Jan. 18, 1955 R. VAHLE 2,699,710

CARTON ERECTING MACHINE

Original Filed Oct. 18, 1946

4 Sheets-Sheet 1

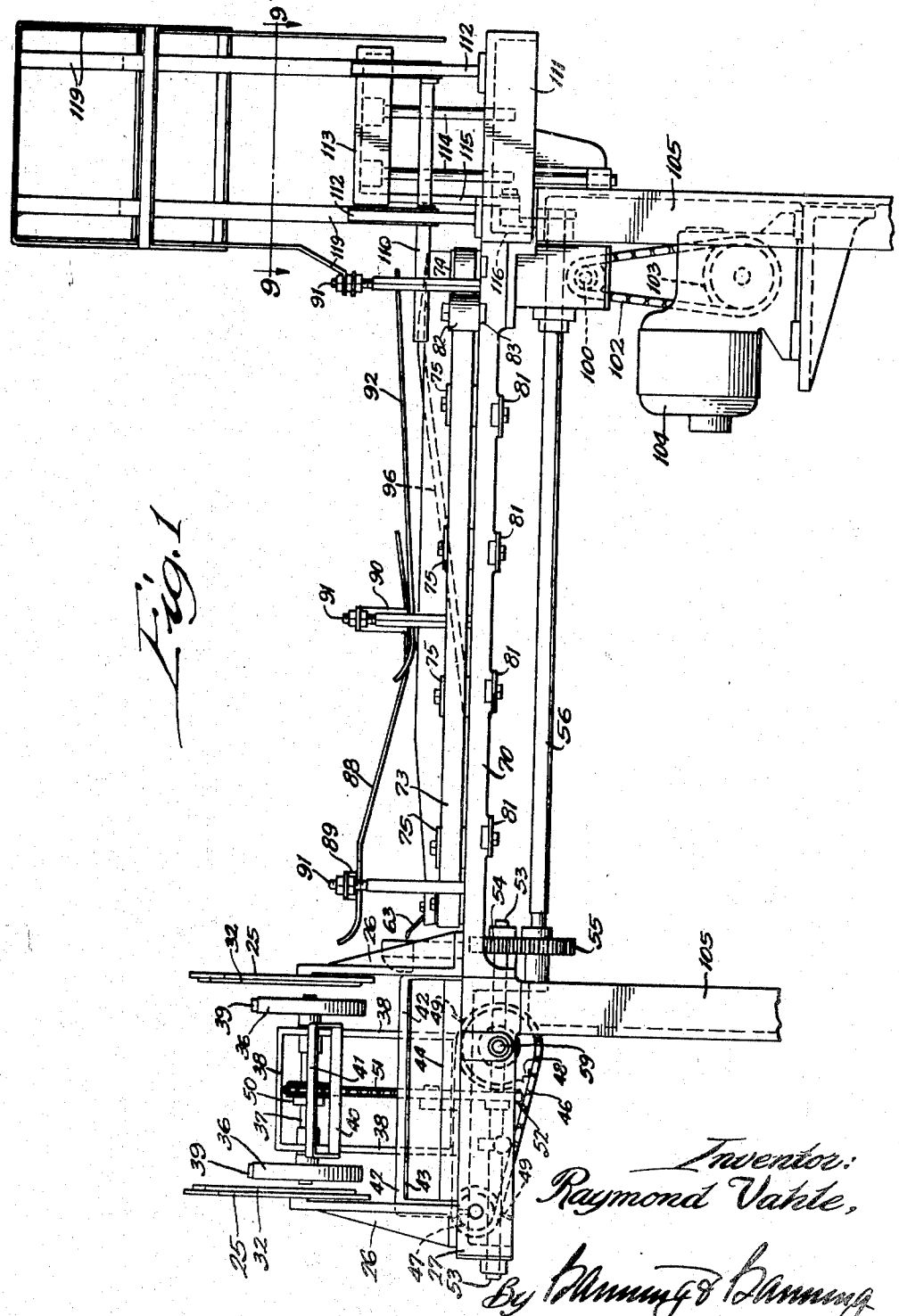


Fig. 1

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4 Sheets-Sheet 2

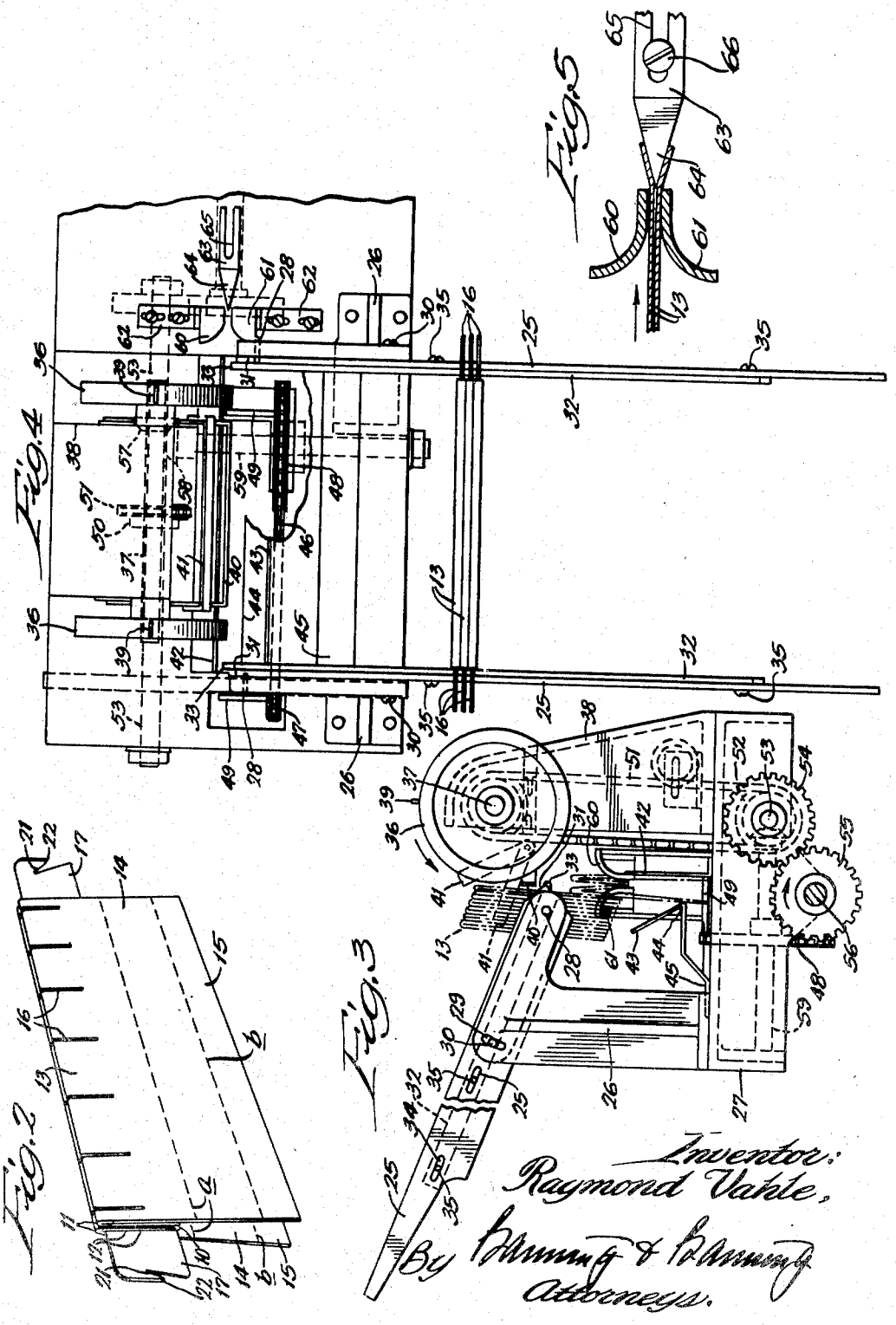


Fig. 5

Fig. 4

Fig. 2

Fig. 3

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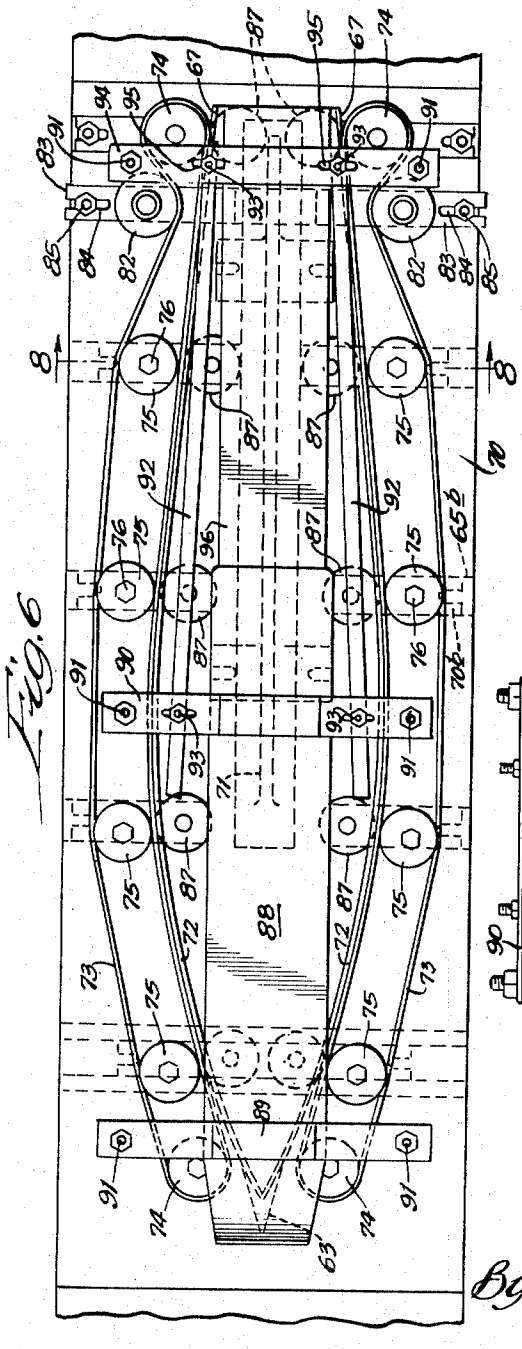


Fig. 6

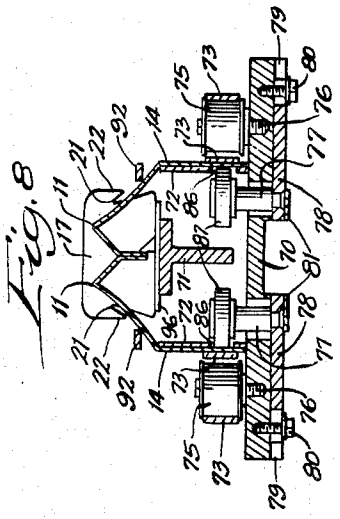


Fig. 8

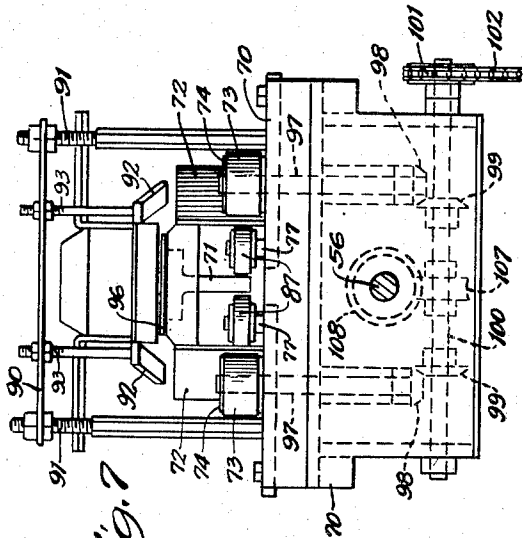


Fig. 7

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CARTON ERECTING MACHINE

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Fig. 9

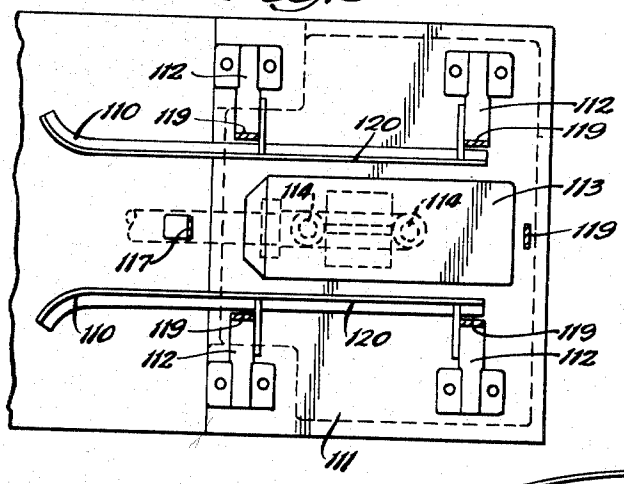
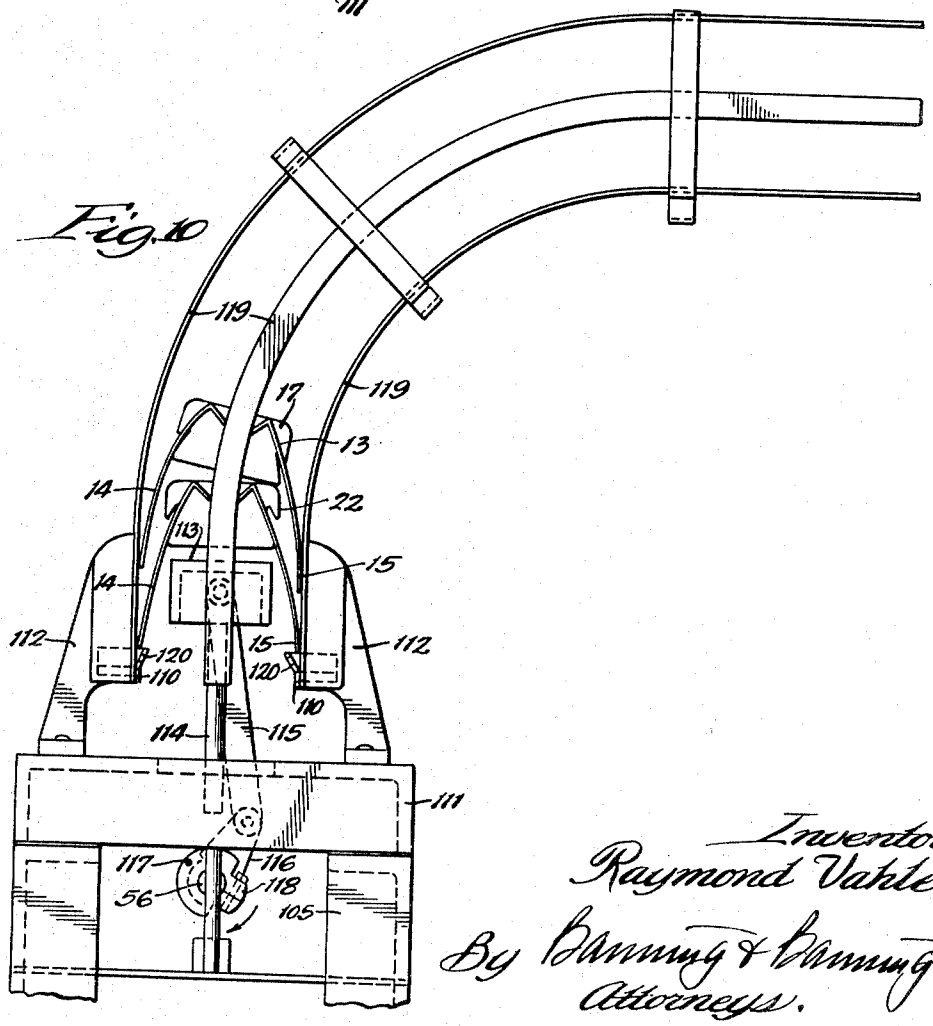


Fig. 10



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United States Patent Office 2,699,710 Patented Jan. 18, 1955

2,699,710

CARTON ERECTING MACHINE

Raymond Vahle, Tappan, N. Y., assignor to Robert Gair Company, Inc., New York, N. Y., a corporation of New York

Original application October 18, 1946, Serial No. 704,247, now Patent No. 2,642,196, dated June 16, 1953. Divided and this application August 1, 1950, Serial No. 177,006

2 Claims. (Cl. 93—37)

This invention relates particularly to a continuously operating machine for successively erecting cellular cartons, for eggs and the like, in which assembled blanks in flat folded condition are fed flatwise one at a time from an inclined hopper, then advanced endwise into an erecting unit to be operated upon, the erected cartons being then discharged in operative relation to a reciprocating stacker having an associated accumulator or magazine into which the cartons are advanced in internested relation.

An important object of this invention is to provide a hopper feed for flattened folded blanks, an erecting unit operable upon the blanks as fed from the hopper, and a stacker for the set-up cartons, all operating in coordinated relation to attain a high rate of production. A further object is to make continuous and automatic the feeding, erection, and stacking of cartons of this kind, so that it is necessary only to place the flat, folded, assembled carton blanks into a hopper at one end in order to be assured of a continuous supply of erected cartons accumulating in the magazine at the other end of the machine.

The features with which I am particularly concerned in this application (which is a division of my pending case filed October 18, 1946, Serial No. 704,247, now U. S. Patent No. 2,642,196) relate primarily to the stacker unit wherein the erected cartons are accommodated in nested relation, to the means by which the erected cartons are advanced into the stacker unit for storage at that point, and to the coordinated means by which carton blanks are fed from the hopper unit to the erecting unit to be set up at that point, and by which the erected cartons are then fed on for delivery to the stacker unit, the movement being continuous but slower in the initial stage and faster in the later stage.

Other objects of the invention will appear from the specification, claims, and accompanying drawings wherein:

Figure 1 is an elevational view of a carton erecting machine embodying the special improvements of this invention, this figure illustrating the blank receiving hopper at one end (the left), and an accumulator at the other end (the right);

Fig. 2 is a perspective view of an assembled carton blank, folded into flat condition, adapted to be erected into a cellular structure by the present machine;

Fig. 3 is a side elevation of the hopper unit looking toward the discharge end thereof;

Fig. 4 is a plan view of the hopper unit;

Fig. 5 is a sectional detail showing the carton blank spreader;

Fig. 6 is a plan view of the erecting unit;

Fig. 7 is an end view of the erecting unit, looking toward the discharge end thereof;

Fig. 8 is a cross sectional view of the erecting unit, taken on line 8—8 of Fig. 6;

Fig. 9 is a plan view of the accumulator and its associated stacker mechanism; and

Fig. 10 is an elevational view thereof.

In erecting different types of cellular cartons, it is often necessary to feed them by hand to a setting-up machine, and then remove them by hand and/or to discharge them upon a movable belt or carrier. The present invention relates to a complete carton erecting machine in which folded carton blanks, together with assembled partitions enclosed therebetween, are deposited in a hopper to be fed in succession therefrom to an erecting unit

and then, when fully set up, stacked in nested relation within a magazine. In the present machine, the folded carton blanks are delivered to the hopper in inverted position, the blanks are fed, with side walls partially spread, to the erecting unit where the side walls are further spread to produce a rotation of the cross partitions to transverse engaging positions, and the carton thus set up is then delivered to the magazine to be nested with other cartons already erected.

Referring now more particularly to the drawings, a folded carton blank, with cross partitions assembled in place, is shown in Fig. 2. Cartons elected from such assembled blanks are shown in Fig. 10. Each carton blank is formed of resilient sheet material, of paper board or the like, having a center fold **10**, two opposite reverse folds **11** to provide two inner plies **12** between outer plies **13**, the latter being formed with fold lines *a* and *b* defining on the erected carton covers **14** and flaps **15** therefor. The inner and outer plies of this blank are formed with registering slots **16** so that cross partitions **17** may be inserted within the slots of the inner plies for hinging movement whereby they are foldable flatly on opposite sides thereof when the assembled carton blank is folded or collapsed, as shown in Fig. 2. In each end of each partition **17** is a notch **21** adapted to engage the outer end of the corresponding slot **16** of the outer ply **13** which then becomes one of the side walls of the erected carton, the resilience of the walls permitting it to be sprung over projections **22** at the outer end of the notches **21** to seat therewithin. The carton is initially supported or held in its erected condition, as shown in Fig. 10, with the covers and cover flaps extended.

When the carton blank is center-folded as shown in Fig. 2, the extremities of the outer cross partitions **17** extend slightly beyond the ends of the blank. These projecting ends of the partitions provide means for supporting the associated blanks in substantially vertical upright parallel position in a receiving hopper, as shown more particularly in Figs. 1, 3, and 4. The erecting machine, as shown, comprises the hopper for receiving these blanks together with feeding mechanism at the bottom of the hopper for delivering the blanks in succession past a spreader to the erecting unit; also a stacker at the end of the erecting unit which is remote from the hopper, together with a framework for receiving the cartons and nesting them in a guideway that extends outwardly and away from the machine. The complete machine may be mounted upon a suitable base or support for receiving the carton blanks at one end and accumulating the erected cartons in stacked nested relation at the other end.

The hopper comprises a pair of inclined spaced parallel bars **25** each having at its lower end an upright mounting bracket **26** suitably secured to a supporting base **27**. Each bar **25** is supported at its lower end upon a pivot **28** carried by the bracket, and remote therefrom the bracket is provided with a slot **29** through which a fastening screw **30** is extended from the bar **25**. By the means just described, the two bars may be adjusted and secured in selected inclined positions within the range of the slots **29**. At the lower end of each bar is a beveled extremity **31** upon which the leading carton blank is supported just before it is discharged, the inclination of the bevel serving to promote separation of the outer plies of the carton blank when supported in this position.

Adjustably attached to the inside of each hopper bar **25** is a strip **32** having a centering projection **33** which extends just beyond the lower end of the bevel **31** of the side bar to accurately position the leading carton blank for its discharge movement. Each strip **32** is adjustable longitudinally by means of slots **34** in the adjacent side bar **25** and fastening screws **35** extending from the strip through the slots.

Also mounted upon the same base **27** as the hopper is a feeder mechanism for the carton blanks. This comprises a pair of spaced feeder wheels **36** affixed to a shaft **37** that is mounted in an upwardly extending frame **38**. These wheels **36** are located at the lower end of the hopper so that the adjacent portions of their peripheries constitute a stop for the lowermost blanks in the hopper. The feeder wheels have projections **39** aligned for movement together and adapted to engage the leading carton

blank so as to advance it downwardly upon the beveled extremities 31 and over the projections 33.

In order to prevent a carton blank from adhering to the wheels 36, a stripper 40, preferably in the form of a bail, is pivoted to the frame 38 between the wheels to extend outwardly beyond the peripheries thereof so that, as the wheels 36 rotate, the upper ends of the carton blank do not tend to adhere to the feeding projections 39 or to rotate with the wheels, but are discharged downwardly from the hopper bars to rest on the top face of the base 27.

When it is desired to prevent the feeding of the carton blanks at the bottom of the hopper without stopping rotation of the feeding wheels 36, a stop 41 in the form of a bail which is pivoted at its ends to the frame 38 is swung downwardly into the path of the carton blanks, as shown in dotted lines in Fig. 3, to hold them away from the feeding wheels. This stop is moved upwardly out of the path of the carton blanks, as shown in solid lines in Fig. 3, when the machine is in normal operation.

A pair of guides 42 and 43 are supported upon the base 27, below the inner or lower end of the hopper, between which each carton blank will fall as it is discharged onto the base. The guide 42 is a straight plate extending upwardly, whereas the guide 43 has an inwardly inclined angular projection 44 with a foot 45 extending oppositely therefrom so that it may be supported on the base 27 laterally at a distance from the position of the carton blank when it has been discharged from the hopper.

To move the discharged carton blanks endwise, I provide an endless chain 46 which is mounted upon sprocket wheels 47 and 48 to extend lengthwise parallel to the carton blanks but out of alignment therewith. Connected to the chain so as to project laterally in alignment with the carton blanks are spaced push bars 49. One portion of the chain between the sprockets extends above the top of the base 27 through suitable openings therein so that the push bars 49 are disposed in the path of the lower edges of the carton blank when resting upon the supporting base; and as the chain is advanced upon the sprockets, the push bars engage the ends of the carton blanks successively and feed them toward the carton erecting unit.

To operate the feeding unit, the shaft 37 is connected by means of a sprocket 50, a chain 51, and a sprocket 52, to a shaft 53 mounted in the base 27. This shaft is connected by a gear 54 with another gear 55 mounted upon a main driving shaft 56. To operate the carton feeding chain 46, a bevel gear 57 secured to the shaft 53 meshes with a bevel gear 58 secured to a cross shaft 59 that is mounted in the base 27. Thus the operation of the feeding wheels and the feeding chain are in timed relation, each carton blank being positively advanced by the feeding chain as soon as it is discharged from the hopper upon the supporting base.

In advance of the guides 42 and 43, and between the hopper and the erecting unit is a spreader blade 63 shown most clearly in Figs. 3, 4, and 5. As the carton blanks are advanced endwise by the feeder chain, they engage inwardly rounded guides 60 and 61 each separately adjustable toward and from the other by a slotted mounted plate 62. These registering guides are flared outwardly both upwardly and rearwardly, as shown in Figs. 3 and 4, for directing a descending and forwardly moving carton blank into correct alignment with the spreader blade.

Upon passing through the guides 60, 61, the carton blank encounters the spreader blade 63 whose pointed extremity 64 is positioned to enter between the plies of the oncoming carton blank on opposite sides of its center, thus initially spreading apart these plies preliminary to being operated upon by the erecting unit. This blade is adjustably mounted at the entrance end of the erecting unit, as by means of a slot 65 and fastening screws 66.

The erecting unit is of the type shown, described and claimed in prior Patent 2,440,840 of P. J. Blackwell. The unit utilizes a supporting base 70 (Figs. 1 and 6) having a longitudinal center rib 71 spaced from opposite side guides 72 which bow outwardly from a point substantially at the forward end close to the rear of the spreader blade 63, to a distance of maximum separation near the center of the erecting unit, and then inwardly again toward each other at the discharge end. At the outer side of each guide 72 is an endless belt 73 rotatable upon end pulleys 74 and intermediate idler pulleys 75 arranged close to the guides so that the inner run of the belt will engage therewith. The idler pulleys may each be mounted upon a stud 76 (see Fig. 8) which is anchored in the base 70. I provide also a plurality of a stub shafts 77 each carried by a slide plate 78 movable in a transverse slot 79 upon the under side of the base so as to be clamped in any adjusted position by a bolt 80 extending through a slot in the slide plate 78 and mounted in a threaded opening or socket in the base 70 and clamping the slide plate 78 in its adjustment. A contact roller 87 is mounted on each stub shaft 77 whose position is adjustable in response to movements of the slide plate 78. Adjacent one end of the erecting unit are tension pulleys 82 each mounted upon a plate 83 and adjustable on the base by means of a slot 84 and a fastening bolt 85. The contact rollers 87 are adapted to engage the inner faces of the carton blank sides as they are slid along the guides by frictional pressure applied from the inner runs of the belts 73.

A top guide plate 88 extends over the front end portion of the guides 72 and rearwardly toward the central portion thereof, being supported by bridges 89 and 90 at the front and central longitudinal portions of the machine, the bridges being supported by side posts 91. This guide plate 88, which flares upwardly at the starting end where it is highest, inclines slightly downwardly to a point in advance of the longitudinal center of the erecting unit from whence it again inclines upwardly slightly to terminate shortly therebeyond, as shown more clearly in Figs. 1 and 6. Commencing at the sides of the central portion of the top guide plate and extending inwardly from the upper edges of the side guides 72 are flat deflecting bars 92 inclined inwardly at the rear somewhat less than the inclination of the side guides 72 and terminating substantially above the rear extremities of the side guides. These bars are united, as by welding, to the lower end of supporting bolts 93 depending from the bridge 90 and from a rear bridge 94, the bolts 93 at each bridge being adjustable in slots 95 to vary the lateral positions of the deflecting bars 92. These deflecting bars do not come into operation until after the outer plies of a carton blank have been opened and separated by advance of the assembled blank along the guides 72.

Extending longitudinally of the erecting unit and inwardly of the side guides 72 is a bottom support 96 which extends gradually upwardly toward the discharge end from a point slightly in advance of its longitudinal center. This support terminates below the top of the guide bars 92 as clearly shown in Fig. 7.

Each of the driving pulleys 74 is secured to the upper end of a shaft 97 mounted in the base 70; at the shaft lower end is a bevel gear 98 meshing with a bevel gear 99 secured to a cross shaft 100. The cross shaft is rotated by a sprocket wheel 101 secured thereto and connected by a chain 102 with a sprocket wheel 103 of a motor drive unit 104 mounted at the under side of the base 70, preferably upon one of a pair of standards 105 upon which the entire machine is supported. The main drive shaft 56 to which is secured the gear 55 is operated from the cross shaft 100 by means of a spiral gear 107 on the shaft 100 and a spiral gear 108 meshing therewith and secured to the drive shaft 56.

After a carton is once set up, it is discharged from the erecting unit into a stacker unit. As shown more clearly in Figs. 1, 9, and 10, the stacker unit comprises a pair of guide rails 110 which flare outwardly at the starting end leaving between them a space which is substantially of a width to receive a set-up carton. These rails are mounted upon a base 111 by means of upwardly extending side brackets 112, and the flaring ends of the rails extend inwardly of the supporting posts 91 for the rear bridge 94 for guiding each set-up carton between them and depositing it upon a reciprocating plunger 113 which is guided in an up and down direction by rods 114 secured to the plunger and extending slidingly through the base 111. The plunger is actuated by means of a pitman 115 connected therewith and with a crank 116 freely rotatable on the shaft 56 near its end, but adapted to be unidirectionally driven thereby. For this purpose I may employ a pin 117 which is projected from a split collar 118 affixed to the

shaft, the pin being positioned to advance against one side of the crank **116** to impart rotation thereto, but to disengage therefrom whenever the crank, in response to gravity, is impelled to accelerate its movement.

Extending upwardly from the supporting brackets **112** and at the sides beyond the plunger **113** is a framework forming an accumulator or magazine which may comprise metallic strips **119** which provide a guideway for receiving and storing the erected cartons. As shown, this framework is curved laterally and in practice it may extend through 180° or so whereby its remote end will point downwardly to deliver the cartons therefrom right side up onto a table, conveyor belt, or other surface.

The set-up cartons are delivered from the erecting unit with the bottoms up and the covers depending divergingly therefrom. The plunger in raising each carton partially compresses its flaring open covers which remain in tensioned engagement with the framework; at the bottom of the framework I provide inclined catches **120** to engage the free edges of the flaps **15** whereby to prevent a downward reverse movement of cartons stacked within the framework. These inclined catches **120** may be constituted by inwardly inclined upper edges of the guide rails **110**. The mounting of the crank **116** on the shaft **56** is such that the crank is free, when rotated beyond its high point, to swing down and forwardly ahead of the shaft whereby to permit the plunger **113** to descend very rapidly so as to assume an operative position beneath the next oncoming carton prior to its arrival at the base of the framework.

In operation, folded assembled carton blanks are suspended upon the inclined bars **25** of the hopper. If the machine is in operation, the stop bail **41** will be in raised position, permitting the feeder wheels **36** to displace the lowermost folded blank; while undergoing this movement the carton blank will be stripped from the feeder wheels by the stripper bail **40** so that it will descend to a position between the guides **42** and **43** where its endwise movement is initiated. At this point one of the push bars **49** on the advancing feeder chain **46** will engage the carton blank to slide it endwise through the guides **60** and **61** which center it relative to the spreader blade **63**. In this movement past the spreader the folded carton is opened up sufficiently to straddle the two guides **72** of the erecting unit at the entrance thereto.

As the carton blank continues its advance through the erecting unit, the potential carton sides are further spread by the guides **72**, to the point of being frictionally engaged by the belts **73**. The outer sides of the carton blank are then bent along the preformed fold lines *a* and in this movement the inner folded plies **12** of the blank are opened out to cause a swinging of the cross partitions **17** upon their slot hinges to transverse positions in which they are aligned with the registering slots **16** of the outer plies. Continued movement of the carton blank upon the diverging guides **72** and beneath the top plate **88** will force the two folds **11** of the carton blank downwardly so that the cross partitions **17** are brought into engagement with the slots **16** ready to be forced therethrough.

At an intermediate point in the travel of each assembled carton blank through the erecting unit the deflecting bars **92** engage the outer plies **13** of the blank to partially depress them, thereby causing the projections **22** at the partition ends to force their way through and beyond the registering slots **16**. Further movement of the partially erected carton upon the bottom support **96** and below the deflecting bars **92** will cause the notches **21** of the cross partitions to be interengaged with the ends of the slots **16** of the outer plies **13** of the blank which at this stage have the side walls of the carton now set up and ready to be discharged from the erecting unit in a self-sustaining condition, as shown in Fig. 10.

The cellular carton upon leaving the erecting unit is guided by the guide rails **110** to a position over the plunger **113** of the stacker mechanism. This plunger which is reciprocated in timed relation to the delivery of the completed inverted cartons falls back rapidly from its most advanced position to its operative position below the next oncoming carton. As the plunger is moved upwardly, it engages the top edges of the partitions inasmuch as each carton is delivered bottom up

with the outer walls and covers **13** and **14** divergingly distended downwardly. As the plunger pushes each carton upwardly into the accumulator, the distended covers and flaps **14** and **15** will frictionally engage the framework strips **119** whereby to sustain each carton in place. The cartons so stacked in column formation within the accumulator will total up to only a light weight. While the force of gravity will probably be insufficient to pull any of the cartons back, still if this happens the catches **120** will prevent any such reverse movement beyond a safe point. When so stacked within the accumulator the cartons will be nested partially within each other, as indicated in Fig. 10, so as to occupy a minimum of space.

The operation of the three main units of the present machine are accurately coordinated so that feeding of the assembled blanks, setting up of the cartons, and stacking of the erected cartons in the accumulator proceeds in timed relation. This results from utilizing a main drive shaft from which motion is transmitted to the feeding, erecting, and stacking units. In this connection the feeder chain **46** is caused to advance a predetermined distance equal to the spacing between two push bars, say 15″, while the feeder wheels rotate through 360°, a one to one ratio being provided for this purpose. The gear ratio in the transmission to the erecting unit is such as to slightly accelerate the speed of movement of the assembled blanks at this station, thereby producing an enhanced distance of separation between them. This extra spacing is relied upon for completion of the plunger movement cycle, so that the plunger may return to an underlying position relative to each oncoming carton. In practice, the speed of the feeding and stacking operations may be the same, but timed so that one is in proper sequence to the other.

I claim:

1. A carton stacker unit comprising: apparatus for feeding the cartons in series toward an exit; a receiving magazine for the cartons adjacent to said exit; a plunger movable across the path of travel of said cartons and reciprocable from a lowered first position to a raised second position and back again to move the cartons into the magazine; and a drive and timing mechanism for the plunger including means retaining the plunger in said lowered first position until said feeding apparatus has moved a carton into engagement with the plunger, and means immediately and rapidly raising the plunger and thus the carton thereon into the magazine and thereafter immediately permitting substantially free fall of the plunger under the force of gravity back to said lowered first position prior to the next carton reaching said plunger, said drive and timing mechanism comprising a continuously rotatable first drive member, a pitman having one end rotatably attached to the plunger, a crank arm normally rotatably attached to the first drive member and to the other end of the pitman, and a catch member operably connecting the first drive member and crank arm for rotation as a unit during a portion only of each revolution of the first drive member for said raising of the plunger and operably disconnecting the first drive member and crank arm during another portion of said revolution for permitting the substantially free fall of the plunger.

2. A carton stacker unit comprising: apparatus for feeding the cartons in series toward an exit; a receiving magazine for the cartons adjacent to said exit; a plunger movable across the path of travel of said cartons and reciprocable from a lowered first position to a raised second position and back again to move the cartons into the magazine; and a drive and timing mechanism for the plunger including means retaining the plunger in said lowered first position until said feeding apparatus has moved a carton into engagement with the plunger, and means immediately and rapidly raising the plunger and thus the carton thereon into the magazine and thereafter immediately permitting substantially free fall of the plunger under the force of gravity back to said lowered first position prior to the next carton reaching said plunger, said last named means including a continuously rotatable first drive member and a second drive member attached to the plunger and periodically operably coupled to the first member for said raising of the plunger and then operably uncoupled from the first member for said free fall.

(References on following page)

References Cited in the file of this patent

UNITED STATES PATENTS

640,594	Sanford	Jan. 2, 1900
749,590	Smith	Jan. 12, 1904
1,329,500	Bradford	Feb. 3, 1920
1,559,615	Hoepner	Nov. 3, 1925
2,072,065	Brown	Feb. 23, 1937
2,395,352	Staude	Feb. 19, 1946
2,440,840	Blackwell	May 4, 1948