Jan. 16, 1962 R. K. GALLOWAY 3,016,808

CARTON FEEDING AND ERECTING MECHANISM

Filed Oct. 29, 1957 8 Sheets-Sheet 2

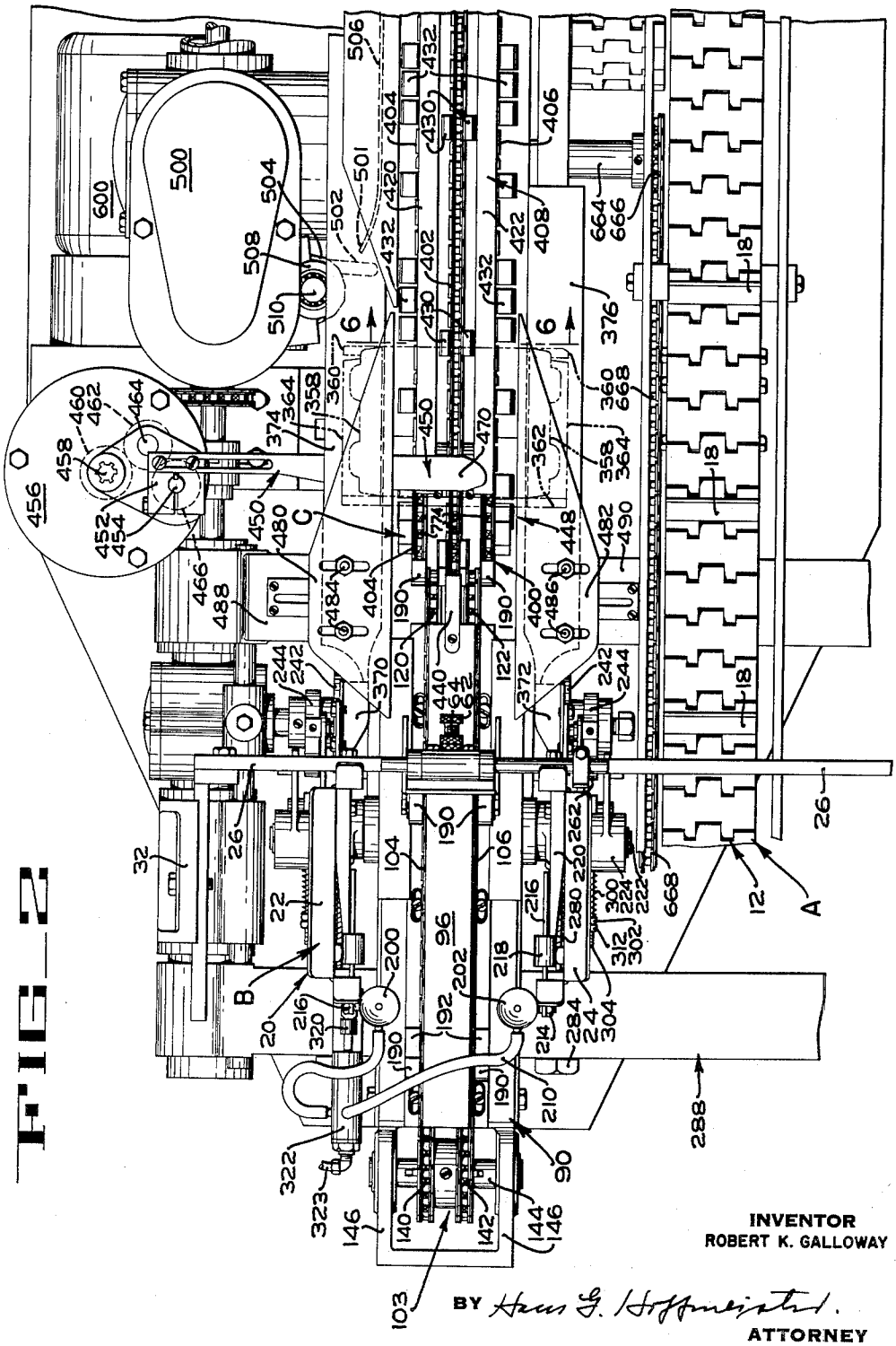


FIG. 2

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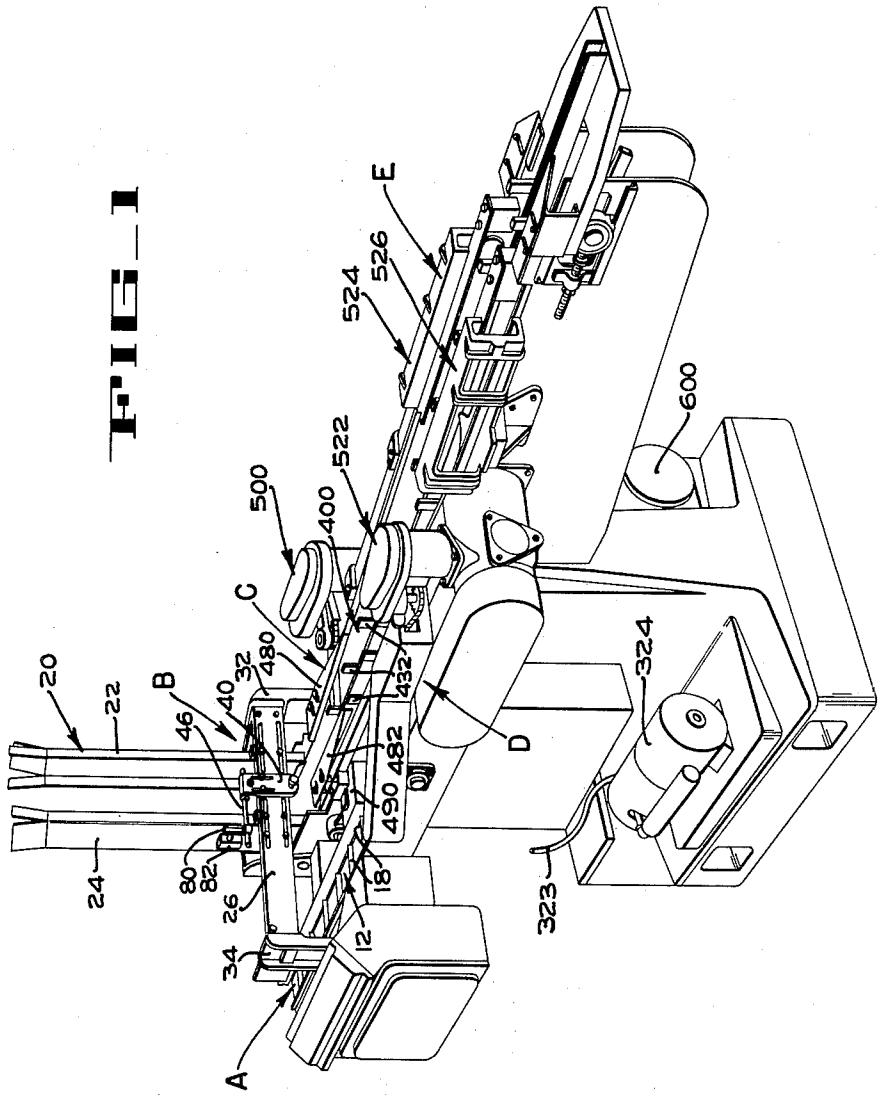
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CARTON FEEDING AND ERECTING MECHANISM

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FIG. 1



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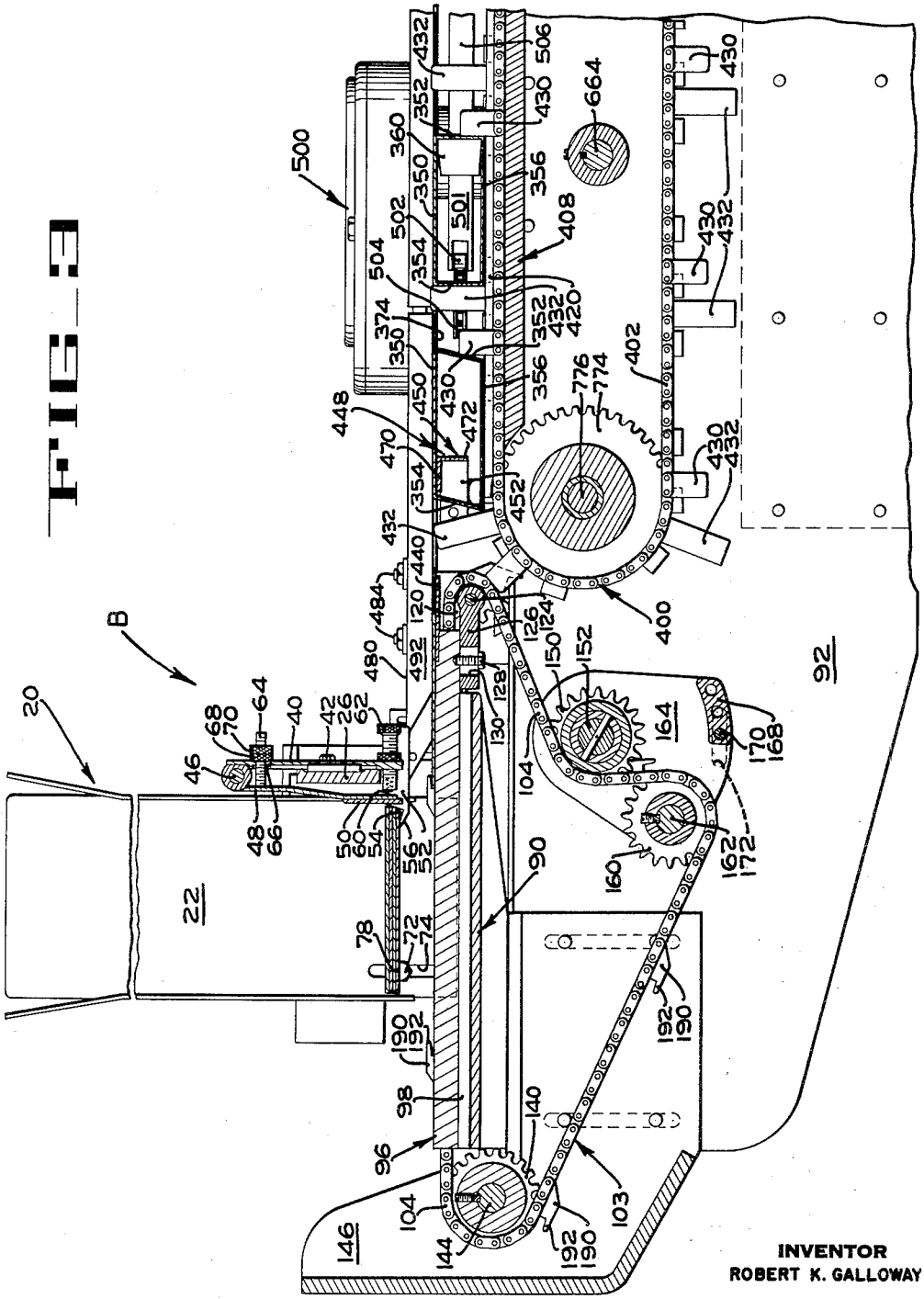
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CARTON FEEDING AND ERECTING MECHANISM

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FIG. 3



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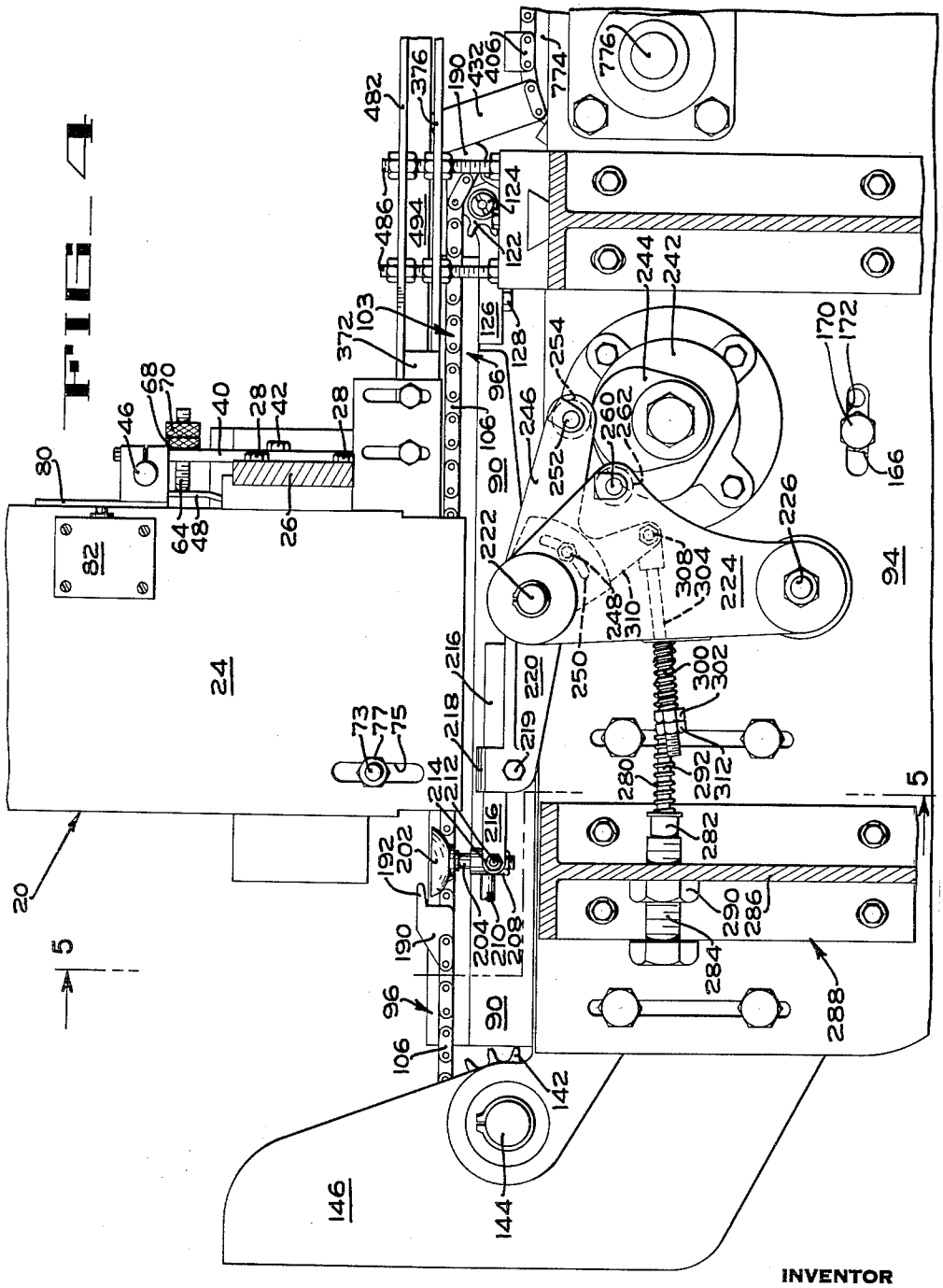
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CARTON FEEDING AND ERECTING MECHANISM

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FIG. 4



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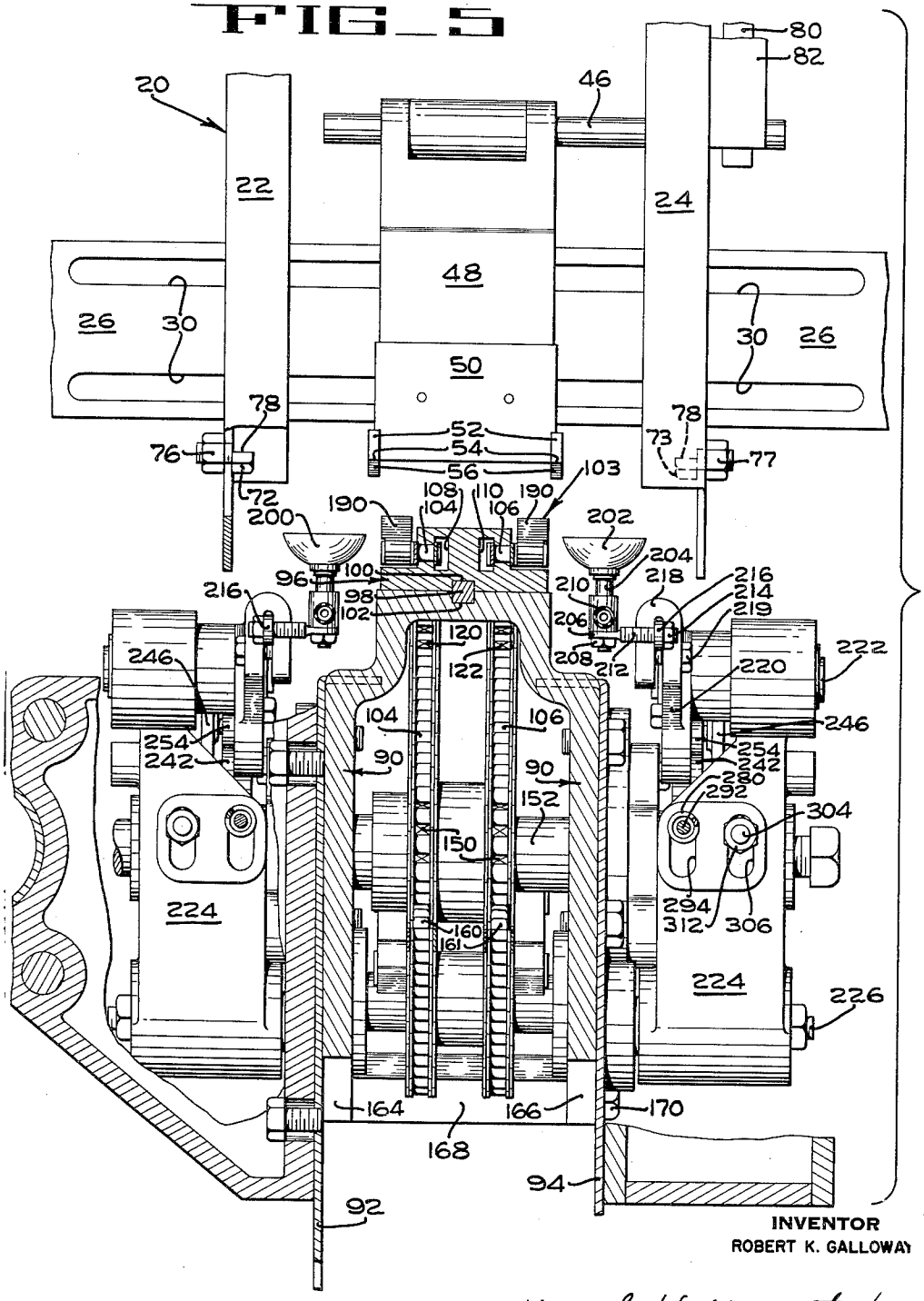
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CARTON FEEDING AND ERECTING MECHANISM

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FIG_5



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CARTON FEEDING AND ERECTING MECHANISM

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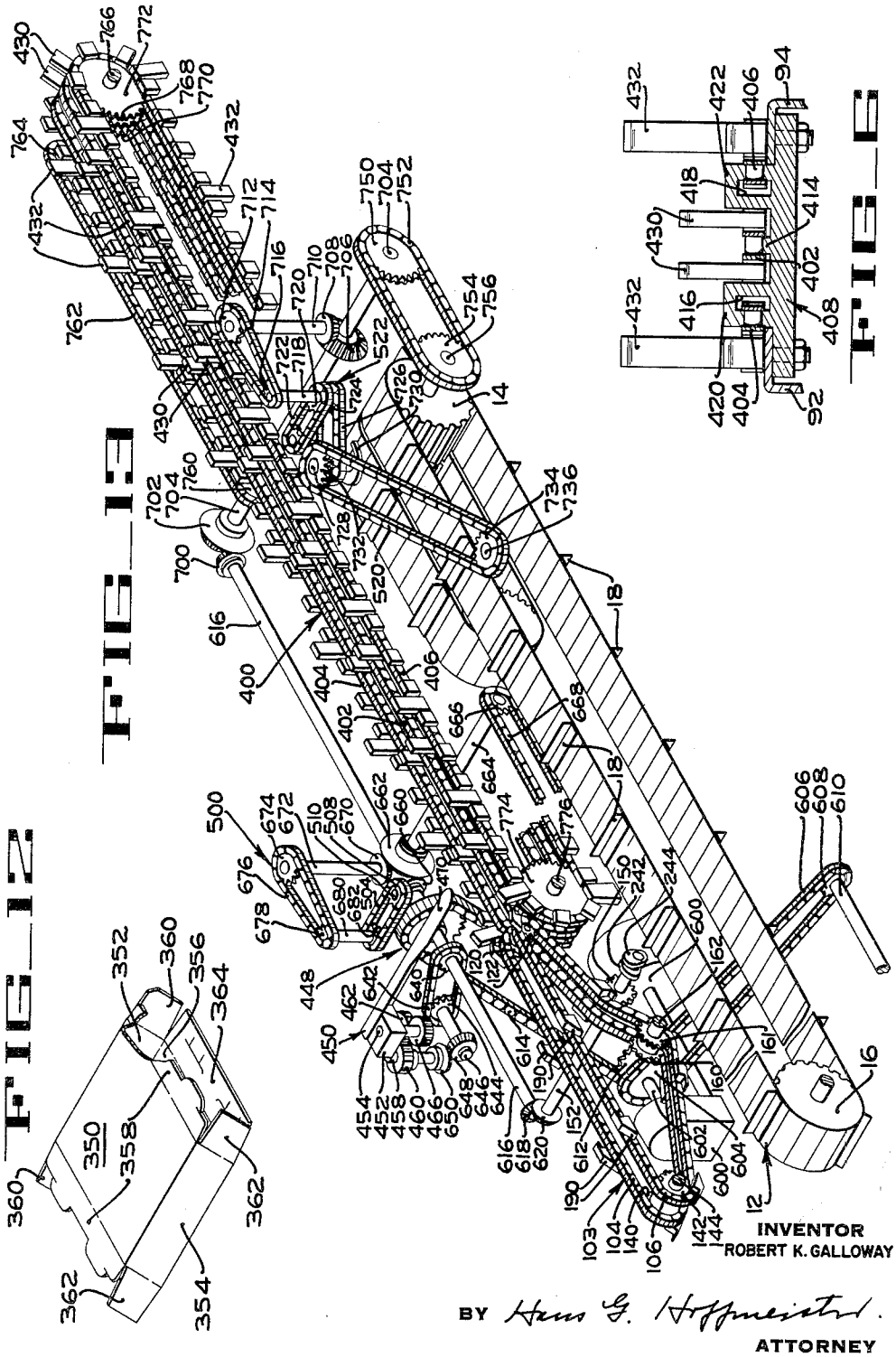


FIG. 12

FIG. 17

FIG. 15

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CARTON FEEDING AND ERECTING MECHANISM

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FIG_7

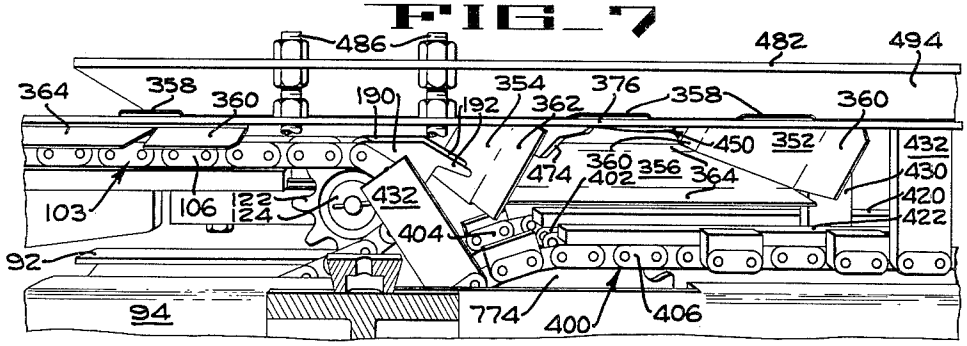
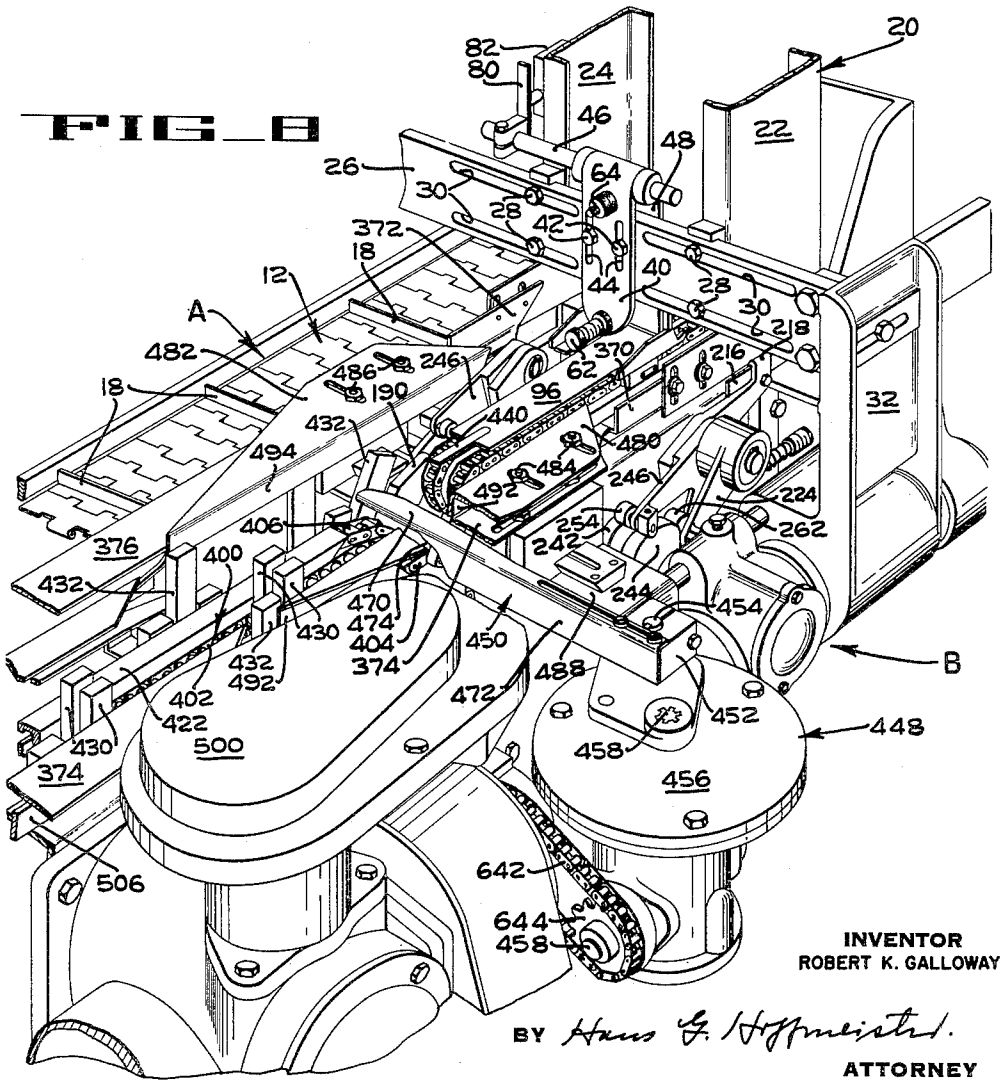


FIG_8



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CARTON FEEDING AND ERECTING MECHANISM

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FIG_9

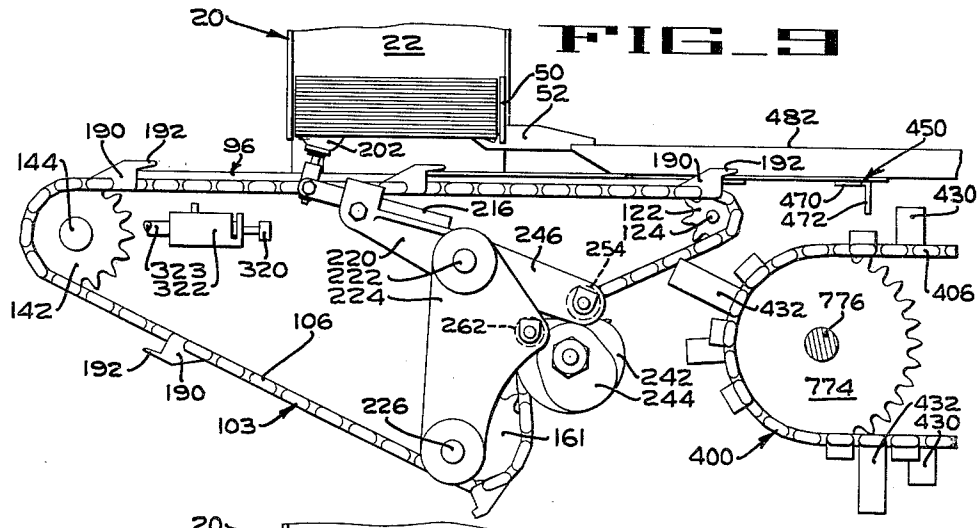


FIG_10

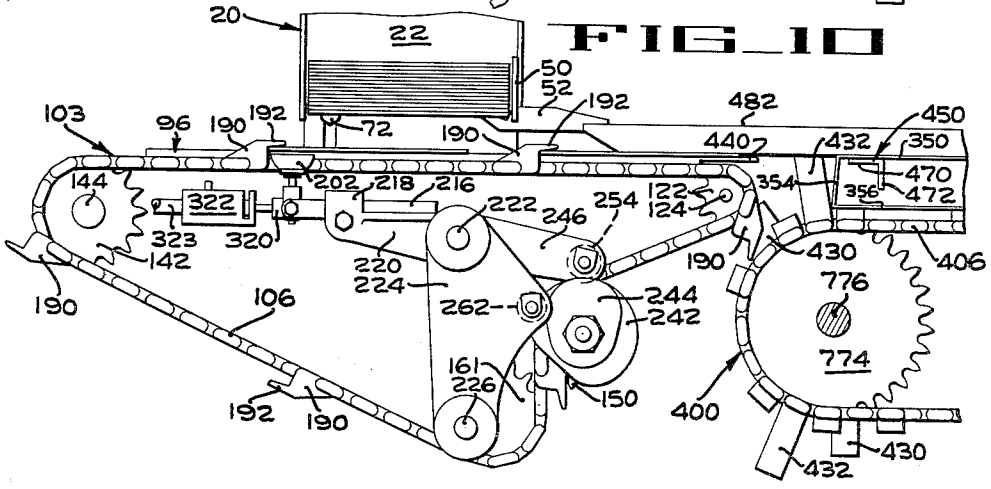
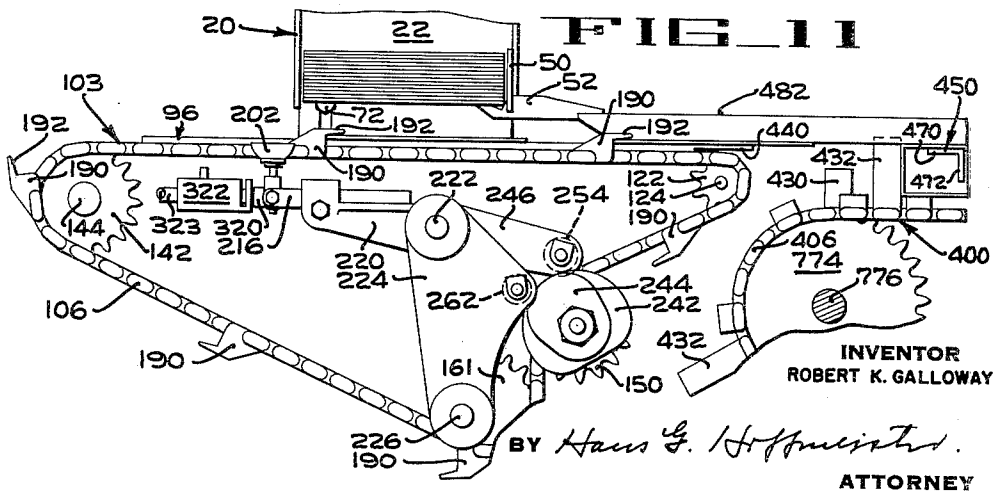


FIG_11



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United States Patent Office 3,016,808
Patented Jan. 16, 1962

3,016,808
CARTON FEEDING AND ERECTING MECHANISM

Robert K. Galloway, Hoopeston, Ill., assignor to FMC Corporation, a corporation of Delaware

Filed Oct. 29, 1957, Ser. No. 693,077
7 Claims. (Cl. 93—53)

This invention pertains to the art of packaging articles, and more particularly relates to a carton feeding and erecting mechanism for use in a machine for inserting articles into cartons.

My copending application Serial No. 581,402, entitled "Machine for Inserting Articles Into Cartons," filed April 30, 1956, now U.S. Patent No. 2,906,392, discloses a high speed machine for inserting pies, or like articles, into cartons. The present invention pertains to an improved carton feed and erecting mechanism for a machine of the type disclosed in said application.

It is, therefore, an object of the invention to provide an improved high speed carton feeding and erecting mechanism adapted for, but not necessarily limited to, use in conjunction with a packaging machine.

Another object of the invention is to provide a high speed mechanism adapted to receive cartons in flat folded superposed relation and to deposit said cartons singly in erected condition on a discharge conveyor, which advantageously can be the carton conveyor of a packaging machine.

Various other objects of the present invention will become apparent from the following description and accompanying drawings in which:

FIG. 1 is a perspective of a packaging machine incorporating the carton feed and erecting mechanism of the present invention.

FIG. 2 is a partial plan of the machine shown in FIG. 1.

FIG. 3 is a longitudinal section through the carton feed and erecting mechanism.

FIG. 4 is a side elevation of the carton feed mechanism.

FIG. 5 is a section taken on lines 5—5 of FIG. 4.

FIG. 6 is a section taken on lines 6—6 of FIG. 2.

FIG. 7 is a partial perspective of the carton erecting mechanism.

FIG. 8 is a partial perspective of the carton erecting mechanism taken from a different viewpoint.

FIGS. 9, 10 and 11 are a series of diagrammatic views illustrating various positions of the carton feed mechanism.

FIG. 12 is a perspective of one of the cartons adapted to be erected by the mechanism of the present invention.

FIG. 13 is a schematic perspective illustrating the various drive mechanisms of the packaging machine.

Referring now to the drawings, the article packaging machine generally comprises an article conveyor A (FIGS. 1 and 2), a carton feeding station B (FIGS. 1, 2, 3 and 4), a carton erecting station C (FIGS. 1, 2 and 3), an article insertion station D (FIG. 1) and a carton closing station E (FIG. 1).

The article conveyor A comprises a flat link conveyor belt 12 (FIGS. 1, 2 and 13) which runs from the rear of the machine toward the front adjacent the right side of the machine. The belt 12 is trained around a drive drum 14 (FIG. 13) at its forward end and an idler drum 16 at its rear end. A plurality of upstanding flights, or pushers, 18 are provided on the belt, and the articles to be packaged are positioned between the flights 18.

A carton magazine generally indicated 20 (FIGS. 1, 2, 3, 4, 5 and 8) is provided at the carton feed station B adjacent the side of the feed conveyor A. The magazine 20 comprises two vertically extending inwardly facing U-shaped members 22 and 24. The members 22 and 24 are adjustably fixed to a cross brace 26 (FIGS. 1, 2, 3, 4 and 8) by bolts 28 extending through suitable laterally extending slots 30 whereby the members 22 and 24 may be moved toward and away from each other to accommodate cartons of different widths. The cross brace 26 is fixed to brackets 32 and 34 one at each of its ends (FIGS. 1 and 8) and the brackets in turn are fixed to the machine frame.

A plate 40 (FIGS. 3, 4 and 8) is adjustably fixed to the cross brace 26 by bolts 42 extending through suitable vertical slots 44 (FIG. 8) in the plate. The plate 40 rotatably carries a transversely extending horizontal shaft 46 adjacent its upper edge. A forwardly and rearwardly adjustable second plate 48 is fixed to the shaft 46 and extends downwardly therefrom. The lower portion 50 of the plate 48 is in the plane of the forward flanges of the magazine members 22 and 24. The plate 48 carries a pair of spaced hook-shaped members 52 (FIG. 5) at its lower edge. Each of the members 52 is provided with an upper horizontal surface 54 which projects rearwardly into the magazine 20 and supports the front edges of the carton blanks, and a downwardly and forwardly inclined surface 56 beneath which the carton blanks must pass when they are removed from the magazine.

The plate 48 is normally retained in its rearmost position illustrated in FIG. 3 by a compression spring 60 which bears against the front surface of the plate 48 and is received within the recessed end of a thumb screw 62 threaded in a suitably tapped opening in the plate 40. The rearward movement of the plate 48 is limited by a stud 64 fixed to the plate 48 and extending forwardly through an opening 66 in the plate 40. An adjustment nut 68 is threaded on the stud 64 and held in its adjusted position by a lock nut 70, whereby the plate 48 is prevented from moving rearwardly beyond the predetermined position wherein the nut 68 abuts the front face of the plate 40.

The rear portions of the folded cartons to be erected rest on ledges comprising bolts 72 and 73 (FIGS. 3 and 5) which extend through suitable vertical slots 74 and 75 in the side panels of the members 22 and 24, respectively, and are fastened by suitable nuts 76 and 77. The heads of the bolts 72 and 73 are half removed as shown at 78 in FIGS. 3 and 5 to provide ledges on which the carton blanks rest.

In the event of a jam in the feed mechanism presently to be described and a carton fails to feed beneath the hook-shaped members 52, the plate 48 will be pushed forward and rotate the shaft 46 counterclockwise as viewed in FIGS. 3 and 4. This rotation of the shaft 46 will move rearwardly a switch actuating arm 80 (FIGS. 1, 4 and 8), fixed to the shaft 46, and stop the machine by actuating a microswitch 82 mounted on the magazine member 24.

Attention is now directed to the carton feed mechanism as particularly illustrated in FIGS. 3, 4, 5, 9, 10 and 11. The feed mechanism comprises a large casting 90 fixed between the main side plates 92 and 94 (FIG. 5) of the machine frame. A chain guiding block 96 (FIGS. 3 and 5) is keyed to the flat upper surface of the casting 90 by a key 98 received within complementary longitudinally extending slots 100 and 102 (FIG. 5) in the casting 90 and the chain guide 96, respectively. The carton feed conveyor 103 comprises a pair of carton feed chains 104 and 106 which are adapted to ride within guide grooves 108 and 110, respectively, formed in the side surface of the guide block 96. The chains 104 and 106 are trained around suitable sprockets 120 and 122, respectively, (FIGS. 3 and 13) fixed to a shaft 124 rotatably mounted in a chain-tightening bracket 126. The bracket 126 is adjustably connected to the guide block 96 (FIG. 3) by a cap screw 128 extending through a slot 130 formed in the bracket 126 and threaded into a suitably tapped opening in the under surface of the guide block 96 adjacent the forward edge thereof.

Adjacent the rear of the guide block 96, the chains 104

and 106 are trained around suitable idler sprockets 140 and 142, respectively (FIGS. 3 and 13), fixed to a shaft 144 rotatably mounted between the rearwardly extending side portions 146 of the casting 90. A pair of drive sprockets 150 (FIGS. 3, 5 and 13) are fixed to a drive shaft 152 rotatably mounted between the side plates 92 and 94 and driven in a manner presently to be described. The drive sprockets are in driving relation with the chains 104 and 106 and drive the chains at identical rates of travel and in such a direction that the upper reaches thereof of travel forwardly through the grooves 108 and 110 in the guide block 96.

The chains 104 and 106 are maintained in a tightened condition by a pair of idler sprockets 160 and 161 (FIGS. 3 and 13) fixed to a shaft 162 rotatably mounted between a pair of plates 164 and 166 (FIGS. 3 and 5), each of which is rotatably mounted on and pivots about the drive shaft 152. A web 168 rigidly interconnects the lower ends of the plates 164 and 166. The plates 164 and 166 are adjustable about the axis of the drive shaft 152 in order to adjust tension of the chains 104 and 106. The plates 164 and 166 are held in their selected position by suitable cap screws 170 (FIG. 3) which extend through suitable slots 172 formed in the side plates 92 and 94 and are received in tapped holes in the web 168.

The chains 104 and 106 each carry pairs of transversely aligned carton engaging lugs 190 (FIGS. 2–5, 7 and 8) spaced at equal intervals along their length. Each of the carton engaging lugs 190 is provided with a forwardly extending nose portion 192 which projects above the upper surface of the guide block 96 during the portion of its travel beneath the magazine 20 while the upper runs of the chains 104 and 106 are traveling within the guide grooves 108 and 110 in the guide block 96 in the manner shown in FIG. 3.

A pair of suction cups 200 and 202 (FIGS. 2, 4 and 5) are adapted to engage the lowermost carton blank in the magazine 20 and draw said carton blank downwardly into engagement with the upper surface of the guide block 96, and to position the rear edge of the blank beneath the nose portions 192 of one pair of the carton engaging lugs 190 fixed to the feed chains 104 and 106. The two suction cups 200 and 202 are similarly mounted one on either side of the feed chain assembly and only the mounting of the cup 202 on the right side will be described in detail.

The suction cup 202 is fixed to the upper end of a rigid hollow tube 204 connected to a bracket 206 by a nut 208. One end of a flexible tube 210 is connected to the tube 204 and communicates with the passage therethrough. The other end of the tube 210 is connected to a vacuum control valve 322 (FIG. 2) described below. The bracket 206 is provided with a threaded portion 212 (FIG. 5) and is connected by a nut 214 to a bar 216 which in turn is clamped by a U-shaped clamp 218 (FIGS. 4 and 5) and a bolt 219 to one end of an arm 220 rotatably mounted on a shaft 222 fixed to a second arm 224. The arm 224 is mounted for forward and rearward oscillation on a rock shaft 226 which is fixed to and projects laterally from the side plate 94 of the machine frame.

Two plate cams 242 and 244 (FIG. 4) are fixed to the previously mentioned drive shaft 152 and are rotated thereby. A cam follower arm 246 is rotatably mounted on the shaft 222 and is adjustably connected to the arm 220 by a cap screw 248 extending through a suitable arcuate slot 250 formed in the arm 220 and threaded into a suitably tapped opening in the arm 246. The rearmost end of the arm 246 carries a stub shaft 252 on which a cam follower roller 254 is rotatably mounted. The cam follower roller 254 rides against the cam surface of the plate cam 242. Similarly, a stub shaft 260 is fixed to the arm 224 and rotatably carries a roller 262 which is in engagement with the cam surface of the cam 244.

The arm 224 is urged toward its forwardmost position, or clockwise as viewed in FIG. 4, about shaft 226 by a compression spring 280 confined between the rear surface of the arm 224 and a bracket 282 fixed to the forward end of a tension adjusting stud 284. The stud 284 is threaded through a suitably tapped opening in the flange 286 of a bracket 288 fixed to the plate 94, and is held in its adjusted position by a lock nut 290. A spring guide 292 is fixed to the bracket 282 and extends through a suitable slot 294 (FIG. 5) formed in the arm 224.

Similarly, the arm 220 is urged to rotate clockwise about shaft 222 as viewed in FIG. 4 by a compression spring 300 confined between the rear surface of the arm 224 and a tension adjusting nut 302 threaded on a spring guide 304 which extends through the spring 300 and a suitable slot 306 (FIG. 5) formed in the arm 224. The spring guide 304 is attached by a pivot pin 308 (FIG. 4) to an arm 310 formed integral with the arm 246. A suitable lock nut 312 maintains the nut 302 in its proper adjusted position on the spring guide rod 304.

From the structure just described it may be seen that the plate cam 242 and the spring 280 cooperate to effect forward and rearward rocking movement of the arm 224 about its shaft 226, thus inducing forward and rearward movement of the suction cup 202. Similarly, the cam 244 and the spring 300 effect rocking movement of the arm 220 about the axis of the shaft 222 thereby causing upward and downward movement of the suction cup 202.

As set forth above, the suction cup 200 is similarly mounted on the opposite side of the feed chain assembly and is controlled by a similar pair of cams fixed to the shaft 152. Corresponding cams 242 and 244, respectively, cause the suction cups 200 and 202 to act in unison and in such a manner that the suction cups 200 and 202 move upwardly against the lowermost carton in the magazine 20 to grip same. The cups are then moved downwardly and rearwardly, bringing the lowermost carton with them, stripping it from the ledges on the bolts 72 and 73 at the rear of the magazine 20, and moving the carton blank rearwardly so that the front edge thereof slips off the upper surface 54 of the hook-shaped members 52. The rearmost edge of the carton blank is inserted beneath the projecting nose portions 192 on a pair of carton engaging lugs 190 being advanced by the chains 104 and 106.

When the rearmost edge of the carton blank is engaged beneath the nose portion 192 of a pair of carton engaging lugs 190, and the carton blank is resting on the upper surface of the guide block 96, the rearmost end of the bar 216 contacts the forward end of a valve actuating plunger 320 of a vacuum controlling valve 322 (FIG. 2) fixed to the machine frame in alignment with the rearward travel of the bar 216. A suitable conduit 323 connects the vacuum control valve 322 with a motor driven vacuum pump 324 (FIG. 1). Further rearward movement of the bar 216 moves the plunger 320 rearwardly to actuate the valve 322 to release the vacuum from the cups 200 and 202 and expose the same to atmospheric pressure. In this manner the carton blank is released by the suction cups and is then fed forwardly along the upper surface of the guide block 96 by the carton engaging lugs 190 on the chains 104 and 106.

A typical carton adapted to be erected by the present machine is illustrated in perspective in FIG. 12, and comprises an upper panel 350, a front side panel 352, a rear side panel 354 and a bottom panel 356. Outwardly projecting front flaps 360 are attached to and project outwardly from the front panel 352. Similarly, end flaps 362 project outwardly from the rear panel 354, end flaps 358 project outwardly from the top panel 350 and end flaps 364 project outwardly from the bottom panel 356. The upper or top panel 350 and the end flaps 358 constitute an upper wall of the carton. The end flaps 360, 362 and 364 are longer and therefore project outwardly beyond the outer edges of the end flaps 358 attached to the upper panel 350. As the cartons are stacked within the magazine 20 the rear panel 354 is in coplanar rela-

tion with the upper panel 350. Similarly, the forward panel 352 is in coplanar relation with the bottom panel 356. It is in this flat folded condition that the cartons are advanced by the carton engaging lugs 190 along the upper surface of the guide block 96.

As the flat folded carton blanks move forwardly from beneath the magazine 20 a pair of splitting blades 370 and 372 (FIGS. 2 and 8) engage the uppermost surfaces of the projecting flaps 360, 362 and 364 which flaps are then depressed beneath the splitting blades 370 and 372 while the upper flaps 358 remain above the upper surfaces of the splitting blades 370 and 372. A pair of supporting, or bottom, plates 374 and 376 (FIGS. 2 and 7) are disposed one on either side of the path of movement of the cartons and are arranged with their rear edges in coplanar relation with and abutting the forward ends of the splitting blades 370 and 372, whereby, as the carton continues to advance forwardly through the machine it will be supported by reason of the fact that the end flaps 358, attached to the upper panel 350 of the carton, are resting on the upper surfaces of the plates 374 and 376.

A carton squaring and advancing conveyor generally indicated 400 (FIGS. 3, 7 and 13) is arranged in alignment with the carton feed conveyor 103 with its rearmost end adjacent the forward end of said carton feed conveyor. The conveyor 400 comrpises three conveyor chains 402, 404 and 406 (FIGS. 6, 7 and 13) which travel along a guide block 408 mounted between the two side plates 92 and 94 of the frame of the machine. The central chain 402 rides on a raised projection 414 at the central portion of the block 408 and extending longitudinally thereof. The two outermost chains 404 and 406 travel within laterally opening grooves 416 and 418, respectively, formed in two raised portions 420 and 422 on the upper surface of the block 408. The central chain 402 carries at equally spaced intervals therealong outwardly extending pairs of blocks 430 (FIGS. 3, 8 and 13) adapted to engage the front panel of a carton being transported by said carton advancing conveyor 400. Similarly, the two outermost chains 404 and 406 each are provided at equally spaced intervals with outwardly projecting blocks 432 adapted to engage the rear panel of a carton being so transported. The relative position of the central chain 402 may be changed with respect to the two outermost chains 404 and 406 to adjust the spacing between the blocks 430 on said central chain and the blocks 432 on the outermost chains to accommodate different size cartons.

As the cartons leave the forward edge of the guide block 96 they are supported by the blades 374 and 376 in the manner previously described and by a forwardly projecting tongue or finger 440 (FIGS. 2 and 8) fixed to the central portion of the block 96. A carton erecting blade assembly 448 (FIGS. 2, 8 and 13), including a carton erecting blade 450 (FIGS. 3, 6, 8 and 13) is located at the left side of the machine adjacent the forward end of the finger 440 and the rear end of the carton squaring and advancing conveyor 400. The carton erecting blade 450 is fixedly mounted on a block 452 which in turn is clamped to a vertical shaft 454 rotatably mounted in a housing 456. The housing 456 is splined to a vertical shaft 458 which in turn is suitably journalled and supported, and is driven in a manner described hereinbelow. Within the housing 456 there is located a stationary sun gear 460 (FIG. 2) which surrounds the vertical shaft 458 and meshes with a planetary gear 462 fixed to a shaft 464 rotatably supported within the housing 456. The planetary gear 462 is similarly enmeshed with a gear 466 fixed to the shaft 454. Because of the planetary gear train just described the carton erecting blade 450 moves with orbital translatory movement.

The blade 450 (FIGS. 3 and 8) is L-shaped in cross section having a flat horizontal flange portion 470 and a vertical flange portion 472. The vertical flange portion 472 is cut away adjacent the innermost end of the blade 450 and is provided with a downwardly and outwardly inclined edge portion 474. As the carton erecting blade 450 moves inwardly, the innermost end of the horizontal flange 470 is inserted between the upper and lower panels of the carton, and the downwardly and outwardly inclined edge 474 of the vertical flange forces the bottom panel downwardly away from the upper panel of the carton in the manner best seen in FIGS. 3 and 7.

At the same time that the blade 450 moves inwardly, a pair of carton advancing lugs 190 on the carton feed conveying chains 104 and 106 pass around the forward sprockets 120 and 122 and push downwardly on the rear panel 354 of the carton to aid in the erection of the carton. The forward panel 352 of the carton engages one of the pairs of blocks 430 on the central chain 402 of the conveyor 400. A pair of blocks 432 on the outermost chains 404 and 406 are approaching the uppermost portion of the rear sprockets about which they are trained and contact the lowermost rear corner of the carton, and as the outer blocks 432 progress to their full vertical position they act in conjunction with the preceding pair of inner blocks 430 on the central chain to confine and square the carton in its fully erected position.

As the carton is being erected it is held down by a pair of members, or top plates, 480 and 482 (FIGS. 2, 3 and 8) adjustably fastened by bolts 484 and 486 to two brackets 488 and 490 mounted on the machine frame. The member 480 is provided with a downwardly extending flange 492 (FIGS. 3 and 8) and the member 482 with a similar flange 494. The lower edges of these flanges 492 and 494 contact the top panel of the carton blank adjacent the side edges thereof.

After the carton has been fully erected it is progressed through a flap folding mechanism 500 (FIGS. 1 and 2) where the front projecting tab 360 at the left end thereof contacts a curved cam finger 501 (FIG. 2) and is folded inwardly in the manner fully described in my above-mentioned copending appliaction. Shortly thereafter, the rear end flap 362 is contacted by a tucking finger 502 carried by a chain 504 and is folded inwardly and engages the inner surface of the curved cam finger 501. The chain 504 which carries the tucker finger 502 is trained around an idler sprocket 508 (FIG. 2) rotatably mounted on a vertical shaft 510 adjacent the left side of the path of movement of the carton and adjacent the rearmost end of the curved cam finger 501. The curved cam finger 501 is formed integrally with a rearward extension of a vertical plate 506 (FIGS. 2 and 8) which extends longitudinally of the machine and maintains the end flaps 360 and 362 at the left end of the carton in their inwardly folded position while the associated top and bottom end flaps 358 and 364, respectively, extend outwardly above and below the upper and lower edges of the plate 506.

After the end flaps 360 and 362 on the left end of the carton have been folded inwardly, and while associated top and bottom flaps 358 and 364 still project horizontally, the carton progresses along the conveyor 400 until the articles to be packaged are moved to the left from the article conveyor 12 and inserted into the open right end of the carton by the article inserting conveyor chain 520 (FIG. 13) in the same manner as fully set forth in my above-mentioned copending application. After an article has been inserted within the carton, it progresses through another flap folder 522 (FIG. 1), the front and rear end flaps 360 and 362 at the right end of the carton are folded inwardly in the same manner as described above in connection with the end flaps 360 and 362 at the left end of the carton. The carton is then advanced through flap closing mechanism 524 and 526 at the carton closing station E (FIG. 1) where the upper and lower end flaps at both ends of the carton are folded into interlocking relation with each other.

The drive mechanism for the machine (FIG. 13) comprises a motor and variable speed drive mechanism 600 having an output shaft 602. A sprocket 604 fixed to the

shaft 602 drives a chain 606 which in turn drives a sprocket 608 fixed to a shaft 610 extending rearwardly from the packaging machine and adapted to drive a pie making, or similar, machine in timed relation with the packaging machine disclosed herein. A second sprocket 612 is fixed to the shaft 602 and through a chain 614 drives a countershaft 616 which extends longitudinally adjacent the left side of the machine. A bevel gear 618 fixed to the countershaft 616 meshes with and drives a bevel gear 620 fixed to the left end of the drive shaft 152 which, as set forth above, is the shaft upon which the drive sprockets 150 for the carton feed conveyor chains 104 and 106 and the plate cams 242 and 244 are mounted.

A sprocket 640 is fixed to the countershaft 616 and through a chain 642 drive a sprocket 644 fixed to a shaft 646. A bevel gear 648 fixed to the shaft 646 drives a bevel gear 650 fixed to the lower end of the vertical shaft 458 which, as set forth above, is the drive shaft for the carton erecting blade assembly 448.

A bevel gear 660 fixed to the countershaft 616 meshes with a bevel gear 662 fixed to a transversely extending shaft 664 suitably journalled in the frame of the machine and carrying a sprocket 666 which drives a chain 668 attached to drive an assembly such as a pie tamping and perforating mechanism of the type disclosed in my above-mentioned copending application.

A bevel gear 670 meshes with the bevel gear 662 and is fixed to the lower end of a vertical shaft 672 which carries at its upper end a sprocket 674. The sprocket 674 through a drive chain 676 drives a sprocket 678 on the upper end of a vertical shaft 680 having at its lower end a sprocket 682 about which the previously described tucking finger chain 504 is trained.

A bevel gear 700 fixed to the forward end of the countershaft 616 drives a bevel gear 702 fixed to a transversely extending shaft 704 suitably journalled on the side plates 92 and 94 of the machine. A bevel gear 706 is fixed to the shaft 704 and meshes with a bevel gear 708 fixed to the lower end of a vertical shaft 710. The shaft 710 has a sprocket 712 fixed to its upper end which through a chain 714 drives a sprocket 716 at the upper end of a vertical shaft 718. The lower end of the shaft 718 carries a sprocket 720 which drives the chain 722 for the tucking finger (not shown) of the flap folding mechanism 522 which folds the rear end flap 362 at the right end of the carton inwardly.

A second sprocket 724 is fixed adjacent the lower end of the shaft 718 and through a drive chain 726 drives a sprocket (not shown) fixed to a vertical shaft 728. The shaft 728 carries an article inserting finger 730 which operates in a manner fully described in my above-mentioned copending application.

The shaft 728 also carries fixed to its upper end a sprocket 732 about which the article inserting conveyor 520 is trained. The other end of the article inserting conveyor 520 is trained around an idler sprocket 734 fixed to a shaft 736 journaled in any suitable manner adjacent the outer edge of the article conveyor 12.

A large sprocket 750 is fixed to the shaft 704 and through a drive chain 752 drives a sprocket 754 fixed to a shaft 756 on which the forward drive drum 14 of the article conveyor 12 is mounted.

A sprocket 760 fixed to the shaft 704 through a drive chain 762 drives a sprocket 764 fixed to a shaft 766 to which three sprockets 768, 770 and 772 are adjustably fixed. The sprockets 768, 770 and 772 are the sprockets about which the chains 402, 404 and 406, respectively, are trained at their forward ends. The rear ends of the chains 402, 404 and 406 are trained around idler sprockets 774 mounted on a shaft 776 (FIGS. 2 and 13).

In the operation of the machine the articles to be packaged are deposited on the article conveyor 12 by a pie making, or similar, machine (not shown) and progress forwardly thereon to the article inserting station D (FIG. 1). An operator places a stack of cartons in their flat folded condition in the magazine 20 at station B.

The suction cups 200 and 202 engage the lowermost carton in the magazine 20 in the manner illustrated in FIG. 9 and grip the same by their suction action. The cups 200 and 202 are then moved downwardly and rearwardly to the position illustrated in FIG. 10, dragging with them the single folded carton which they have engaged, causing the front edge of the folded carton to drop off the hook-shaped member 52, so that the carton drops flat onto the upper surface of the guide block 96. Further rearward movement of the cups actuates the vacuum control valve 322 to release the suction from the cups 200 and 202 and to admit atmospheric pressure therein to release the carton from the cups, and the carton is then moved forwardly along the upper surface of the guide block 96 by the lugs 190 on the feed chains 104 and 106. It should be noted that due to the compound movement of the cups 200 and 202 the succeeding carton can be gripped by the cups 200 and 202 while the preceding carton is still partially beneath the magazine 20. This action greatly increases the speed of the carton feed mechanism since it is not necessary to wait until the preceding carton clears the magazine before the suction cups can grip the succeeding carton.

As the carton is moved from beneath the magazine 20, the splitting blades 370 and 372 (FIGS. 2 and 8) separate the projecting end flaps so that the flaps 358 connected to the top panel of the carton are above the blades 370 and 372, while the remaining flaps 360, 362 and 364 pass beneath the blades in the manner set forth above. After the end flaps have been separated the carton continues to move forwardly and is supported only by the flaps 358 resting on the upper surfaces of the plates 374 and 376 (FIGS. 2, 7 and 8) and held downwardly thereagainst by the lower edges of the flanges 492 and 494 of the members 480 and 482, respectively.

As the lugs 190 progress around the sprockets 120 and 122, the forwardly projecting nose portions 192 sweep downwardly and bend the rear side panel 354 of the carton downwardly away from its coplanar position with respect to the top panel 350 in the manner illustrated in FIG. 7. Simultaneously, the erecting blade 450 (FIG. 2) moves inwardly, and the downwardly and outwardly inclined cam edge 474 thereon separates the bottom panel 356 from the top panel 350, thus partially erecting the carton in the manner illustrated in FIG. 7.

The front panel 352 of the carton is now resting against the rear edge of one pair of the blocks 430 on the central chain 402 of the carton squaring and carrying conveyor 400. The blocks 432 on the conveyor chains 404 and 406 are progressing around the sprockets 774 and contact the lower rear corner of the carton where the rear panel 354 joins the bottom panel 356, in the manner illustrated in FIG. 3. Further movement of the chains 402, 404 and 406 brings the blocks 432 to their fully erect position and completes the erection of the carton. The forwardmost carton shown in FIG. 3 illustrates a carton which has been completely erected and is held in its erected condition by the confining action of a cooperating group of the blocks 430 and 432.

After the cartons have been fully erected they are carried by the conveyor 400 in opposed relation to the articles on the conveyor 12. The article inserting chain 520 (FIG. 13) moves the articles laterally into the cartons and the finger 730 (FIG. 13) seats them therein. The tucking mechanism then tucks the right front and rear end flaps and the carton is moved through the carton closing mechanism E.

From the foregoing description it may be seen that a novel carton feed and erecting mechanism has been provided which is relatively simple and which is capable of very high speed operation.

While a preferred embodiment of the present invention is disclosed herein, various changes may be made

therein without departing from the spirit of the invention as defined in the appended claims.

Having thus disclosed my invention, what I claim and desire to secure by Letters Patent is:

1. In a carton feeding and erecting mechanism, a first conveyor, a sprocket adjacent the forward end of said first conveyor about which said conveyor is trained, means for depositing onto said first conveyor flat folded cartons each including a top panel having end flaps projecting therefrom and a rear panel hinged to the top panel, a lug on said first conveyor engageable with the rear edge of a carton on the first conveyor, a second conveyor trained around forward and rear sprockets and extending forward from said first conveyor, the rear sprocket of said second conveyor being adjacent the forward sprocket of said first conveyor, front and rear carton engaging blocks on said second conveyor adapted to engage the front and rear panels of a carton and square the carton therebetween, means adjacent opposite sides of said conveyors for supporting a carton by engaging the outwardly projecting end flaps attached to the top panel of the carton, and a carton erecting blade mounted adjacent said second conveyor for orbital translatory movement toward and away from a carton so supported and adapted to move the bottom panel of the carton downward away from the top panel as the rear panel is bent downwardly by the lugs on said first conveyor as they sweep around the forward sprocket of said first conveyor to bring the lower rear corner of said carton into position to be engaged by the rear carton squaring block sweeping upwardly around the rear sprocket of said second conveyor, said carton being confined between said front and rear carton engaging blocks on said second conveyor in its fully erected and squared condition when said rear block reaches its fully erect vertical position.

2. In a carton feeding and erecting mechanism, a first conveyor, a sprocket adjacent the forward end of said first conveyor about which said conveyor is trained, carton engaging lugs on said first conveyor, means for depositing flat folded cartons onto said first conveyor with their rear edges engaged by said lugs, each of said cartons including hingedly interconnected top, rear, and bottom panels and end flaps projecting from said top panel, a second conveyor comprising three parallel chains each trained around forward and rear sprockets and extending forward from said first conveyor, the rear sprockets of said second conveyor being adjacent the forward sprocket of said first conveyor, front carton engaging blocks on the center chain and rear carton engaging blocks on the outer chains of said second conveyor adapted to engage the front and rear panels of a carton and square the carton therebetween, means for adjusting the center chain relatively to the outer chains to accommodate different sized cartons, means adjacent said conveyors for supporting a carton by engaging the outwardly projecting end flaps of the top panel of the carton, and a carton erecting blade mounted adjacent said second conveyor for orbital translatory movement toward and away from a carton so supported and adapted to move the bottom panel of the carton downwardly away from the top panel as the rear panel is bent downwardly by the sweeping movement of the lugs on said first conveyor as they progress around the forward sprocket of said first conveyor to bring the lower rear corner of said carton into position to be engaged by the rear carton squaring block sweeping upwardly around the rear sprocket of said second conveyor, said carton being confined between said front and rear carton engaging blocks on said second conveyor in its fully erected and squared relation when said rear block reaches its fully erect vertical position.

3. In a carton feeding and erecting mechanism, a conveyor trained around forward and rear sprockets, front and rear carton engaging blocks on said conveyor adapted to engage the front and rear panels of a carton and square the carton therebetween, means adjacent said conveyor for supporting a flat folded carton by engaging outwardly projecting end flaps attached to the top panel of said carton, means for advancing a carton so supported, and a carton erecting blade mounted adjacent the conveyor for orbital translatory movement toward and away from said cartons and adapted to move the bottom panel of the carton downwardly away from the top panel to bring the lower rear corner of said carton into position to be engaged by the rear carton squaring block progressing upwardly around the rear sprocket of said conveyor, whereby said carton will be confined between said rear and front carton engaging blocks on said conveyor in its fully erected and squared condition when said rear block reaches its fully erect vertical position.

4. In a carton feeding and erecting mechanism, a conveyor comprising three parallel chains each trained around forward and rear sprockets, front carton engaging blocks on the center chain and rear carton engaging blocks on the outer chains of said conveyor adapted to engage the front and rear panels of a carton and square the carton therebetween, said center chain being movable with respect to the outer chains to adjust the spacing between said front and rear blocks, means adjacent said conveyor for supporting a carton by engaging outwardly projecting end flaps attached to the top panel of the carton, means for advancing a carton so supported, and a carton erecting blade mounted adjacent the conveyor for orbital translatory movement toward and away from said supported carton and adapted to move the bottom panel of the carton downwardly away from the top panel thereof to bring the lower rear corner of said carton into position to be engaged by the rear carton squaring block progressing upwardly around the rear sprocket of said conveyor whereby said carton will be confined between said rear and front carton engaging blocks on said conveyor in its fully erected and squared condition when said rear block reaches its fully erect vertical position.

5. In a carton feeding and erecting mechanism, a conveyor trained around forward and rear sprockets, front and rear carton engaging blocks on said conveyor adapted to engage the front and rear panels of a carton and square the carton therebetween, means adjacent said conveyor for supporting a carton by engaging outwardly projecting end flaps attached to the top panel of the carton, means for advancing a carton so supported, a carton erecting blade mounted adjacent the conveyor for orbital translatory movement toward and away from said carton and adapted to move the bottom panel of the carton downwardly away from the top panel thereof to bring the lower rear corner of said carton into position to be engaged by the rear carton squaring block progressing upwardly around the rear sprocket of said conveyor whereby said carton will be confined between said rear and front carton engaging blocks on said conveyor in its fully erected and squared condition when said rear block reaches its fully erect vertical position, and means for driving said conveyor, said carton advancing means, and said carton erecting blade in timed relation with each other.

6. In a carton erecting mechanism, a conveyor trained around forward and rear rotatable conveyor members, front and rear blocks on said conveyor adapted to engage the front and rear panels of a carton to square the carton therebetween, means adjacent said conveyor for supporting a flat folded carton by engaging end flaps projecting from the top panel thereof, means for advancing the carton so supported, a carton erecting blade, and means mounting said blade adjacent said conveyor for movement in a predetermined path toward said conveyor and between the top and bottom panels of the carton, thence forwardly relative to said conveyor and angularly relative to said path, and thence outwardly away from said conveyor whereby to move the bottom panel of the carton away from said top panel, whereby to bring the lower rear corner of said carton into position to be engaged by said rear carton squaring block progressing upwardly

around said rear conveyor member, and whereby said carton is confined between said front and rear carton engaging blocks on said conveyor in its fully erected and squared condition when said rear block reaches its fully erect position.

7. In a machine for erecting a carton having opposed first and second panels interconnected by front and rear side panels, wherein end flaps project from said first and second panels, and wherein said first panel and the flaps projecting therefrom constitute a wall of the carton, a frame, a pair of elongated bottom plates mounted in the frame in opposed spaced relation to each other, the bottom plates having carton supporting surfaces substantially in a common plane and defining an elongated carton path therebetween, said bottom plates being adapted to support a folded carton extended transversely of said path with the end flaps of its first panel individually slidably rested on said surfaces, a pair of elongated top plates mounted in the frame above and individually in closely adjacent relation to said surfaces of the bottom plates for slidably engaging said wall of the carton on the opposite side thereof from said bottom plates whereby said plates yieldably resist movement of said first panel relative to said plates, and a carton erecting blade mounted in the frame adjacent said plates for orbital translatory movement between said first and second panels of a carton supported by the plates for moving said second panel away from said first panel.

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