a direction toward the center of the machine, the end or trailing edges being in the direction toward the front end of the machine, as viewed in Fig. 1, and the side of the folded blank having the corners cut away at 25 being uppermost.

A pair of reciprocating pushers 42 are provided, having abutment shoulders 43 on their top surface, for engaging the trailing ends of the blanks (Fig. 5). The pushers 42 reciprocate in parallel slots 44 in the top plate 40 and are connected by triangular shaped spacer blocks 45 with a cross bar 46 extending transversely beneath the top plate 40. The cross bar 46 is mounted for movement in guideways formed by longitudinally extending guide bars 47 which are

secured at their ends 48 on opposite sides of the slots 44 and in spaced relation below the top plate 40. The cross bar 46 is provided on its ends with depending brackets 49, which are pivotally connected to links 50. The links 50 are pivotally connected to the ends of arms 51 which are secured to a cross shaft 52 journaled in side bearing brackets 53 which depend from the top frame members 37. An arm 54 secured on the shaft 52 is pivotally connected to one end of an adjustable operating link 55 which is provided with a forked end 56 which straddles the transversely mounted cam shaft 57 and which is reciprocated by a cam roller 58 secured adjacent the forked end 56 and operating in a cam track 59 in a face cam 60 on the cam shaft 57.

The transverse cam shaft 57 is journaled in side brackets 61 which project upwardly from the side rails of the bottom frame 39 of the machine. The cam shaft 57 is adapted to be driven in any suitable manner from a suitable source of power and constitutes the main drive for the machine, all the operating mechanisms being driven by means of sprockets or cams mounted on this shaft.

The pushers 42 are reciprocated to feed the carton body blanks 10, one by one, from the bottom of the compartment formed by the vertical members 41, the forward flanges of the two forward vertical members 41 being cut away at the base thereof at 62 to provide clearance for a single blank 10.

The blanks 10 are delivered by the pushers 42 into the bite of pairs of cooperating feed rollers 63, 64 which are mounted in spaced relation on the transverse shafts 65 and 66, respectively. The shafts 65 and 66 are arranged immediately adjacent the forward vertical members 41 in position for the feed rollers 63, 64 to receive the folded edge of each successive carton blank 10 as it passes through the cut away portion 62 at the base of the forward vertical members 41. The shaft 65 is journaled in upstanding spring-pressed bearing supports 67 mounted on the side members of frame 37. The shaft 66 is journaled in bearing brackets 68 depending from frame 37 beneath the bearing supports 67. The lower shaft 66 is provided with a drive sprocket 69 which is connected by a chain 70 with a sprocket 71 secured on the transverse power shaft 57. Shafts 65 and 66 are provided adjacent the one end with intermeshing pinions or gears 72 and 73.

The top plate member 40 terminates adjacent the forward vertical members 41 with a central portion 74 extending a short distance forwardly between the pairs of feed rollers 63, 64 and with side portions 75 extending forwardly the same distance along the outer sides of the pairs of feed rollers 63, 64. The plate extensions 74 and 75 form bottom guide and supporting means for the central and side portions of the folded carton blank 10. Top side guide members 76 are mounted on the forward vertical members 41 and extend in spaced relation above the plate extensions 75 a sufficient distance to accommodate the folded blank as it passes between the feed rollers 63, 64. The top guide members 76 extend somewhat beyond the bottom guide plate extensions 75 and their inside edges are cut away on an oblique line 77 at the ends thereof for a purpose which will be described.

The carton blank 10 is delivered by the pairs of feed rollers 63, 64 to an oscillating mandrel 78 which is mounted on a shaft 79 extending transversely of the central portion of the machine. The shaft 79 is journaled adjacent its ends in upstanding bearing brackets 80 which are supported on the side members of the top frame 37 of the machine.

The mandrel 78 is provided with an axially extending slot having an outwardly opening V-shaped portion 81 and an inwardly extending relatively short narrow rectangular portion 82. In the initial blank receiving position the mandrel 78 is positioned with the slot portion 81 opening toward the feed rollers 63, 64 and at a slight upward angle from the horizontal. In this position the mandrel 78 is adapted to receive the folded edge portion of the carton blank in the slot portion 82 as the blank is moved forward by the feed rolls 63, 64. The mandrel 78 is also provided with a plurality of transverse slots 83 which are axially spaced to correspond with the transverse spacing of the slots 27 in the carton blank 10 and which extend transversely across the greater portion of the mandrel (Figs. 4 and 5).

The mandrel shaft 79 is provided adjacent one end with an arm 84 (Fig. 2) which is pivotally connected to one end of an adjustable link 85. The other end of the link 85 is pivotally connected to one end of a cam arm 86. The cam arm 86 is pivoted at its other end on a bracket 87 (Fig. 10) which is supported on a cross bar of lower frame 39 and is provided with a cam roller 88 operating in a cam track 89 of the double face cam 90 which is mounted on the cam shaft 57. The shaft 79 is oscillated by rotation of the cam 90 to provide for intermittent movement of the mandrel 78 between the carton blank receiving position (Fig. 5) and a position in which the slot portions 81 and 82 extend in a vertical direction (Fig. 14). In the latter position the carton blank is partially opened out and the cross partition forming members 28 are assembled therewith by mechanism which will be described.

A supporting plate member 91 is provided on the top of frame 37 at the rear end of the machine and a plurality of angle members 92 extend upwardly therefrom (Figs. 4 and 5) which are arranged to provide seven compartments 93 extending transversely in a row adjacent the end of the machine. The angle members 92 are held in vertical position by upper and lower rectangular frame members 94 and 95. The lower frame 95 is secured to the plate member 91 some distance above the same. Each compartment 93 is adapted to receive a stack of the partition forming blanks 28 arranged in flatwise relation and in the relative position shown in Fig. 12.

The partition blanks 28 are fed from the compartments 93 by pusher plates 96. The pusher plates 96 reciprocate beneath the compartments 93 on the top surface of the supporting plate 91. Each plate 96 is provided with an intermediate shoulder 97 on its top surface and a recessed portion 98 upon which a single blank 28 is seated for delivery out of the stack and into an erecting area 99 (Fig. 4) immediately adjacent the compartment 93 on the side toward the center of the machine.

Each pusher plate 96 is secured at one end to a cross bar 100 which is movable on the supporting plate 91. A slot 101 is provided in the supporting plate 91 beneath the path of movement of each pusher plate 96. A cross bar 102 extends crosswise of the machine beneath the supporting plate 91 and the pusher plates 96 are connected thereto through the slots 101. The cross bar 102 is provided with a depending bracket 103 which is

pivotally connected to one end of a link 104. The other end of the link 104 is pivotally connected to the end of one arm 105 of a bell crank mounted for pivotal movement on the cross bar 106 which is supported by side brackets 107 (Fig. 2). The other arm 108 of the bell crank is connected to one end of an adjustable cam rod 109 (Figs. 5 and 11). The rod 109 is provided with a forked end 110 which straddles the power shaft 57 and with a laterally extending cam roller 111 which travels in the cam track 112 of the face cam 113 secured on the power shaft 57. Rotation of the shaft 57 thus provides reciprocating movement of the pusher plates 96 for feeding the partition blanks 28 from the compartments 93.

As the partition blanks 28 are moved out of the compartments 93 by the feed plates 96 the blanks are held in a flatwise position by springs 114 and return movement is prevented by depending stop members 115 which are pivotally mounted on brackets 116 secured to the forward vertical members 92. The stop members 115 are moved upwardly by the blanks 28 as they pass beneath the same after which they drop into the path of movement of the blanks and prevent return movement of the same.

Upstanding pins 117 provide stops for limiting the movement of the blanks 28 in the forward direction while the blanks are in flatwise position. The blanks 28 are confined laterally of the machine by transversely spaced vertical plate members 118 which separate the erecting areas 99. Each plate member 118 constitutes a vertical abutment against which the respective blanks are moved as they are tilted about the top edges 29 to bring them into vertical edgewise position for further movement toward the center of the machine.

The partition blanks 28 are erected or turned on edge against the plate 118 by a series of arms 119 (Figs. 5 and 9) which are pivotally mounted at 120 on a fixed cross bar 121 depending beneath the plate 91. The arms 119 are pivotally connected at 122 to a transverse operating plate 123. Each arm member 119 is adapted to pivot about the point 120 to project its end through a transverse slot 124 in the plate 91 to engage the blank 28 and tilt the same about the edge 29 into vertical position against the plate 118. The blanks 28 are retained in the vertical position by fingers 125 each of which is pivoted at 126 to a cross bar 127 supported at its ends by angle members 128 (Fig. 5) mounted on the frame 94. Each finger 125 has a limited pivotal movement between stop pins 129 and 130 being normally positioned with its free end projecting into the path of movement of the blank 28 as it is moved into vertical position by the erecting arm 119. Movement of the blank 28 lifts the finger 125 out of the way until the blank 28 is in the vertical position whereupon the finger 125 is free to drop back into normal position to prevent return movement of the blank 28.

The blank erecting arms 119 are rotated about the pivots 120 by movement of the cross bar 123. The bar 123 is provided with a downwardly projecting arm 131 carrying on its end a cam roller 132 which is held in engagement with a cam plate 133 by operation of a spring 134 secured at one end to the end of plate 123 and at the other end to a pin 135 depending from the fixed cross bar 121.

The cam plate 133 is secured on the end of a stub shaft 136 which is journaled in a depending bracket 137 and provided at its other end with a miter pinion 138 which is driven by a cooperating miter pinion 139 on a transverse shaft 140. The shaft 140 is supported by depending end brackets 141 and is driven by means of a sprocket 142 secured thereon and a chain 143 which is in turn driven by a sprocket 144 (Fig. 10) secured on the power shaft 57.

The vertical plate members 118 are extended towards the center of the machine to form one side of narrow guideways in which the blanks 28 travel as they are moved toward the mandrel 78. The extended portions of each plate 118 comprise a rear end portion 145 and a front end portion 146, the latter terminating in an upwardly angled extension 147 which overlies a portion of the mandrel 78 and is curved at the bottom at 148 to conform to the surface of the mandrel 78. Cooperating vertical plates having rear end portions 149 and front end portions 150 which are arranged in spaced relation to the corresponding plate portions 145 and 146, respectively, form the other side of the guideways for the blanks 28. The center guideway is substantially straight longitudinally of the machine, and aligns with the center one of the slots 83 in the mandrel 78. The guideways on each side of the center one have the rear end portions converging toward the center of the machine and the front end portions in spaced parallel relation and in alignment with the respective slots 83 in the mandrel 78 so that a partition blank 28 is guided from each erecting area 99 to a slot 83.

The main portion of plate 91 underlies and supports the rear end guideway forming members 145 and 149 which are secured to the plate 91 by brackets 151. A central extension 152 on the plate 91 underlies and supports the front end guideway forming members 146 and 150 which are secured to the plate extension 152 by brackets 153. The length of the guideway is such that there are always two transverse rows of partition blanks 28 positioned in the guideways for movement towards the mandrel 78.

The partition blanks 28 are moved from the erecting areas 99 adjacent the compartments 93 into the narrow guideways by a cross bar 154 (Fig. 5) which is connected by side bars 155 and angle members 156 to the cross bar 100 which carries the blank feed plates 96 so that the erected blanks 28 are moved out of the erecting area 99 as the blank feed plates 96 feed the next set of partition blanks 28 into position for erection by the arms 119. The preceding rows of the partition blanks 28 in the guideways are simultaneously moved towards the mandrel 78 by transverse pusher bars 157 and 158. The pusher bars 157 and 158 are angular in cross section and are connected at their sides by longitudinally extending side members 159. Each of the side members 159 is pivotally connected at 160 to a side member 155 so that the pusher bars 154, 157 and 158 and the blank feed plates 96 are moved towards and from the mandrel 78 simultaneously.

The pusher bars 157 and 158 are given a compound movement by means of cam rollers 161 which are mounted adjacent the ends of the pusher bar 157 on the side members 159 and which are operative in a movable cam track 162. The cam tracks 162 are supported for vertical movement by pairs of parallel links 163 and 164 (Fig. 2). Links 163 are pivoted at 165 to the cam track 162 and at 166 to the side members of the top frame 37 of the machine. Links 164 are pivoted at the upper ends at 167 to the cam tracks 162 and secured at the lower ends

to stub shafts 168 journaled in the frame members of the machine. The stub shafts 168 have secured thereto arms 169 which are pivotally connected at 170 to links 171 which are in turn pivotally connected at 172 to arms 173 secured on the ends of the mandrel carrying shaft 79. By means of this arrangement oscillation of the shaft 79 raises and lowers the cam tracks 162 and the pusher bars 157 and 158. The vertical movement of the pusher bars 157 and 158 is coordinated with the reciprocation of the bars to provide a four-motion feed for moving the partition forming blanks 28 toward the mandrel 78.

A folding and gripping head 174 is provided for cooperation with the mandrel 78 to hold the successive carton body members 10 in position on the mandrel 78 while the cross partition blanks 28 are assembled with the same and for thereafter removing the assembled carton in partially set-up condition to a folding member which cooperates therewith to complete the setting up of the carton.

The folding head 174 is shown in Figs. 2, 3 and 5 in an intermediate withdrawing position with the gripping members engaging the partially erected carton while it is being carried away from the mandrel 78. In Figs. 7 and 8 the folding head is shown in detail to an enlarged scale with the gripping members thereof in the position they assume when the carton has been released and removed from the head.

The folding head 174 comprises a U-shaped cross frame having a bight portion or member 175 extending transversely of the machine and side arms 176. The ends of the side arms 176 are pivoted at 177 to supporting brackets 178 mounted on the top plate 40 at opposite sides of the machine (Fig. 4). The side arms 176 are pivotally connected at 179 to the ends of adjustable links 180 (Fig. 2). The other ends of the links 180 are pivotally connected at 181 to arms 182. The arms 182 are pivoted at 183 to brackets 184 supported on opposite sides of the bottom frame structure 39. A cam roller 185 (Fig. 10) on the one arm 182 operates in a cam track 186 in the double face cam 90 while a similar cam roller 187 on the opposite arm 182 operates in a cam track 188 in the face cam 189 which is mounted on the power shaft 57. The cam tracks 186 and 188 are identical and provide for oscillation of the head 174 in proper timed relation to the operation of the mandrel 78 and the cross partition feed means.

A plurality of generally W-shaped strap members 190 are attached to the cross frame member 175 at one end and extend forwardly of the same in transversely spaced relation to provide folding and shaping elements for the bottom of the carton, the spaces between the strap members 190 permitting the insertion of the cross partition blanks 28 while the strap members 190 are in holding relation relative to the mandrel 78.

Each of the strap members 190 is provided with a smaller strap member 191 which is secured to one leg of the member 190 and which is provided with a curved end 192 extending below and away from the bottom of the member 190 as shown in Fig. 8. A cross bar 193 is secured adjacent the cross frame member 175 on the strap members 190 and a plurality of relatively narrow L-shaped members 194 are arranged in upstanding transversely spaced relation, as shown in Fig. 8, in the spaces between the strap members 190, for a purpose which will be described.

A cross rod 195 is provided which is journaled in bearing brackets 196 which are attached to the side members 176 adjacent the ends of the cross frame member 175. The rod 195 carries a pair of spaced forwardly extending arms 197, the ends of which are bent at a slight upward angle and attached to a cross bar 198. The cross bar 198 is provided on its lower face with a plurality of small angle brackets 199, the downwardly projecting legs of which constitute the fixed jaws of a plurality of grippers for engaging the cross partition blanks 28. The cross bar 198 is provided with a plurality of spaced slots 200 which are adapted to receive pivotal members having portions 201 depending below the pivots 202 which constitute the movable jaws of the grippers and upstanding portions or arms 203 which are pivotally connected at 204 to an operating bar 205. Tension springs 206 are connected between the pivot points 204 and fixed posts 207 on the cross bar 198. The springs 206 urge the gripper jaws 199 and 201 into closed gripping relation.

The cross bar 205 is provided at an intermediate point with a cam roller 208 which is adapted to ride on a cam surface 209. The cam 209 is mounted on a bracket 210 which is secured to and projects upwardly from an intermediate one of the strap members 190. The cam 209 is shaped to cause the bar 205 to move in an axial direction to pivot the gripper jaws 201 to the open position. The cam roller 208 is urged into contact with the cam 209 by a tension spring 211 which is connected at one end 212 to the bar 205 and at the other end 213 to one of the arms 197. A coiled torsion spring 214 on the cross rod 195 is secured at the one end 215 to the arm 197 and at the other end 216 to the cross bar 175 to urge the arms 197 and the gripper structure carried thereon away from the strap members 190.

The cross shaft 195 is extended at one end and an operating arm 217 is secured thereon. The arm 217 is provided at its free end on the inside face thereof, with a cam roller 218 and intermediate its ends, on the outside face thereof, with another cam roller 219. The cam roller 218 is adapted to engage a fixed cam 220 to hold the gripper assembly in open position while the head 174 moves down into engagement with the carton body blank on the mandrel 78. The cam 220 is formed on the end of a bracket member 221 which is supported in a vertical position on the top plate 40 at one side of the machine. An L-shaped gripper release or actuator member 222 is pivotally mounted at 223 on an upstanding bracket member 224 which is supported on the top plate 40 adjacent the bracket member 221. A rest 225 is provided on the top of the bracket member 221 to limit the movement in the forward direction of the L-shaped member 222, by engagement with the upper portion or leg 226 of the member 222. A stop member 227 is provided on the side member of the top frame 31 which limits the movement of the L-shaped member by engagement with the lower portion or leg 228 of the member 222. The leg 226 is provided adjacent its end with a cam roller 229 which is adapted to be moved into the path of the cam plate 230 when the leg 226 is pivoted counterclockwise about the pivot point 223 (Fig. 2) by engagement with the cam roller 218. The cam plate 230 is mounted on the end of the continuously rotating shaft 65.

When the folding head 174 is in the blank hold-

ing position relative to the mandrel 78 and the cross partition blanks 28 are moved into the slots 83 by forward movement of the pusher bar 158 the cam plate 230 engages the cam roller 229 to close the gripper jaws 199 and 201 on the blanks 28 and thereafter to move the cross partition blanks 28 into fully inserted position. The cut-away corners 33 on the trailing edges of the blanks 28 permit the blanks 28 to clear the bottom of the guideways as they are moved into final position. The pusher bar 158 is immediately retracted sufficiently to avoid interference with subsequent removal of the carton from the mandrel 78. When the folding head 174 is moved away from the mandrel 78 the gripper assembly is retained in the operative position by action of the torsion spring 214 and the partially set-up carton is carried upwardly away from the mandrel 78.

When the folding head 174 reaches its uppermost position and the folding operations are completed, the cam plate 230 strikes the cam roller 229 and pivots the actuator member 222 clockwise about the point 223 to engage the portion 226 with the cam roller 218. The resulting movement of the arm 217 releases the gripper jaws 199 and 201 from engagement with the cross partition blanks 28 and permits the carton to fall downwardly away from the folding head 174.

The folding head 174 is timed to move downwardly toward the mandrel 78 after the carton body forming blank 10 has been delivered to the mandrel 78 and the latter has been rotated to bring the slot portions 81 and 82 into upwardly opening position. In the latter position the uppermost half of the folded blank 10 extends substantially vertically from the mandrel 78 while the lowermost half extends substantially horizontally. As the folding head 174 moves into engagement with the blank 10 the portion 19 of the horizontally extending half of the blank 10 is engaged by the curved end 192 of the member 191 on the head 174 and folded downward around the curved surface of the mandrel 78 so that when the partition blanks 28 are moved by the gripper assembly into their final position the slots 27 in body blank portion 19 will interengage with the slots 32 in the partition blanks.

When the folding head 174 moves upwardly away from the mandrel 78 (Figs. 2, 3 and 5) with the cross partition members 28 engaged by the gripper jaws 199 and 201 the carton is in assembled condition except for the one side wall portion 19 which must be moved to bring the slots 27 into interlocking engagement with the slots 32 in the ends of the partition blanks 28. As the head 174 nears the limit of its upward movement the side wall portion 19 is moved into contact with a fixed folding device 231 which is supported on the forward vertical members 41 (Figs. 5 and 6).

The folding device 231 comprises a U-shaped frame having the bight portion 232 secured to the vertical members 41 and the legs 233 projecting upwardly with their ends connected by a cross bar 234. Arms 235 are secured to the cross bar 234 and extend forwardly and downwardly to another bar 236 extending transversely of the machine and having pairs of spaced curved spring fingers 237 extending forwardly in parallel relation at opposite ends. A rod 238 is secured to each upstanding leg 233 which extends forwardly into the space between the spring fingers 237. The rods 238 are each provided with a depending abutment member 239 adjacent the outer end thereof which extends downwardly below the spring fingers 237. As the folding head 174 moves upwardly the side wall forming portion 19 of the body blank is forced into hooked relation in the end slots 32 of the cross partition forming blanks 28 by operation of the abutment members 239 and spring fingers 237.

A cross rod or shaft 240 is rotatably mounted on uprights 241 which are supported on the side members of the top frame 37 on the side of the mandrel 78 opposite the path of the folding head 174. A pair of laterally spaced guide arms 242 are secured intermediate their ends to the cross shaft 240 with the portion 243 which projects on the one side of the cross shaft 240 extending in slightly curved relation a relatively short distance. The guide arms 242 limit the movement of the side and cover flap portion of the carton body blank in a direction forwardly of the mandrel 78 while the carton is being erected on the mandrel and removed therefrom and prevent interference with the preceding carton. A cross bar 244 connects the upright supporting members 241 at an intermediate point and also operates as a stop or support for the side and cover flap portions of the body blank while it is on the mandrel 78.

A cross frame comprising vertically extending side members 245 and a top cross member 246 is provided parallel to and spaced from the frame formed by the vertical side members 241 and the cross bar 244. The side members 245 are supported on the side members of the frame 37 and are braced by frame members 247 to the side members 241. A cross rod or shaft 248 is journaled in the side frame members 245 at a height of slightly above the cross shaft 240. A U-shaped frame comprising a cross rod 249 and side arms 250 is secured at the ends of the side arms 250 to the shaft 248. The cross rod 249 has secured thereon laterally spaced upwardly opening V-shaped supporting members 251 which are adapted to receive the fully assembled carton when it is released from the folding head 174. The cross shafts 240 and 248 are extended at one end and provided with sprockets 252 and 253, respectively, which are connected by a drive chain 254 to provide parallel movement of the arms 242 and 250. An arm 255 is secured at one end to the shaft 248 and pivotally connected at the other end 256 to the upper end of a link 257. The lower end of link 257 is pivotally connected at 258 to one end of an arm 259, the other end of which is pivoted at 260 to a bracket 261 depending from the machine frame 37. The arm 259 is provided with a cam roller 262 which travels in the cam track 263 in the cam 264 which is mounted on the driven shaft 140.

The completed cartons are discharged, by upward swinging movement of the arms 250, into a chute above the machine, which chute is formed by a curved bottom plate member 265 (Fig. 1) and a pair of laterally spaced generally parallel curved stripping members 266 arranged in spaced relation above the plate 265. The plate 265 is supported at one end by brackets 267 extending upwardly from the cross frame member 246 and at the other end by the bottom member 268 of a rectangular cross frame which is supported in a vertical position by uprights 269 secured to the bottom cross frame member 268 at their upper ends and to vertical members 92 at their lower ends. The top member 270 of this cross frame supports the rearward ends of the stripping

members 266. The stripping members 266 are supported adjacent their forward ends by brackets 271 which are connected to top cross member 272 of a transversely extending inverted U-shaped frame having side frame members 273 secured at their lower ends to the cross frame member 246. The stripping members 266 are connected by a cross bar 274 at the forward end which constitutes the entrance end of the chute. Side brace members 275 connect the forward and rearward side frame members 273 and 276, respectively.

The operation of the machine in assembling the cross partition blanks 28 with the body forming blanks 10 and completely erecting the carton is illustrated schematically in Figs. 12 to 17.

Referring to Figs. 12 and 13 particularly, the compartment or magazine formed by the vertical members 41 is supplied with a stack of the body forming blanks 10 which have been folded as illustrated in Fig. 19. The blanks 10 are positioned in the stack with the side uppermost which is provided with the oblique corners at 25 and with the folded edge in a direction towards the center of the machine. The feed members 42 are reciprocated to move the lowermost blanks successively from the compartment to the continuously operating feed rollers 63 and 64. As the feed rollers 63 and 64 move the blank forward the oscillating mandrel 78 is moved to the blank receiving position with the slots 81 and 82 opening toward the feed rollers 63 and 64 and at a slight upward angle. The folded edge of the blank 10 is moved into the rectangular slot portion 82. Because of the angular position of the slot 82 some tension is applied to the blank, tending to urge it in an upward direction. The blank is restrained from any movement in the upward direction by engagement of the trailing edge with the feed rollers 63 and 64 and the side guide members 76 until the blank is moved, by oscillation of the mandrel 78, to pull the trailing edge away from the rollers 63 and 64 and from beneath the guide plates 76 (Fig. 4).

Prior to oscillation of the mandrel 78 to the upwardly opening or assembling and erecting position a plurality of cross partition blanks 28 are moved into position adjacent the mandrel 78 on the side of the mandrel opposite that on which the blank 10 is fed. In the illustrated machine a supply of the blanks 28 are arranged as shown in Fig. 12 in the seven compartments or magazines 93 at the other end of the machine. The feeding of the blanks 28 is coordinated with the movement of the mandrel 78 and three sets or rows of blanks are handled simultaneously by the blank feeding mechanism. When the body blank 10 is delivered to the mandrel 78 three rows of blanks 28 are positioned in spaced relation to the guideways leading up to the mandrel 78. As the mandrel 78 is oscillated to the upward position the pusher bars 154, 157 and 158 are in the retracted position with the bars 157 and 158 also in the raised position. Upon oscillation of the mandrel 78 to the upright position the pusher bars 157 and 158 are lowered as in Fig. 14 so that all three of the bars are in position to move the rows of blanks 28 toward the mandrel simultaneously. The feed plates 96 for feeding the blanks 28 from the supply compartments 93 are in the withdrawn position.

As the mandrel 78 turns to the assembling and erecting position the blank 10 is moved from beneath the top feed rollers 63 and the uppermost side of the blank 10 is released by the side guide plates 76 by reason of the cut-away corner portions 25 of the blank and the cut-away portions 77 of the guide plates 76 to permit the uppermost side to spring upwardly and forwardly into engagement with the cross bar 244 and the lower ends 243 of the pivoted arms 242. The lowermost side of the blank 10 is prevented from moving upwardly by the side guide plates 76, being held in a horizontal position and free of the bottom plate members 74 and 75 so that it may be moved downwardly. The folding head 174, which is in the raised position in Fig. 13, is moved down toward the mandrel 78 as the mandrel turns, to a holding position closely adjacent the top of the mandrel when the mandrel has completed its movement to the position indicated in Fig. 14. In this position the end 192 of the plate 191 on the mandrel engages the lowermost side of the blank 10 and moves it downwardly toward the curved surface of the mandrel 78. The bar 198 on the mandrel which carries the cooperating gripper jaws 199 and 201 is in the raised position with the gripper jaws open.

When the mandrel 78 and the folding head 174 are in the position shown in Fig. 14 the pusher bars 154, 157 and 158 are moved forwardly to insert the row of partition members 28 which is adjacent the mandrel 78 into the transverse slots 83 in the mandrel and the slots 27 in the body blank 10 which are aligned therewith as shown in Fig. 15. Thereafter the folding head 174 is moved downwardly towards the mandrel 78 into clamping engagement with the body blank 10. The gripper carrying bar 198 is moved downwardly to bring the gripper jaws into gripping relation with the members 28 and to move the members 28 further downwardly and backwardly relative to the mandrel 78. This movement of the members 28 causes the double walled partition portions of the blank 10 to be positioned in engagement in the slots 34 in the blanks 28. It also causes the lowermost side wall portion of the blank 10 to be positioned in interlocking engagement in the slots 32 in the leading edges of the blanks 28. In this position the cross wall members 28 and the body blank 10 are completely assembled in interengaging relation except for the engagement of the uppermost side wall portion in the slots 32 in the trailing edges of the members 28.

I claim:

1. A machine for assembling and erecting a cellular carton of the type which is characterized by a foldable body forming blank and a plurality of cross partition forming blanks which are adapted to be positioned in interlocking relation in aligned slots in the body forming blank, said machine comprising means for receiving the body forming blank in partially folded condition, means for holding the blank in said partially folded condition, means for delivering to said body blank receiving means a plurality of cross partition forming blanks in spaced parallel edgewise relation, means for inserting said cross partition forming blanks in transversely aligned pairs of slots in said body blank, and means for further moving said cross partition forming blanks relative to said body forming blank to bring the same into interlocking relation with side wall portions of said body forming blank.

2. A machine as recited in claim 1 wherein the means for receiving the body blank in partially folded condition comprises a movable mandrel for engaging the body forming blank in one position and moving the same to another position.

3. A machine as recited in claim 1 wherein the means for receiving the body blank in partially folded condition comprises a mandrel having an axially extending slot for receiving a folded edge of the body forming blank.

4. A machine as recited in claim 1 wherein the means for receiving the body blank in partially folded condition comprises a movable mandrel having an axially extending slot provided with a flared opening for receiving a folded edge of the body forming blank.

5. A machine as recited in claim 1 wherein the means for receiving the body blank in partially folded condition comprises a mandrel mounted on a transverse oscillatable shaft, said mandrel having an outwardly opening axially extending slot for receiving a folded edge of the body forming blank when said mandrel is in one position, and means for oscillating said shaft to move said mandrel to another position.

6. A machine as recited in claim 1 wherein the means for receiving the body blank in partially folded condition comprises a rotatable mandrel having an outwardly opening axially extending slot for receiving a folded edge of the body forming blank and said mandrel having a plurality of axially spaced transverse slots which are adapted to align with the transverse slots in the body forming blank when said blank is received on said mandrel.

7. A machine for assembling a cellular carton of the type which is characterized by a body blank of generally rectangular shape which is adapted to be folded to form a double-walled medial partition, bottom walls, side walls and cover flaps and which is further characterized by a plurality of separate cross wall blanks which are adapted to be positioned in interengaging relation in longitudinally spaced transversely aligned slots in the body blank, which machine comprises a movable mandrel for receiving the body blank in folded condition, means cooperating with the mandrel for moving the body blank to another position with the blank in partially unfolded condition, means for holding the body blank on said mandrel, means for delivering to said mandrel a plurality of cross wall forming members in spaced parallel edgewise relation, means for partially inserting said cross wall forming members in transversely aligned pairs of slots in said body blank, means cooperating with said body blank holding means for moving said cross wall members into interlocking relation with one side wall of said body blank and for thereafter removing the assembled body blank and cross wall members from the mandrel, and means for folding the other side wall of said body blank into interlocking relation with the cross wall members.

8. A machine for assembling and erecting a cellular carton of the type which is characterized by a foldable body forming blank and a plurality of cross partition forming blanks which are adapted to be positioned in interlocking relation in aligned slots in the body forming blank, said machine comprising a mandrel for receiving the body forming blank in folded condition, means for rotating said mandrel to another position, guide means for preventing movement of one side wall forming portion of said blank, said guide means being cut away to permit movement of the other side wall portion of said blank whereby said blank is partially unfolded by the movement of said mandrel, means for holding said blank in partially unfolded condition, means for delivering to said mandrel a plurality of cross partition forming blanks in spaced parallel edgewise relation, means for inserting said cross partition forming blanks in aligned pairs of slots in said body blank, and means for folding said body forming blank to bring the same into interlocking relation with the partition forming members.

9. A machine for assembling a cellular carton of the type which is characterized by a body blank of generally rectangular shape which is adapted to be folded to form a double-walled medial partition, bottom walls, side walls and cover flaps and which is further characterized by a plurality of separate cross wall blanks which are adapted to be positioned in interengaging relation in longitudinally spaced transversely aligned slots in the body blank which machine comprises a supporting frame, an oscillatable mandrel intermediate the ends of said supporting frame, means at one end of the machine for delivering body blanks which are folded about a medial line toward the mandrel with the folded edge foremost and to position successive blanks on the mandrel in partially unfolded condition, as the mandrel moves to another position, a reciprocal head for holding the body blank on said mandrel, a plurality of transversely spaced vertical guideways extending from the other end of the machine to the mandrel, means for delivering to said guideways a plurality of cross wall forming blanks in edgewise position, means for inserting said cross wall forming blanks in aligned pairs of slots in the body blank, means for cooperating with said head for engaging said cross wall blanks and moving them into interlocking relation with a side wall, the medial partition and bottom walls of the body blank and for thereafter holding the partially assembled body blank and cross wall members on said head as said head moves to another position, and means along the path of movement of said head for folding the other side wall of the body blank into interlocking relation with the cross wall blanks.

10. A machine for assembling a cellular carton which is characterized by a body forming blank having two rows of transversely spaced longitudinally extending slots arranged on opposite sides of a medial fold line and a plurality of slotted cross wall forming blanks which are insertable within the slots of the body forming blank for interlocking engagement therewith, said machine comprising a set-up member having an axially extending outwardly opening slot therein, means for delivering a body forming blank which has been folded about the medial line to said set-up member and inserting the folded edge thereof in said slot, means for unfolding the remainder of the body blank to spread the side portions thereof in a transverse direction relative to said slot with the slots in the body blank on opposite side portions in transverse alignment, means for delivering a row of cross wall blanks in edgewise relation and in alignment with the slots in the body blank, means for inserting said cross wall blanks in said slots, means for moving said cross wall blanks to bring the one side portion of the body blank into interlocking engagement in slots in said cross wall blanks, and means for moving said body blank to bring the other side portion thereof into interlocking engagement with other slots in said cross wall blanks.

11. A machine as recited in claim 10 wherein the means for delivering the cross wall blanks

comprises a plurality of compartments for receiving a supply of blanks in flatwise relation, guideways extending from each compartment to the set-up member, means for simultaneously delivering individual blanks from the compartments, means for turning the blanks about an edge to bring them into edgewise relation, and means for moving the blanks through the guideways to the set-up member.

12. A machine for assembling cellular cartons which are characterized by body forming blanks having rows of spaced slots on opposite sides of a medial line thereof and slotted cross wall forming blanks which are insertable within the slots of the body forming blanks for interlocking engagement therewith, said machine comprising a supporting frame, a set-up member having an axially extending outwardly opening slot therein supported intermediate the ends of the supporting frame, means at one end of the supporting frame for delivering successive body forming blanks which have been folded about the medial line to said set-up member and inserting the folded edge thereof in said slot, means for unfolding the remainder of the body blank to spread the side portions thereof in opposite directions with the rows of slots on the opposite side portions in transverse alignment, means at the other end of the supporting frame for assembling rows of cross wall blanks in edgewise transversely spaced relation and in alignment with said slots and for inserting successive rows of said cross wall blanks in the slots in the successive body blanks, means for moving the cross wall blanks to bring one side portion of the body blanks into interlocking engagement in slots in said cross wall blanks, and means for moving the body blanks to bring the other side portion into interlocking engagement with other slots in said cross wall blanks.

13. A machine as recited in claim 12 wherein the means for assembling the cross wall blanks and inserting them in the slots in the body blanks comprises relatively narrow transversely spaced guideways extending from the set-up member toward the other end of the machine, said guideways being aligned at one end with the slots in the body blank when they are on the set-up member and diverging outwardly at their other ends, a cross wall blank supply compartment aligned with each guideway at said other end, means for simultaneously delivering successive blanks from each compartment in flatwise relation, means for turning the blanks on edge, and pusher bars operable to move the blanks in successive rows through the guideways and into the slots in the body blanks on the set-up member.

14. A machine for assembling in erected condition a cellular carton of the type which is characterized by a body forming blank adapted to be folded to form a double-walled medial partition, bottom walls, side walls and cover flaps and a plurality of cross wall forming blanks having slots at opposite ends thereof which are adapted to be engaged in interlocking relation in longitudinally spaced transversely aligned slots in the bottom and side wall portions of the body blank, which machine comprises means for positioning and holding the body blank in partially folded condition with the bottom walls extending in diverging relation relative to the medial partition wall and the side walls extending from the bottom walls in generally opposite directions, means for delivering the cross wall blanks in edgewise relation and in alignment with the slots in the bottom and side walls, means for inserting the cross wall blanks in said slots, means for moving the cross wall blanks relative to the bottom and side walls to engage the one side wall in the slots at one end of the cross walls, and means to move the other side wall to engage the same in the slots at the other end of the cross walls.

15. A machine for assembling in erected condition a cellular carton of the type which is characterized by a body forming blank adapted to be folded to form a double-walled medial partition, bottom walls, side walls and cover flaps and a plurality of cross wall forming blanks having slots at opposite ends thereof which are adapted to be engaged in interlocking relation in longitudinally spaced transversely aligned slots in the bottom and side wall portions of the body blank, which machine comprises a mandrel for positioning and holding the body blank in partially folded condition with the bottom walls extending in upwardly diverging relation relative to the medial partition wall and the side walls extending from the bottom walls in opposite upward and downward directions, a folding head operable in an arcuate path for movement toward and from said mandrel, said folding head engaging the body blank and holding it on the mandrel at one end of said arcuate movement, means for delivering the cross wall blanks in edgewise relation and in alignment with the slots in the bottom and side walls and for inserting the cross wall blanks in said slots, a gripper bar mounted for swinging movement on said folding head and having gripper jaws adapted to engage in gripping relation the uppermost edge of the cross wall blanks when they are inserted in the body slots, means for swinging said gripper bar to grip the cross wall blanks and move the same relative to the bottom and side walls to engage the one side wall in the slots at one end of the cross walls, means for thereafter moving the folding head to the other end of its arcuate path to carry the carton away from the mandrel and cooperating fixed abutment fingers at said other end of said path for moving the other side wall of the body blank to engage the same in the slots at the other end of the cross walls.

16. A machine for assembling and erecting a cellular carton of the type which is characterized by a body blank of generally rectangular shape which is adapted to be folded to form a double-walled medial partition, bottom walls, side walls and cover flaps and which is further characterized by a plurality of separate cross wall forming blanks which are adapted to be positioned in interengaging relation in longitudinally spaced transversely aligned slots in the bottom and side wall forming portions of the body blank, which machine comprises means for feeding the body blank initially folded about a medial line with the folded edge forming the leading edge of the blank, means for receiving the folded edge of the body blank and holding the medial partition forming portions of said blank in folded condition, means for opening out the remaining portions of the blank whereby the side wall forming portions extend in generally opposite directions, means for feeding a plurality of cross wall blanks in edgewise relation into aligned relation with the slots in said body blank, means for inserting said cross wall blanks in said slots, means for engaging said cross wall blanks and moving them into interengaging relation with one side wall forming portion of the body blank, and means for moving the other side wall forming

portion of the body blank into interengaging relation with said cross wall blanks to thereby complete the erection of the carton.

17. A machine for assembling and erecting a cellular carton of the type which is characterized by a body blank of generally rectangular shape which is adapted to be folded to form a double-walled medial partition, bottom walls, side walls and cover flaps and which is further characterized by a plurality of separate cross wall forming blanks which are adapted to be positioned in interengaging relation in longitudinally spaced transversely aligned slots in the bottom and side wall forming portions of the body blank, which machine comprises means for feeding the body blank initially folded about a medial line with the folded edge forming the leading edge of the blank, means for receiving the folded edge of the body blank and holding the medial partition forming portions of said blank in folded condition, means for moving said body blank receiving means to another position for opening out the remaining portions of the body blank whereby the side wall forming portions extend in generally opposite directions, means for holding the body blank in opened out condition, means for feeding a plurality of cross wall blanks in edgewise relation into aligned relation with the slots in said body blank and for inserting said cross wall blanks in said slots, means cooperating with said blank holding means for gripping said cross wall blanks and moving them into interengaging relation with one side wall forming portion of the body blank, means for moving said blank holding means and said gripper means to withdraw the carton from said body blank receiving means, and means in the path of movement thereof for folding the other side wall forming portion of the body blank into interengaging relation with said cross wall blanks to thereby complete the erection of the carton.

18. A machine for assembling a plurality of cross wall forming blanks with a body forming blank which is foldable to provide a double-walled medial partition, bottom walls, side walls and cover flaps, said bottom and side walls being provided with transversely aligned slots for receiving said cross wall blanks, said machine comprising a frame supporting intermediate its ends a transversely extending folding mandrel, said mandrel being provided with an axially extending outwardly opening slot and axially spaced transverse slots, a blank supply compartment at one end of said supporting frame adapted to receive a stack of body forming blanks which have been folded about a transverse medial line, a delivery mechanism for delivering successive blanks in flatwise relation from said compartment to said mandrel and for inserting the folded edge of the blank in the slot in sad mandrel, side guide elements for holding the blank in folded condition while it is being delivered to said mandrel, means for rotating said mandrel approximately a quarter turn to withdraw one side of the body blank from said guide elements and open out the body blank, a folding head mounted for movement in a direction laterally of the path of movement of the body blank toward and from said mandrel, said head being adapted in one position to clamp said body blank in opened out position against said mandrel, cross wall blank supply compartments at the other end of the machine, mechanism for delivering said cross wall blanks from said compartments to said mandrel for insertion in aligned slots in the bottom and side wall forming portions of said body blank while it is being held between said mandrel and said head, mechanism movably mounted on said head for gripping said cross wall blanks and moving them into interengaging relation with the medial partition and a side wall of said body blank, means for thereafter moving said head to remove the partially assembled carton from said mandrel, and mechanism in the path of movement of said head for moving the other side wall of the body blank into interengaging relation with said cross wall blanks.

19. A machine for assembling a plurality of cross wall forming blanks with a body forming blank which is foldable to provide a double-walled medial partition, bottom walls, side walls and cover flaps, said bottom and side walls being provided with transversely aligned slots for receiving said cross wall blanks, said machine comprising a frame supporting intermediate its ends a transversely extending rotatably mounted folding mandrel, said mandrel being provided with an axially extending radial slot having a flared opening and a plurality of axially spaced transversely extending slots, a blank supply mechanism at one end of said supporting frame adapted to receive a stack of body forming blanks which have been folded about a transverse medial line, a delivery mechanism including cooperating feed rollers for delivering successive blanks in flatwise relation toward said folding mandrel and for inserting the folded edge of the blank in the axially extending slot in the folding mandrel, vertically spaced side guide plates for holding the blank in folded condition while it is being delivered to said mandrel, means for rotating said mandrel upwardly approximately a quarter turn to withdraw one side of the body blank from said feed rollers and said guide plates and permit the body blank to open out, a folding head mounted for generally vertical movement toward and from said mandrel, said folding head clamping said body blank in opened out position against said mandrel at one end of its movement, cross wall blank supply mechanisms at the other end of the machine, guideways between said supply mechanisms and the mandrel, means for delivering cross wall blanks through said guideways for insertion in aligned slots in the bottom and side wall forming portions of said body blank while it is being clamped against said mandrel by said folding head, mechanism pivotally mounted on said folding head for gripping the uppermost margins of the cross wall blanks and forcing them into interengaging relation with the medial partition and a side wall of the body blank, said folding head being thereafter movable to the other end of its path to remove the partially assembled carton from the mandrel, and fixed abutment members in the path of movement of said head for engagement with the other side wall of the body blank to move the same into interengaging relation with said cross wall blanks.

20. A machine for assembling cellular cartons which are characterized by a foldable body blank having spaced rows of slots therein and slotted cross wall blanks which are insertable within the slots of the body blank for interlocking engagement therewith, said machine comprising a supporting frame, a rotatable set-up member mounted on a transverse axis intermediate the ends of said supporting frame, said set-up member having an axially extending outwardly opening slot therein, means at one end of the machine for delivering a body blank which has been folded

about a medial line to said set-up member and inserting the folded edge thereof in said slot, said set-up member being initially positioned with the slot opening towards said blank delivery means, means for rotating said set-up member to bring the slot into a generally upwardly opening position to unfold the remainder of the body blank and to bring one side portion thereof into an upwardly extending direction, a folding head mounted for generally vertical reciprocating movement above said set-up member, said folding head being engageable in clamping relation with said set-up member at one end of its movement to hold the body blank thereon and to position the other side portion thereof into a generally downwardly extending direction, means at the other end of the machine for delivering a plurality of the cross wall blanks to said set-up member in transversely spaced edgewise relation and for inserting said cross wall blanks in aligned slots in the partially folded body blank, movable gripper means on said folding head for gripping said cross wall blanks and moving them relative to the body blank to bring one side portion of the body blank into interlocking engagement in slots in said cross wall blanks, said folding head being thereafter movable upwardly away from said set-up member to remove the carton from said set-up member, and folding members in the path of movement of the folding head to move the other side portion of the body blank into interlocking engagement with other slots in said cross wall blanks.

21. A machine as recited in claim 20 and means for releasing the completed carton at the end of the upward movement of the folding head and permitting it to move downwardly away from said folding head.

22. A machine as recited in claim 20 and discharge members mounted above said set-up member for reciprocating movement in timed relation into the path of movement of said folding head for receiving the completed carton from said folding head.

23. A machine as recited in claim 20 and means for releasing said grippers from gripping engagement with the carton cross walls and freeing the completed carton for movement downward away from said folding head, and a discharge frame swingable to a position beneath said folding head when the carton is freed therefrom to receive the completed carton.

24. A machine as recited in claim 20 and cam operated trip means for disengaging said grippers from the carton cross walls at the end of the upward movement of the folding head to permit the carton to drop free of the folding head, a discharge chute above said mandrel for receiving successive completed cartons in nested relation, a swingable discharge frame mounted above the folding mandrel and movable from a position between the folding head and the mandrel where it receives the freed carton to a position where the carton is inserted in said discharge chute.

25. A machine as recited in claim 20, and a pair of arms mounted above said set-up member and swingable from a generally horizontal position to a generally vertical position for engagement with the free edge of the upwardly extending side portion of the body blank to limit the movement of the same while the body blank is being assembled with the cross wall blanks on the set-up member.

26. A machine as recited in claim 20 and a guide arm mounted on a transverse shaft above said set-up member and swingable from a generally horizontal to a generally vertical position, said arm being attached to said shaft at a point intermediate its ends, a portion of said arm extending on one side of said shaft being engageable by the free edge of the upwardly extending side portion of the body blank to limit the movement thereof when the set-up member moves to the upright position and a portion of said arm extending on the other side of said shaft being engageable by said blank side portion as the carton is removed upwardly from the set-up member.

27. In a machine for assembling and erecting a cellular carton of the type which is characterized by a foldable body forming blank and a plurality of cross partition forming blanks which are adapted to be positioned in interlocking relation in aligned slots in the body forming blank, a supporting frame, a rotatable mandrel intermediate the ends of said supporting frame, a supply compartment at one end of said frame for receiving a stack of the body forming blanks which have been folded about a medial cross line, feeding and guiding means between said supply compartment and said mandrel for delivering successive body blanks from said supply compartment to said mandrel with the folded edge foremost, and means on said mandrel for receiving the folded edge of the body blank and holding adjacent portions of the blank in folded relation while said mandrel is rotated in a direction towards the other end of the machine sufficiently to free one-half of the body blank from said guiding means to open out said blank.

28. In a machine for assembling and erecting a cellular carton of the type which is characterized by a rectangular blank adapted to be folded about transverse lines to form a double-walled medial partition, bottom walls, side walls and cover flaps, and provided with a row of transversely spaced slots on opposite ends of the medial partition which extend into the bottom and side wall forming portions of the blank and a plurality of cross wall members which are adapted to be received in interlocking relation in aligned pairs of slots in the body, a supporting frame, an axially slotted transversely extending mandrel mounted on said supporting frame, said mandrel being rotatable from a body blank receiving position in which the slot opens towards one end of the machine to a blank assembly position in which the slot opens upwardly of the machine, mechanism for supplying body blanks which have been folded about a medial line, and mechanism for guiding successive blanks with their folded edge foremost toward the open slot in said mandrel, said guide mechanism comprising pairs of feed rollers and side guide plates, one of said side guide plates being cut away at the ends to permit one-half of the body blank to be freed before the other half upon rotation of said mandrel from the body blank receiving position to the assembly position whereby the freed half of the blank is positioned in a generally opposite direction from the other half of the blank for receiving the cross wall members in the slots therein.

29. In a machine for assembling and erecting a cellular carton of the type which is characterized by a foldable body forming blank and a plurality of cross partition forming blanks which are adapted to be positioned in interlocking relation in aligned slots in the body forming blank, a generally cylindrical mandrel having an axial

slot for receiving a folded portion of the body forming blank, said mandrel having transversely extending guide slots of greater radial depth than the axial slot, said mandrel being rotatable from one position for receiving the folded body blank to another position for receiving a plurality of cross partition blanks in said transverse guide slots and guideway forming members for delivering to said mandrel a plurality of cross partition forming blanks in spaced parallel edgewise relation, said guideway forming members being aligned with the transverse guide slots in said mandrel and having end portions extending in a peripheral direction around said mandrel.

30. In a carton set-up machine for assembling cross wall blanks in interlocking relation in transversely aligned pairs of slots in a body blank which body blank is foldable to provide a carton having in cross section the general form of the letter W, a mandrel for supporting the body blank in partially folded condition, said mandrel being generally cylindrical and having an axially extending outwardly opening generally V-shaped slot of a length somewhat greater than the length of the carton for receiving a folded portion of the body blank, said mandrel having axially spaced transverse slots extending inwardly beyond the depth of the axially extending slot and adapted to align with the slots in the body blank when the body blank is supported thereon for guiding the cross wall blanks into the slots in the body blank, and means for rotatably supporting said mandrel on an axis which extends within the confines of the generally V-shaped slot whereby said mandrel may be rotated from a position for receiving a folded portion of a body blank in the generally V-shaped slot to another position for receiving the cross wall blanks in the transverse slots.

31. In a carton set-up machine for assembling cross wall blanks in interlocking relation in transversely aligned pairs of slots in a body blank which body blank is foldable to provide a carton having in cross section the general form of the letter W, a mandrel for supporting the body blank in partially folded condition, said mandrel being generally cylindrical and having an axially extending outwardly opening generally V-shaped slot for receiving a folded portion of the body blank, said mandrel having axially spaced transverse slots adapted to align with the slots in the body blank when the body blank is supported thereon for guiding the cross wall blanks into the slots in the body blank, and a folding head mounted for movement against said mandrel when the mandrel is in body blank supporting position to hold the body blank in position while the cross wall blanks are inserted in the slots in the body blank, said folding head comprising a cross bar and laterally extending axially spaced strap members having generally V-shaped portions adapted to move into the V-shaped slot in said mandrel and folding tongues at the base of said strap members adapted to fold a portion of a body blank on said mandrel against the periphery of said mandrel adjacent one side of the V-shaped slot.

32. In a carton set-up machine as recited in claim 31 and a gripper frame pivotally mounted on said folding head, gripper members mounted on said frame between said strap members for engaging the cross wall blanks, and means including a cam on said folding head for operating said gripper members when said gripper frame is pivoted in a direction toward said folding head.

33. In a machine for assembling a cellular carton which is characterized by a body forming blank having two rows of transversely spaced longitudinally extending slots arranged on opposite sides of a medial fold line and a plurality of slotted cross wall forming blanks which are insertable within the slots of the body forming blank for interlocking engagement therewith, a rotatable cylindrical member having an axially extending outwardly opening slot and axially spaced transversely extending slots therein, means for delivering a body forming blank which has been folded about the medial line to said cylindrical member and inserting the folded edge thereof in said axially extending slot, means for rotating said cylindrical member to another position to unfold the blank and spread the side portions thereof in transverse directions relative to said axially extending slot with the slots on opposite side portions of the body blank in transverse alignment, guide means for delivering successive rows of cross wall blanks in edgewise relation and in alignment with the transverse slots in said cylindrical member, pusher members partially controlled by rotation of said cylindrical member for moving said cross wall blanks and inserting the foremost row of said cross wall blanks in said slots, means for moving said cross wall blanks to bring the one side portion of the body blank into interlocking engagement in slots in said cross wall blanks, and means for moving said body blank to bring the other side portion thereof into interlocking engagement with other slots in said cross wall blanks.

34. A machine for assemblying in erected condition a cellular carton of the type which is characterized by a body forming blank adapted to be folded to form a double-walled medial partition, bottom walls, side walls and cover flaps and a plurality of cross wall forming blanks having slots at opposite ends thereof which are adapted to be engaged in interlocking relation in longitudinally spaced transversely aligned slots in the bottom and side wall portions of the body blank, which machine comprises means for feeding the body blank in a predetermined path, means for positioning the body blank in partially set-up condition with the bottom walls extending in diverging relation relative to the medial partition wall and the adjacent side walls extending therefrom in generally opposite directions, means for delivering cross wall blanks into position for assembly with said body blank by insertion in aligned slots in the bottom and side walls, means for moving said cross wall blanks edgewise toward said body blank for inserting the cross wall blanks into the slots, means adjacent said body blank positioning means and cooperating therewith while said body blank is in said partially set up condition for moving the cross wall blanks and the body forming blank relative to each other to bring one side wall into engagement with the slots at one end of the cross walls, and means to move said blanks relative to each other to bring the other side wall into engagement with the slots at the other end of the cross walls.

35. In a machine for assemblying a cellular carton which is characterized by a foldable body forming blank having spaced rows of slots therein and slotted cross wall forming blanks adapted to be positioned in interlocking engagement in aligned pairs of slots in the body blank, a movable mandrel for receiving the body blank in

partly folded condition and positioning the same for insertion of the cross wall blanks, said mandrel being formed to provide an axially extending outwardly opening recess which is generally V-shaped in transverse section and having axially spaced transversely extending slots which are adapted to be aligned with the slots in the body blank for guiding the cross wall blanks into interlocking engagement in the slots in the body blank, and a cross wall blank delivery mechanism which comprises guideways aligned with the slots in said mandrel and reciprocable pusher bars for moving the cross wall blanks through the guideways and into the slots in the body blank, said pusher bars being partially controlled by movement of said mandrel.

36. In a machine for assembling a cellular carton which is characterized by a foldable body forming blank having spaced rows of slots therein and slotted cross wall forming blanks adapted to be positioned in interlocking engagement in aligned pairs of slots in the body blank, a mandrel for receiving the body blank in partly folded condition and positioning the same for insertion of the cross wall blanks, said mandrel being formed to provide an axially extending outwardly opening recess which is generally V-shaped in transverse section and having axially spaced transversely extending slots which are adapted to be aligned with the slots in the body blank for guiding the cross wall blanks into interlocking engagement in the slots in the body blank, and a folding head mounted for swinging movement toward and from engagement with said mandrel to hold the body blank on said mandrel while the cross wall blanks are moved into the slots therein and movable gripper mechanism on said folding head adapted to grip the cross wall blanks and move them into interlocking relation with the body blank, said gripper mechanism being adapted to hold the partially erected carton on the folding head for removal from the mandrel upon movement of the folding head away from the mandrel.

37. In a machine for assembling a cellular carton which is characterized by a foldable body forming blank having spaced rows of slots therein and slotted cross wall forming blanks adapted to be positioned in interlocking engagement in aligned pairs of slots in the body blank, a mandrel for receiving the body blank in partly folded condition and positioning the same for insertion of the cross wall blank, said mandrel being formed to provide an axially extending outwardly opening recess which is generally V-shaped in transverse section and having axially spaced transversely extending slots which are adapted to be aligned with the slots in the body blank for guiding the cross wall blanks into interlocking engagement in the slots in the body blank, and a folding head mounted for swinging movement toward and from engagement with said mandrel to hold the body blank on said mandrel while the cross wall blanks are moved into the slots therein and thereafter to remove the carton from said mandrel, said folding head comprising a supporting bar, generally V-shaped spaced strap members extending forwardly of said bar, a gripper frame pivotally mounted adjacent the ends of said supporting bar, spring urged gripper jaws mounted on said frame in the spaces between said strap members, said gripper jaws being pivotally connected to a cam operated cross bar and an operating arm on said gripper frame for controlling the movement of said frame and the operation of said cross bar.

38. A machine for assembling and erecting a cellular carton of the type which is characterized by a body forming blank having portions foldable along transverse lines to provide a double wall median partition, bottom walls and side walls and a plurality of cross partition forming blanks which are adapted to be positioned in interlocking relation in aligned slots in oppositely disposed wall portions when said body forming blank is erected into body forming condition, said machine comprising means for moving said body forming blank in a predetermined path, means for receiving said body forming blank and positioning the same in partially erected body forming condition, means for delivering cross partition forming blanks in predetermined spaced relation into position for assembly with said body forming blank by insertion in transversely aligned pairs of slots in opposed wall portions of said body blank, means for moving said cross partition forming blanks edgewise toward said body forming blank receiving and positioning means and for inserting said cross partition forming blanks in said slots, and means adjacent said body forming blank receiving and positioning means and cooperating therewith while said body forming blank is in said partially set up condition for moving said cross partition forming blanks and said body forming blank relative to each other to bring said cross partition forming blanks into interlocking relation in the slots in the wall portions of said body forming blank.

39. In a machine for assembling a cellular carton which is characterized by a foldable body forming blank having spaced rows of slots therein and slotted cross wall forming blanks adapted to be positioned in interlocking engagement in aligned pairs of slots in the body blank, a mandrel for receiving the body blank in partly folded condition and positioning the same for insertion of the cross wall blanks, said mandrel having an axially extending outwardly opening recess which is generally V-shaped in transverse section and having axially spaced slots extending transversely thereof which are adapted to be aligned with the slots in the body blank for guiding the cross wall blanks into interlocking engagement in the slots in the body blank, means to deliver cross wall blanks to a position laterally of said mandrel, and in alignment with said transversely extending slots therein, means for moving said cross wall blanks into said mandrel slots and a folding head mounted for movement to and from said mandrel, said folding head having a portion which is generally V-shaped in transverse section for engaging in the recess in the mandrel to clamp the body blank therein, while the cross wall blanks are moved into interlocking relation therewith.

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References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
1,960,238	Benoit	May 29, 1934
1,970,550	Benoit et al.	Aug. 21, 1934
1,981,988	Burger	Nov. 27, 1934
2,024,201	Benoit et al.	Dec. 17, 1935