April 24, 1962 R. K. GALLOWAY 3,031,186

CARTON FEEDING DEVICE

Filed Oct. 27, 1959 8 Sheets-Sheet 1

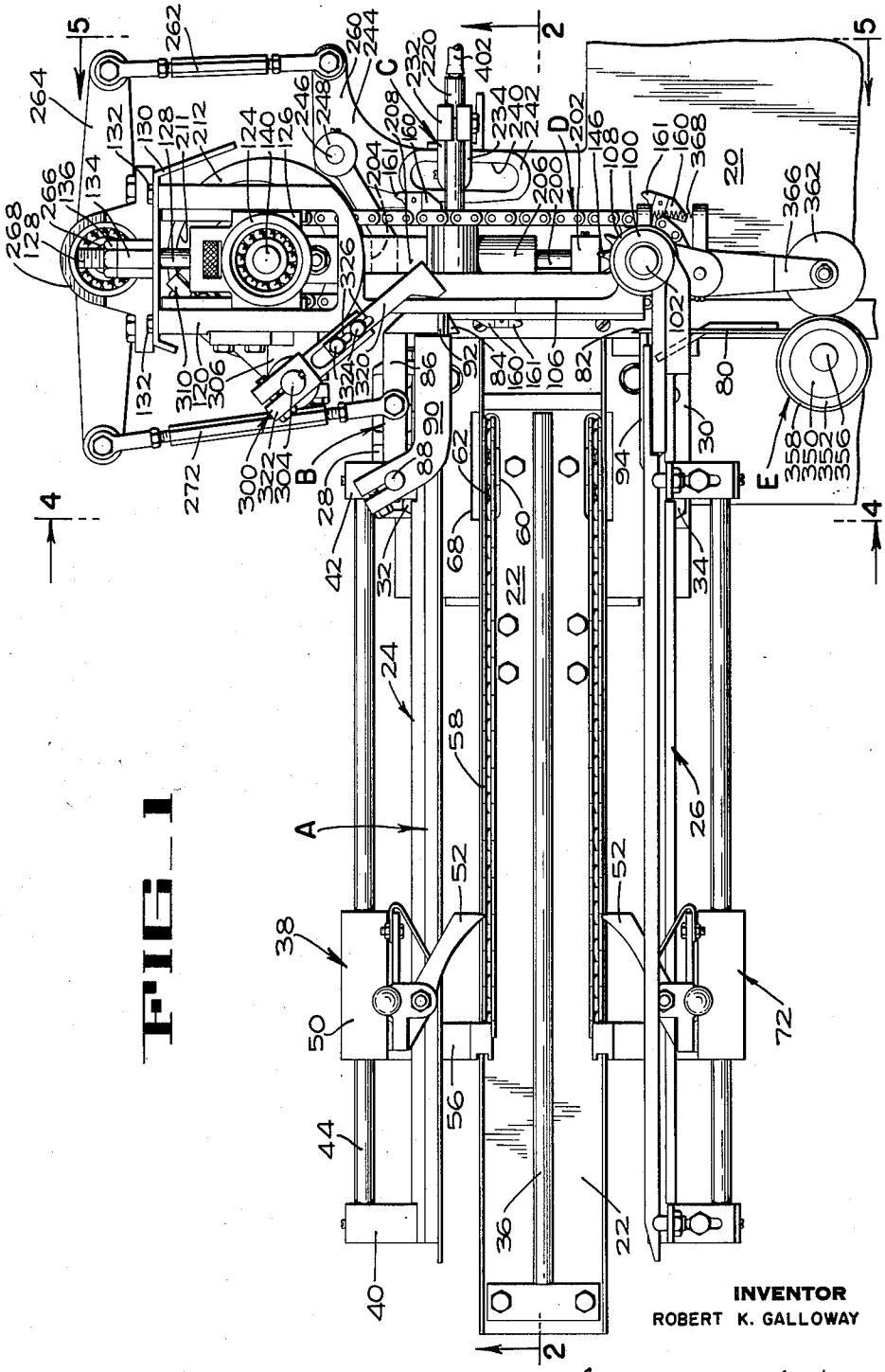


FIG. 1

INVENTOR
ROBERT K. GALLOWAY

BY Hans G. Hofmeister
ATTORNEY

April 24, 1962 R. K. GALLOWAY 3,031,186

CARTON FEEDING DEVICE

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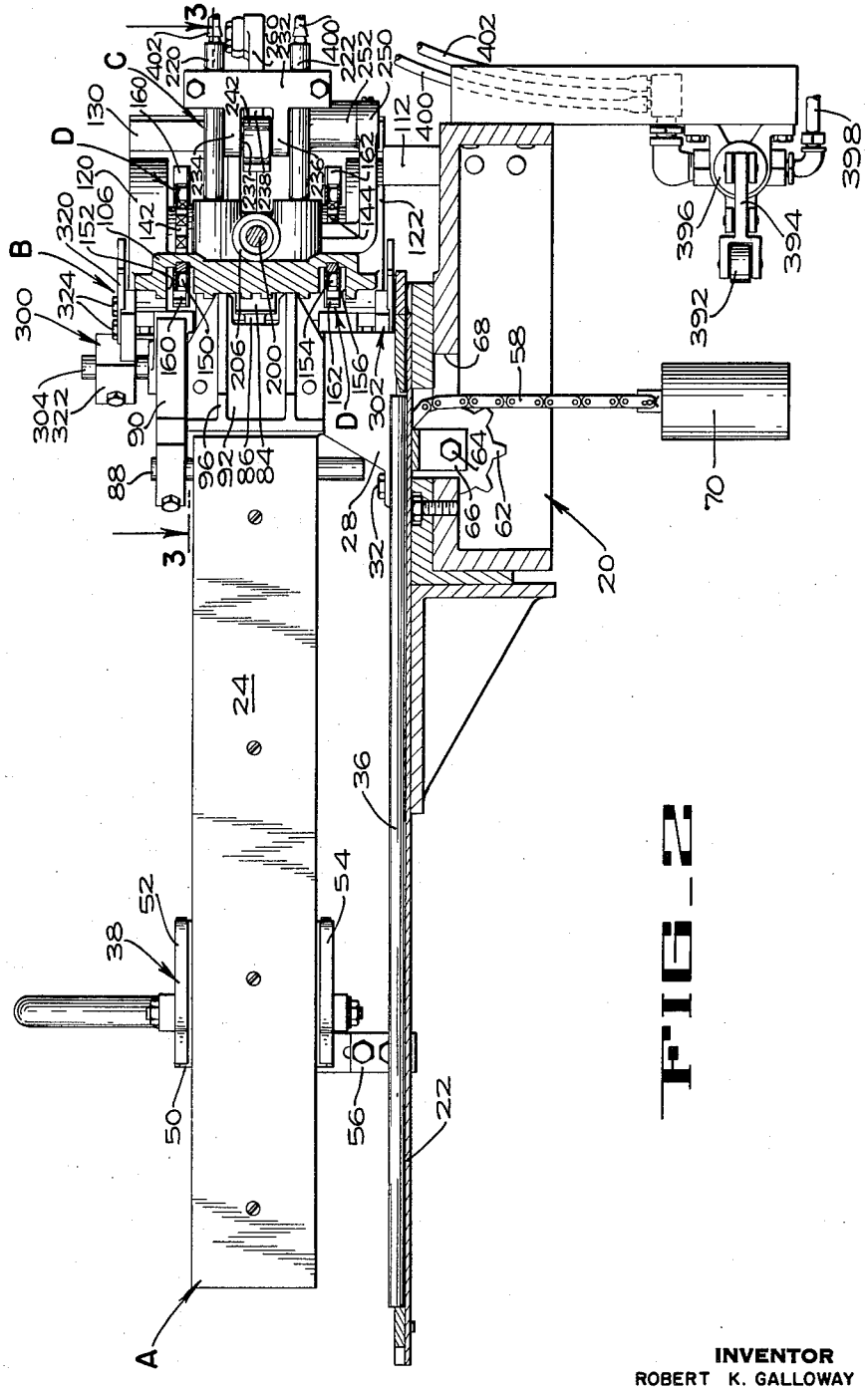


FIG_2

INVENTOR
ROBERT K. GALLOWAY

BY Hans G. Hoffmeister

ATTORNEY

April 24, 1962 R. K. GALLOWAY 3,031,186

CARTON FEEDING DEVICE

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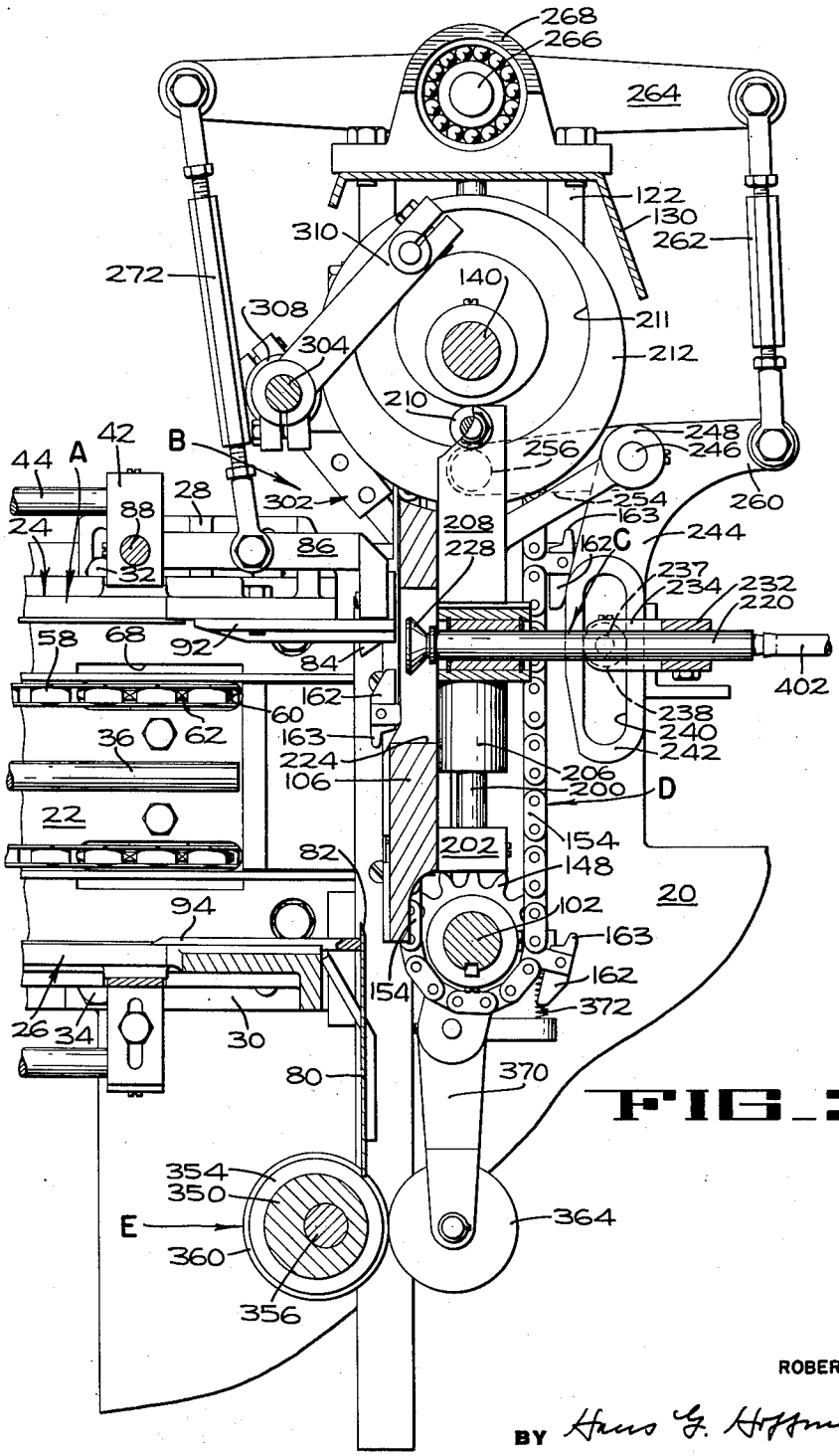


FIG. 3

INVENTOR
ROBERT K. GALLOWAY

BY Hans G. Hoffmeister

ATTORNEY

April 24, 1962 R. K. GALLOWAY 3,031,186

CARTON FEEDING DEVICE

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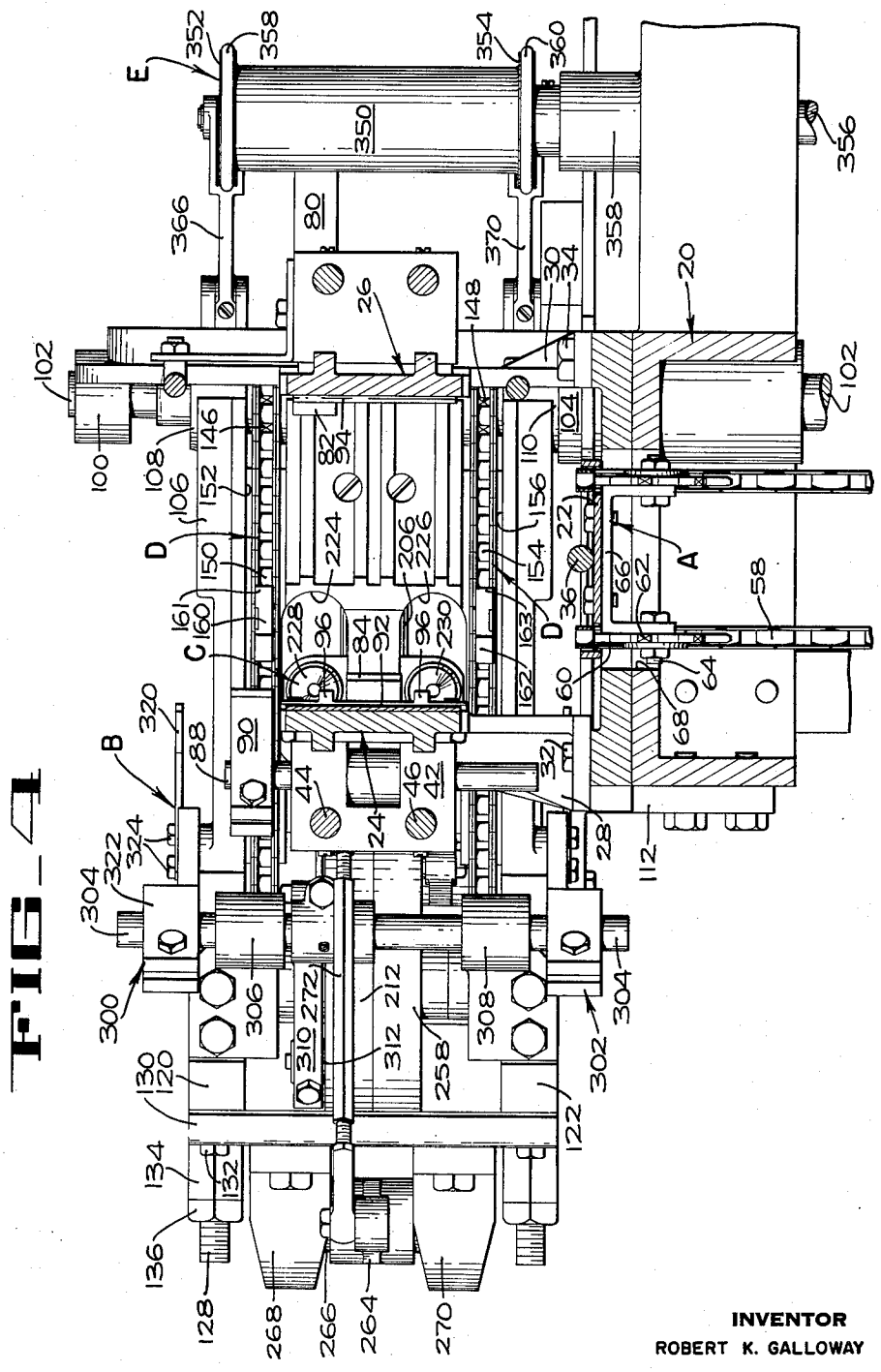


FIG. 4

INVENTOR
ROBERT K. GALLOWAY

BY Hans G. Hoffmeister
ATTORNEY

April 24, 1962 R. K. GALLOWAY 3,031,186

CARTON FEEDING DEVICE

Filed Oct. 27, 1959 8 Sheets-Sheet 5

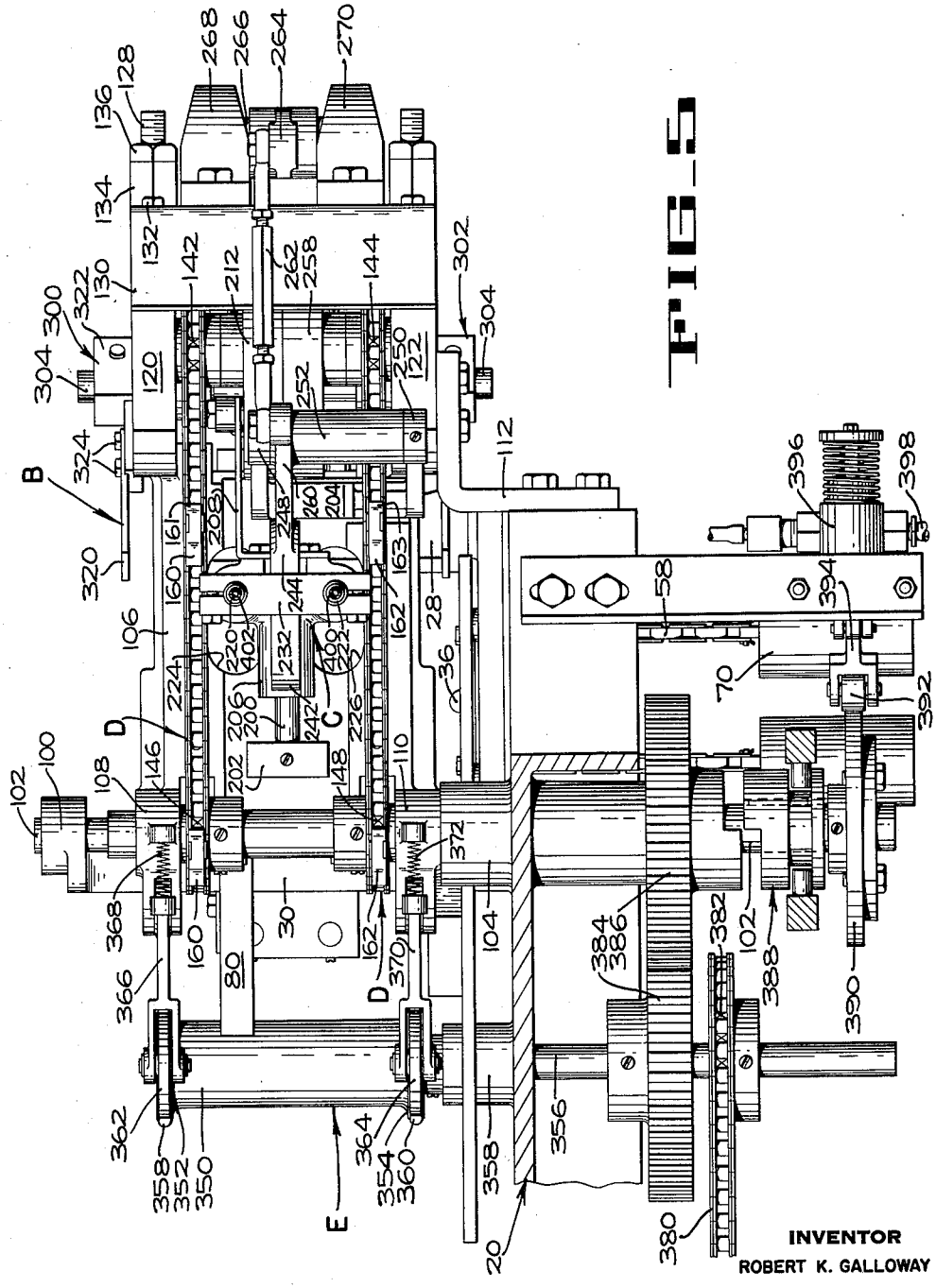


FIG. 5

INVENTOR
ROBERT K. GALLOWAY

BY Hans G. Hofmeister

ATTORNEY

April 24, 1962 R. K. GALLOWAY 3,031,186

CARTON FEEDING DEVICE

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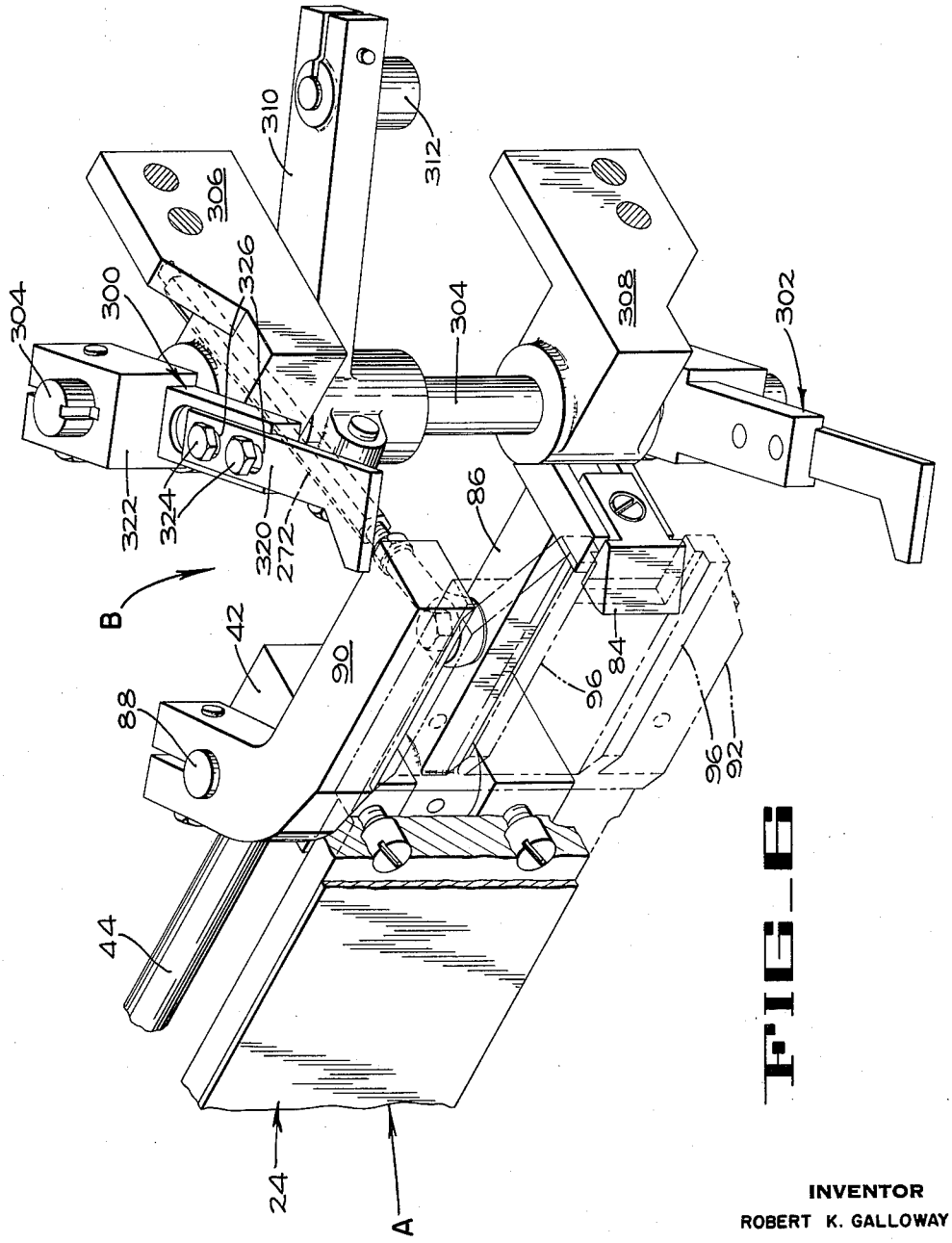


FIG. 6

INVENTOR
ROBERT K. GALLOWAY

BY Hans G. Hoffmeister
ATTORNEY

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CARTON FEEDING DEVICE

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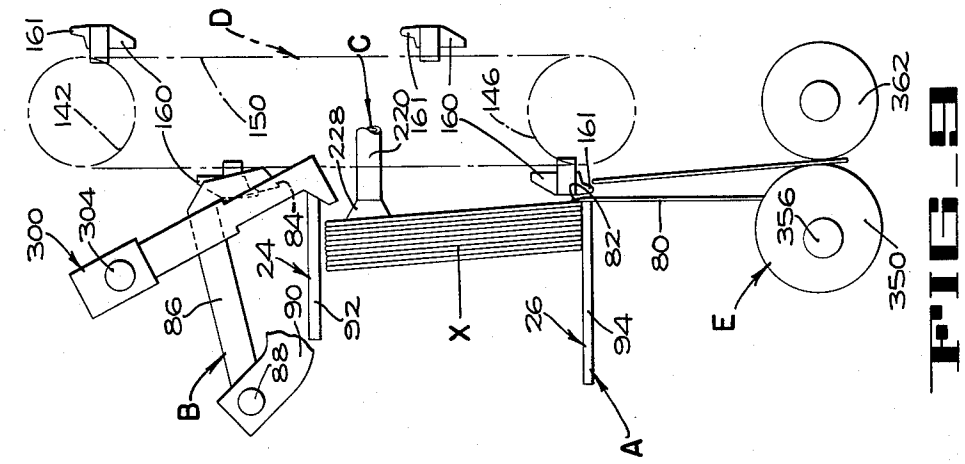


FIG. 5

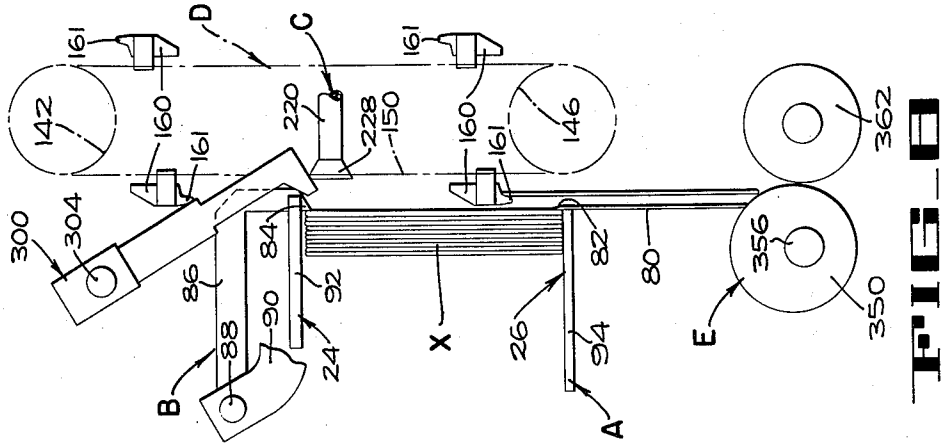


FIG. 6

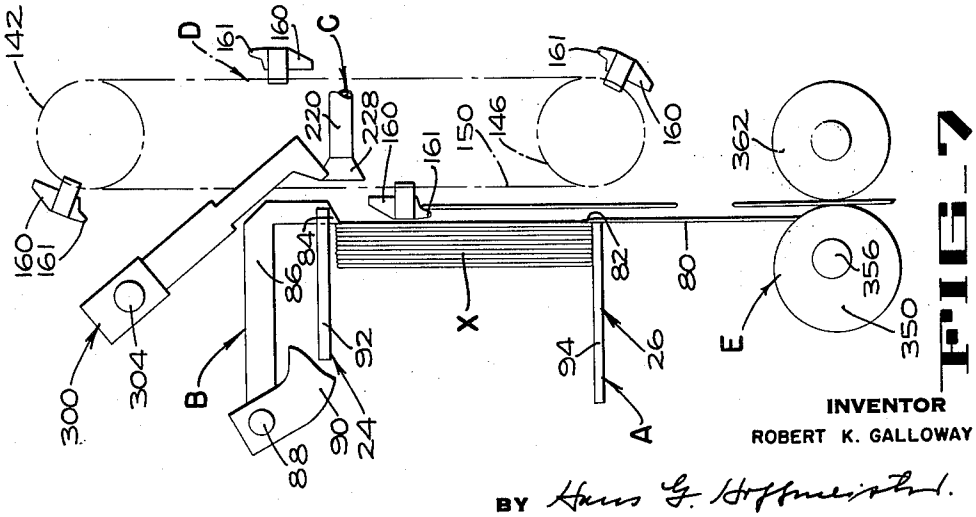


FIG. 7

INVENTOR
ROBERT K. GALLOWAY

BY Hans G. Hoffmeister

ATTORNEY

April 24, 1962 R. K. GALLOWAY 3,031,186

CARTON FEEDING DEVICE

Filed Oct. 27, 1959 8 Sheets-Sheet 8

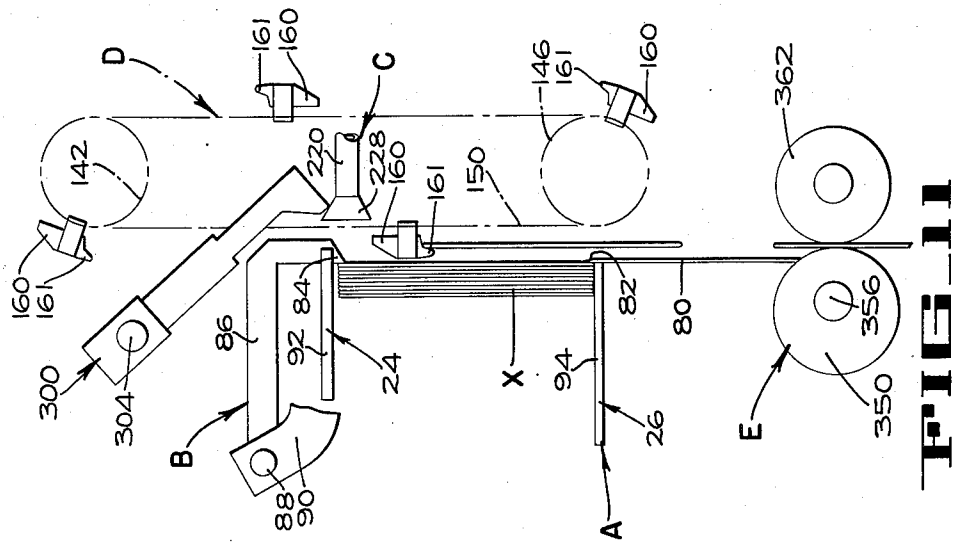


FIG_11

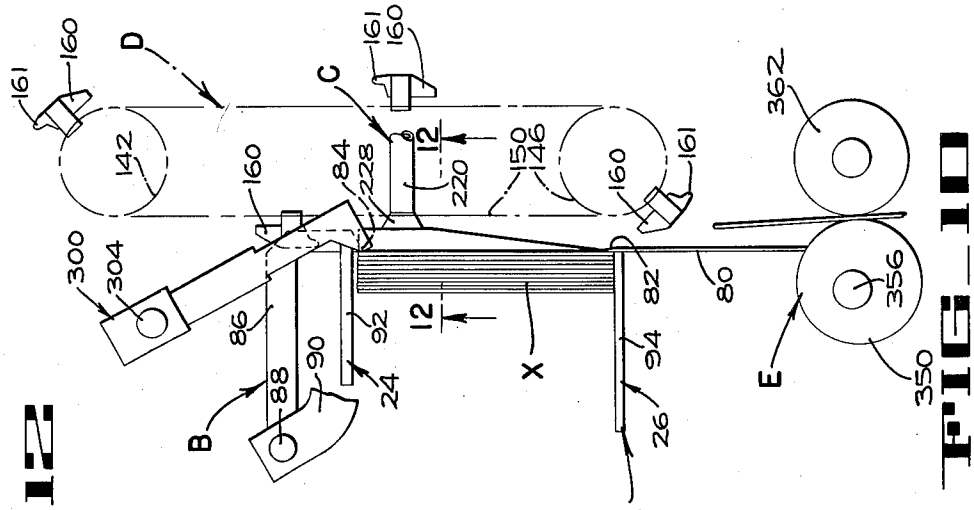


FIG_10

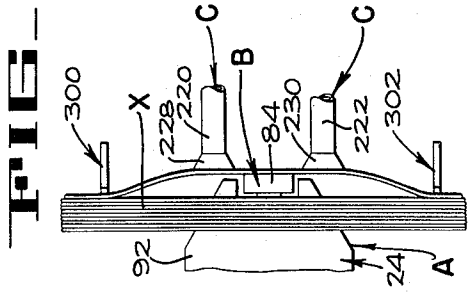


FIG_12

INVENTOR
ROBERT K. GALLOWAY

BY Hans G. Hoffmeister

ATTORNEY

United States Patent Office

3,031,186

Patented Apr. 24, 1962

3,031,186

CARTON FEEDING DEVICE

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

Filed Oct. 27, 1959, Ser. No. 848,987
16 Claims. (Cl. 271—12)

The present invention relates to a carton feeding device, and more particularly to a carton feeding device adaptable for use in the handling of flat or collapsed cartons coated with wax or similar material.

In the packaging of frozen foods or like materials, a reduction in the cost of the packaging material is realized when the cartons used are of lightweight construction or made of thinner material than is commonly used in the frozen food packaging processes. However, such lightweight cartons are less rigid than the commonly used cartons, and when removed from a supply stack by conventional devices, tend to separate from the stack two or more at a time. Further, such cartons are more fragile and, therefore, more susceptible to damage.

It is an object of the present invention to provide a carton feeding device adaptable for use in the feeding of lightweight cartons.

Another object of the present invention is to provide an improved gate mechanism for the magazine of a carton feeding device.

Another object is to provide a carton feeding device for lightweight cartons, which will feed cartons, one at a time, to a carton handling mechanism.

Another object of the present invention is to provide an improved gate mechanism operable in conjunction with a suction cup feeding mechanism which insures that the cartons will be fed one at a time from the magazine of the machine.

Other objects and advantages of the present invention will become apparent from the following description taken in connection with the accompanying drawings, in which:

FIG. 1 is a top plan of the carton feed mechanism of the invention.

FIG. 2 is a vertical section taken on lines 2—2 of FIG. 1.

FIG. 3 is a horizontal section taken on lines 3—3 of FIG. 2, and particularly illustrates the relationship between the suction cups and the magazine gate mechanism.

FIG. 4 is a vertical section taken on lines 4—4 of FIG. 1.

FIG. 5 is an end elevation taken generally on lines 5—5 of FIG. 1.

FIG. 6 is a perspective of the several elements which make up the gate mechanism for the carton magazine.

FIGS. 7, 8, 9, 10, and 11 are a series of schematic views illustrating the cooperative relationship and actions of the carton magazine and gate mechanism and the suction cup feed mechanism.

FIG. 12 is a schematic sectional view taken on lines 12—12 of FIG. 10 to more particularly illustrate one of the relationships between the carton gate mechanism and the suction cup feed mechanism.

As shown in general in FIG. 1, the carton blank feeding mechanism of the present invention comprises a carton magazine A adapted to contain a supply of folded carton blanks, a movable gate mechanism B, and a suction cup mechanism C adapted to withdraw carton blanks one at a time from the magazine A and to deliver them to feed chains D, which in turn feed the carton blanks in successive order to an accelerating mechanism E, which mechanism delivers the carton blank to any suitable receiver, such as a carton erecting mechanism (not shown).

The device of the present invention comprises a bed or base plate 20 (FIGS. 1 through 5) adapted to be supported on suitable legs (not shown) or to be connected to the frame of a suitable carton erecting and filling mechanism (not shown). The magazine A comprises a bottom plate 22 fixed to the upper surface of the bedplate 20 and extending laterally therefrom. Two side plates 24 and 26 extend laterally along but spaced above each side of the bottom plate 22 and are provided at their inner ends with brackets 28 and 30, respectively (FIG. 4), bolted to the upper surface of the bedplate by suitable bolts 32 and 34, respectively. A rod 36 (FIGS. 1–4) is fixed to the upper surface of the bottom plate 22 and extends longitudinally centrally thereof. The bottom plate 22 and the two side plates 24 and 26 together form an open-topped trough within which the stacked carton blanks to be fed by the machine are placed. The carton blanks rest on edge on the upper surface of the rod 36 and are confined between the side walls 24 and 26.

The mechanism generally indicated 38 for feeding the carton blanks inwardly, or to the right as viewed in FIGS. 1 and 2, comprises a pair of brackets 40 and 42 fixed to the outer surface of the side plate 24, and a pair of guide rails 44 and 46 (FIGS. 1 and 4) extending parallel to the outer surface of the side plate 24 and fixed to the brackets 40 and 42. A sliding block 50 is slidably mounted on the slide rails 44 and 46 and carries a pair of pivotally mounted detent fingers 52 and 54 which are spring urged inwardly above and below the top and bottom edges, respectively, of the plate 24 and engage the outer surface of the outermost carton blank in the stack.

A bracket 56 is fixed to the block 50 and extends inwardly therefrom adjacent the upper surface of the bottom plate 22. A chain 58 is fixed to the inner end of the bracket 56 and extends along the upper surface of the bottom plate 22 to a point adjacent the inner end thereof. A slot 60 is formed in the plate 22 adjacent the inner end thereof and a sprocket 62 projects therethrough. The sprocket 62 is mounted for rotation on a shaft 64 fixed to a bracket 66 which in turn is fixed to the under surface of the plate 22. The chain 58 is trained around the sprocket 62 and extends downwardly through a suitable opening 68 formed in the bedplate 20 and is connected at its lower end to a suitable weight 70. A similar carton blank advancing mechanism generally indicated 72 is associated with the opposite side plate 26.

A stack of carton blanks can be placed within the magazine A behind the spring pressed fingers 52 and 54 of both stack advancing mechanisms 38 and 72. The slide blocks are then retracted toward the outer end of the magazine A. As this occurs the spring pressed detent fingers ride along the side edges of the carton blanks until the slide blocks reach a point wherein the fingers are beyond the outermost carton blank at which time the spring fingers move inwardly so that when the slide blocks are released the action of the weights pulling downwardly on the chains moves the spring fingers into engagement with the outermost carton blank to urge the blank toward the right or inwardly of the machine. It will be appreciated that with the use of two carton blank advancing mechanisms 38 and 72 associated with the magazine A, one of which acts on each side of the stack of blanks, the stack will be advanced uniformly to the feeding station adjacent the gate mechanism B.

The gate mechanism B comprises a plate 80 (FIGS. 1, 3, and 4) rigid with the inner end of the side plate 26 of the magazine A and projecting inwardly therefrom a short distance to form a fixed lip or ledge 82 which engages the innermost or leading carton blank in the stack adjacent one side edge thereof to retain the blank within the magazine A. The opposite side edge of the leading carton blank engages a movable detent in the form of a lip 84 adjacent the inner end of the side plate 24 (FIGS. 1 and 6). The movable lip 84 is mounted on an L-

shaped arm 86 which in turn is fixed to a vertical shaft 88, which shaft, as best seen in FIG. 4, is rotatably supported by the previously mentioned bracket 42 fixed to the outer surface of the side plate 24. Oscillation of the L-shaped arm 86 to cause the movable lip 84 to move out of engagement with the leading carton blank in the stack and to return to engage the next succeeding carton blank after said leading blank has advanced beyond the range of movement of the lip is effected through a mechanism which will be described hereinbelow. A jogger arm 90 (FIGS. 1, 2 and 4) is fixed to the upper end of the shaft 88 and moves inwardly toward and outwardly from the stack of advancing carton blanks as the shaft 88 oscillates to jog the blanks in the stack into smooth alignment with each other. It will be noted that plates 92 and 94 are fastened to the side plates 24 and 26, respectively, adjacent the gate assembly B, and that plate 92 is provided with inwardly projecting longitudinally extending ribs 96 whereby, in this zone of the magazine, the carton blanks are confined in smooth alignment with each other to insure proper registration thereof with the stop lips 82 and 84 mentioned above.

The previously mentioned bracket 30, which supports the side plate 26 of the magazine, projects upwardly beyond the upper edge of said side plate and forwardly therefrom and is provided at its upper end with a bearing receiving hub or boss, 100 (FIGS. 1, 4 and 5). The main drive shaft 102 of the carton blank feeding mechanism is a vertically extending shaft which is rotatably mounted in the bearing received within the boss 100 and within a similar bearing received within a suitable bearing boss 104 formed on the upper surface of the bedplate 20 (FIG. 5). While the machine is in operation, the shaft 102 is constantly rotated counterclockwise as viewed in FIGS. 1 and 3.

The plate 106 which supports the working parts of the carton blank feed mechanism extends across the inner or discharge end of the magazine A and projects laterally therefrom to one side of the magazine. The support plate 106 is provided with two bosses 108 and 110 adjacent one of its ends which are mounted on, and supported by, the main drive shaft 102. The outboard end of the support plate 106 is fixed to a bracket 112 which in turn is fixed to the bedplate 20 (FIG. 5).

For purposes of convenience in the description which follows, the side of the plate 106 which faces the magazine A will be termed the front face of the plate and the opposite side will accordingly be termed the rear face of the plate 106.

The outboard end of the support plate 106 is in the form of two vertically spaced bifurcated yokes 120 and 122, respectively (FIG. 5). A bearing 124 (FIG. 1) is mounted in a block 126 slidably mounted between the legs of the upper yoke 120. The block 126 is positioned within the yoke 120 by a stud 128 fixed to the block 126 and projecting through a suitable opening in a cap member 130 fixed to the open end of the yoke 120 by capscrews 132. An adjusting nut 134 and a lock nut 136 are threaded on the outer end of the stud 128. A similar bearing (not shown) is similarly mounted in the lower yoke 122.

A shaft 140 is rotatably mounted in the bearing 124 and a similar bearing (not shown) mounted in the lower yoke 122. Two vertically spaced sprockets 142 and 144 (FIGS. 2 and 5) are fixed to the shaft 140. Similarly, two opposing sprockets 146 and 148 (FIGS. 1, 3, 4 and 5) are fixed to the drive shaft 102. An upper carton advancing chain D is trained around the sprockets 142 and 146. Similarly, a lower carton advancing chain D is trained around the sprockets 144 and 148.

The inner reach 150 of the upper carton advancing chain D travels within a suitable groove 152 (FIG. 2) formed in the front face of the support plate 106 adjacent the upper edge thereof. Similarly, the inner reach 154 of the lower carton advancing chain D travels within a similar groove 156 formed in the front face of the support plate 106 adjacent the lower edge thereof. A plurality of carton engaging lugs 160 (FIG. 1) having forwardly projecting nose portions 161 are fixed to the upper carton advancing chain D at spaced points therealong. Similar carton engaging lugs 162 (FIG. 3), having forwardly projecting nose portions 163, are fixed to the lower carton advancing chain D in opposition to the lugs 160 on the upper chain D.

The vacuum cup assembly C comprises a slide shaft 200 (FIGS. 1, 2, 3 and 5) extending parallel to the support plate 106 adjacent the back side thereof and fixed between suitable brackets 202 (FIGS. 1, 3 and 5) and 204 (FIG. 5). A slide block 206 is slidably mounted on the shaft 200. An arm 208 (FIGS. 1, 3 and 5) fixed to the slide block 206 carries a cam roller 210 received within a cam groove 211 formed in the upper surface of a cam disc 212 fixed to the shaft 140. When the cam 212 rotates the slide block 206 reciprocates longitudinally of the support plate 106.

Two lateral bores are formed in the slide block 206, one above and one below the shaft 200, and two tubes 220 and 222, respectively (FIGS. 1–3), are slidably mounted therein. The tubes 220 and 222 project through openings 224 and 226 (FIGS. 3, 4 and 5) formed in the support plate 106 and are provided at their inner ends with suction cups 228 and 230, respectively (FIGS. 3 and 4). The outer ends of the tubes 220 and 222 are clamped by a clamp member 232 (FIGS. 1, 2, 3 and 5). The clamp 232 is provided with two inwardly projecting vertically spaced arms 234 and 236 (FIG. 2). A shaft 237 extends between the arms 234 and 236 and through a roller 238 which is freely rotatably thereon. The roller 238 is received within an elongated slot 240 (FIG. 3) formed in one arm 242 of a bell crank lever 244 rotatably mounted on a vertical shaft 246. The shaft 246 is supported by two arms 248 and 250 (FIG. 5) fixed to the previously mentioned block 204. As best seen in FIG. 5 the bell crank lever 244 is provided with an elongated hub portion 252 to which is fixed in cam follower arm 254 (FIG. 3) which carries at its inner end a cam follower roller 256 received in a suitable cam groove formed in the underside of a cam disc 258 (FIG. 4) fixed to the shaft 140.

The other arm 260 (FIGS. 1 and 3) of the bell crank lever 244 is connected by a link 262 to one end of a rocking lever 264 (FIGS. 1, 2 and 4) fixed to a shaft 266 rotatably supported in two pillow block bearings 268 and 270 (FIGS. 4 and 5) fixed to the outboard end of the support plate 106. The other end of the rocking lever 264 (FIGS. 1, 3 and 4) is connected by a link 272 to the L-shaped arm 86, (FIGS. 1–4 and 6) which effects operation of the movable lip 84 to release a single carton blank from the magazine A, as hereinbefore explained. As the cam disc 258 is rotated the bell crank lever 244 oscillates to move the suction cups inwardly and outwardly and away from the carton magazine A and at the same time, through the rocking lever 264 and the links 262 and 272, moves the movable lip 84 inwardly and outwardly in conjunction with the movement of the suction cups toward and away from the magazine.

Two carton blank holding fingers 300 and 302 (FIGS. 1, 3 and 6) which form part of the gate mechanism B, are clamped and keyed to a vertical shaft 304 rotatably carried by brackets 306 and 308 fixed to the yoke portions 120 and 122, respectively, of the support plate 106. A cam follower arm 310 is fixed to the central portion of the shaft 304 and carries a cam roller 312 received within the same cam groove 211 on the upper cam disc 212 that receives the slide block actuating roller 210. The upper finger 300 is made in two parts, 320 and 322, respectively, held together by bolts 324 which extend through slots 326 in the outer part 320 and are threaded into the inner part 322, and the lower finger 302 is of similar construction. Thus, the fingers may be lengthened

or shortened within limits. The fingers 300 and 302 are oscillated toward and away from the discharge end of the magazine A by the cam 212 in timed relation to the movements of the movable lip 84 and the suction cups 228 and 230.

The carton blank accelerating mechanism E (FIGS. 1, 3, 4 and 5) which discharges the carton blanks from the machine does so by seizing the leading edge of each successive carton blank as it is advanced laterally from the discharge end of the magazine A by a pair of the lugs 160 and 162 on the feed chains D, and rapidly accelerating the blank to disengage it from the lugs. The accelerating mechanism E comprises a spool 350 having upper and lower flanges 352 and 354, respectively. The spool 350 is fixed to a vertical shaft 356 which is rotatably mounted in a bearing (not shown) received within a boss 358 (FIGS. 4 and 5) formed on the upper surface of the bedplate 20. The peripheral surfaces of the flanges 352 and 354 are grooved and rubber tire members 358 and 360, respectively, are mounted therein. It will be noted that the spool 350 is eccentrically mounted on the shaft 356 whereby during one portion of its revolution its periphery is moving at a faster linear speed than during another portion of its rotation.

Two discs 362 and 364 are mounted in opposition to the peripheral flanges 352 and 354, respectively, of the spool member 350. The upper disc 362 is mounted between the arms of the bifurcated end portion of an arm 366 the other end of which is pivotally mounted on the support plate 106. A spring 368 urges the arm 366 to rotate so that the disc 362 is in contact with the rubber tire 358 on the periphery of the upper flange 352 of the spool member 350. The lower disc 364 is similarly mounted on an arm 370 which in turn is pivotally mounted on the support plate 106 and is provided with a spring 372 which urges the lower disc 364 into contact with the rubber tire 360 on the lower flange 354 of the spool 350.

The shaft 356 is driven by a chain 380 (FIG. 5) which engages a sprocket 382 fixed to the shaft 356. The chain 380 is driven by any suitable source of power (not shown).

A gear 384 (FIG. 5) is fixed to the shaft 356 for rotation therewith and meshes with a gear 386 which is freely rotatable on the main drive shaft 102. A clutch indicated at 388 is adapted when engaged to drive the shaft 102. Since the clutch 388 is engageable only in one position relative to the gear 386, and since the drive shaft 102 drives all of the elements of the machine other than the carton accelerating mechanism E, it will be noted that whenever the clutch 388 is engaged the various elements will operate in proper timed relation with each other.

A cam 390 (FIG. 5) is fixed to the main drive shaft 102 and actuates a cam follower roller 392 carried by an arm 394 which is part of a vacuum control valve 396 (FIGS. 2 and 5). The vacuum control valve 396 is connected by a conduit 398 to any suitable source of vacuum and by conduits 400 and 402 to the suction cups 228 and 230, respectively.

In the operation of the device an operator places a stack of folded carton blanks in the magazine A and moves the stack advancing units 38 and 72 outwardly so that the fingers thereon engage the outer end of the stack to urge the stack inwardly toward the gate mechanism B. The innermost carton blank will rest against the ledge 82 and the movable lip 84. The operator then engages the clutch 388 to place the machine in operation.

The various actions of the several elements during the operation of the machine is best illustrated in the series of diagrammatic views 7 through 12 and will be described in conjunction therewith.

In FIG. 7 it will be noted that the stack of carton blanks X is resting with one edge of the innermost carton blank resting on the ledge 82 adjacent the side wall 26 and with the opposite edge of the carton blank resting on the movable lip 84 adjacent the plate 92 which forms part of the side wall 24 of the magazine. The suction cups 228 and 230 are in their most retracted position, that is, their position furthest away from the carton magazine A and in their rearmost position with respect to the direction of travel of the carton blank advancing runs of the chains D. The fingers 300 and 302 are in their retracted positions.

In FIG. 8 it will be noted that the suction cup 228 has advanced slightly in the direction of movement of the carton blank advancing runs of the chains D and has been projected inwardly toward the stack X. Similarly the finger 300 has started to rotate inwardly toward the stack X.

In FIG. 9 the suction cup 228 is in its innermost position and has moved the edge of the stack associated with the movable lip 84 a short distance to the left as viewed in FIG. 9, i.e., back into the magazine. The finger 300 is also in its innermost position and the movable lip 84 has been retracted from in front of the stack of carton blanks X.

Hereinafter the edges of the carton blanks adjacent the movable lip 84 will be called the rear edges thereof since these are the edges that will trail when the blanks are subsequently advanced by the feed chains D.

In FIG. 10 the suction cup 228 has moved outwardly to bow the central portion of the rear edge of the carton blank outward beyond the plane of the movable lip 84 while the fingers 300 and 302 retain the top and bottom edges of the rearmost portion of the carton blank in their position substantially coplanar with the inner surface of the movable lip 84 in the manner best illustrated in FIG. 12. In this stage of the operation the movable lip 84 has been moved back to its original position and projects between the innermost carton blank and the next carton blank in the stack X.

The fingers 300 now rotate back to their original position so that the innermost carton returns to its planar relation. The suction cups 228 continue their outward movement and simultaneously are moved rearwardly with respect to the direction of movement of the inner reach 150 of the carton advancing chain D to drag the forward edge of the innermost carton blank rearwardly and to release it from the stationary ledge 82 and to insert the rear edge of the innermost carton blank beneath the forwardly projecting nose portions 161 and 163 of a pair of the lugs 160 and 162, respectively, carried by the two feed chains D.

As soon as the rear edge of the carton blank is engaged by a pair of the lugs 160 and 162, the cam 390 on the main drive shaft 102 actuates the vacuum valve 396 to cut off the source of vacuum from the suction cups 228 and 230 and vent the same to atmosphere so that they release the carton blank which is then advanced by the chains D to the carton accelerating mechanism E as shown in FIG. 11.

As soon as the forward edge of the carton blank engages in the nip between the flanges flanges 352 and 354 on the spool 350 and the two opposing discs 362 and 364, the carton blank is accelerated so that it is withdrawn from beneath the forwardly projecting nose portions 161 and 163 of the lugs 160 and 162, and is advanced by the carton accelerating mechanism and delivered to carton erecting mechanism or other receiver (not shown).

While the mechanism has been described herein with respect to carton blanks which are disposed vertically with the stack extending horizontally, it is equally applicable to feeding folded carton blanks which are disposed horizontally in a vertical magazine. When used for feeding cartons disposed horizontally, it would be rotated 90° from its arrangement illustrated in the drawings so that the carton magazine projects vertically upwardly. When so used, a gravity feed for the carton magazine can be relied on and the carton stack advancing mechanisms 38 and 72 may be dispensed with.

While a preferred embodiment of the invention has been shown and described, it should be noted that various changes may be made therein without departing from the spirit of the invention as defined in the appended claims.

The invention having thus been described, what is claimed and desired to be secured by Letters Patent is:

1. In a carton blank feeding machine, a magazine, a fixed ledge adapted to contact a carton blank in said magazine and support one edge of the blank, a movable lip adapted to contact the central portion of the opposite edge of said carton blank, carton blank engaging fingers adapted to be moved into engagement with said carton blank adjacent said opposite edge thereof on opposite sides of said movable lip, a suction cup movable toward and away from said magazine and adapted to grip a central portion of the carton blank adjacent said opposite edge thereof, and means for actuating said elements in timed relation with each other to effect removal of the carton blank from said magazine.

2. In a carton blank feeding machine, a magazine, a fixed ledge adapted to contact a carton blank in said magazine and support one edge of the blank, a movable lip adapted to contact the central portion of the opposite edge of said carton blank, carton blank engaging fingers adapted to be rotated into engagement with the carton blank adjacent said opposite edge thereof on opposite sides of said movable lip, carton advancing chains mounted adjacent said magazine for movement laterally thereof, a plurality of carton blank engaging lugs on said chains in opposed relation with each other, a suction cup movable toward and away from said magazine and adapted to grip the central portion of said initial carton blank adjacent said opposite edge thereof, and means for actuating said elements in timed relation with each other to effect successive removal of the carton blank from said magazine and engagement thereof with an opposed pair of the lugs on said chains.

3. In a carton blank feeding machine, a magazine, a fixed ledge adapted to contact a carton blank in said magazine and support one edge of the blank, a movable lip adapted to contact the central portion of the opposite edge of said carton blank, a pair of carton blank engaging fingers adapted to be rotated into engagement with the carton blank adjacent said opposite edge thereof on opposite sides of said movable lip, a pair of carton blank advancing chains mounted adjacent said magazine for movement laterally thereof, a plurality of carton blank engaging lugs on each of said chains in opposed relation with each other, a suction cup movable toward and away from said magazine and adapted to grip the central portion of the carton blank adjacent said opposite edge thereof, means for actuating said elements in timed relation with each other to effect successive removal of the carton blank from said magazine and engage the rear edge of the blank with an opposed pair of the lugs on said chains, and means for releasing the suction in said suction cup when the rear edge of the carton blank engages said lugs.

4. In a carton blank feeding machine, a magazine, a fixed ledge adapted to contact a first carton blank in said magazine and support one edge of said blank, a movable lip adapted to contact the central portion of the opposite edge of said carton blank, a pair of carton blank engaging fingers adapted to be rotated into engagement with said carton blank adjacent said opposite edge thereof on opposite sides of said movable lip, a suction cup mounted for movement toward and away from the magazine and for lateral movement relative to the magazine and adapted to grip a central portion of said carton blank adjacent said opposite edge thereof, means for connecting said suction cup to a source of vacuum, and means for actuating said elements in timed relation with each other to effect successive removal of said carton blank from said magazine by advancing the suction cup toward the magazine to engage and grip said carton blank, rotating said fingers into engagement with said carton blank, retracting the movable lip, withdrawing the suction cup to bow the rear edge of said carton blank, moving the movable lip into the spaced between said carton blank and a succeeding carton blank, retracting said fingers, and moving the suction cup rearwardly to withdraw the front edge of said first carton blank from said fixed ledge.

5. In a carton blank feeding machine, a magazine, a fixed ledge adapted to support the forward edge of a first carton blank in said magazine, a movable lip adapted to support the rear edge of said carton blank, a pair of carton blank engaging fingers adapted to be rotated into engagement with the rear edge of said carton blank on opposite sides of said movable lip, a pair of carton blank advancing chains mounted adjacent said magazine for movement laterally thereof, a plurality of carton blank engaging lugs mounted on said chains in opposing relation with each other, means for driving said chains, a suction cup mounted for movement toward and away from the magazine and for lateral movement relative to the same and adapted to grip the central portion of said carton blank adjacent the rear edge thereof, means for connecting said suction cup to a source of vacuum, and means for actuating said elements in timed relation with each other to effect successive removal of said carton blank from the magazine by advancing the suction cup toward the magazine to engage and grip said carton blank, rotating the fingers inwardly into engagement with said carton blank, retracting the movable lip, withdrawing the suction cup to bow the rear edge of said carton blank, moving said movable lip into the space between said first carton blank and a succeeding carton blank, retracting the fingers, and moving the suction cup rearwardly to withdraw the front edge of said first carton blank from said fixed ledge and to engage the rear edge of said first carton blank with an opposed pair of the lugs on said chains.

6. In a carton blank feeding machine, a magazine, a fixed ledge adapted to support the forward edge of a first carton blank in said magazine, a movable lip adapted to support the rear edge of said carton blank, a pair of carton blank engaging fingers adapted to be rotated into engagement with the rear edge of said carton on opposite sides of said movable lip, a pair of carton blank advancing chains mounted adjacent said magazine for movement laterally thereof, a plurality of carton blank engaging lugs mounted on said chains in opposed relation with each other, a suction cup mounted for movement toward and away from the magazine and for lateral movement relative thereto and adapted to grip the central portion of the rear edge of said initial carton blank, means for connecting said suction cup to a source of vacuum, means for actuating said elements in timed relation with each other to effect successive removal of said carton blank from said magazine by advancing said suction cup toward the magazine to engage and grip said carton blank, rotating said fingers inwardly into engagement with said carton blank, retracting the movable lip, withdrawing the suction cup to bow the rear edge of said carton blank, moving the movable lip into the space between said first carton blank and a succeeding carton blank, retracting said fingers, and moving the suction cup rearwardly to withdraw the front edge of said first carton blank from said fixed ledge and engaging the rear edge of said first carton blank with an opposed pair of the lugs on said chains, and means for releasing the vacuum in the suction cup and venting the same to atmosphere when the rear edge of said first carton blank engages said lugs.

7. In a carton blank feeding machine, a magazine, a fixed ledge adapted to contact and support the forward edge of a carton blank in said magazine, a movable lip adapted to contact and support the rear edge of said carton blank, a pair of carton blank engaging fingers adapted to be rotated into engagement with said carton blank on opposite sides of said movable lip, a suction cup mounted

for movement toward and away from said magazine and for forward and rearward movement relative to the same and adapted to grip a central portion of said carton blank adjacent the rear edge thereof, means for connecting the suction cup to a source of vacuum, cam means for moving the suction cup toward and away from said magazine and said movable lip into and out of its carton blank supporting position, whereby as the suction cup moves toward the magazine the movable lip is withdrawn and as the suction cup moves away from the magazine the movable lip is returned, and cam means for moving the suction cup forwardly and rearwardly and moving said fingers into and out of their carton blank engaging positions, whereby the fingers are moved into carton blank engaging positions when the movable lip is withdrawn and are moved out of their carton blank engaging positions after the movable lip is returned to its carton blank engaging position, and whereby the suction cup is subsequently moved rearwardly to withdraw the front edge of said carton blank from said fixed ledge.

8. In a carton blank feeding machine, a magazine, a fixed ledge adapted to contact and support the forward edge of a carton blank in said magazine, a movable lip adapted to contact and support the rear edge of said carton blank, a pair of carton blank engaging fingers adapted to be rotated into engagement with said carton blank on opposite sides of said movable lip, a pair of carton blank advancing chains mounted adjacent said magazine for movement laterally thereof, a plurality of carton engaging lugs on said chains in opposed relation with each other, a suction cup mounted for movement toward and away from said magazine and for forward and rearward movement relative thereto and adapted to grip the central portion of the rear edge of said carton blank, means for connecting the suction cup to a source of vacuum, cam means for moving the suction cup toward and away from the magazine and said movable lip into and out of its carton blank supporting position, whereby as the suction cup moves toward the magazine the movable lip is withdrawn and as the suction cup moves away from the magazine the movable lip is returned, and cams means for moving the suction cup forwardly and rearwardly and moving said fingers into and out of their carton blank engaging positions, whereby the fingers are moved into carton blank engaging positions when the movable lip is withdrawn and are moved out of their carton blank engaging positions after the movable lip is returned to its carton blank engaging position, and whereby the suction cup is subsequently moved rearwardly to withdraw the front edge of said carton blank from said fixed ledge and engage the rear edge of said carton blank with a pair of the lugs on said chains.

9. In a carton blank feeding machine, a magazine, a fixed ledge adapted to contact and support the forward edge of a carton blank in said magazine, a movable lip adapted to contact and support the rear edge of said carton blank, a pair of carton blank engaging fingers adapted to be rotated into engagement with said carton blank on opposite sides of said movable lip, a pair of carton blank advancing chains adjacent said magazine and moving laterally thereof, a plurality of carton blank engaging lugs on said chains in opposed relation with each other, a suction cup mounted for movement toward and away from the magazine and for forward and rearward movement relative thereto and adapted to grip a central portion of said initial carton blank adjacent the rear edge thereof, means for connecting the suction cup to a source of vacuum, cam means for moving the suction cup toward and away from the magazine and the movable lip into and out of its carton blank supporting position, whereby as the suction cup moves toward the magazine the movable lip is withdrawn and as the suction cup moves away from the magazine the movable lip is returned, cam means for moving the suction cup forwardly and rearwardly and moving said fingers into and out of their carton blank engaging positions, whereby said fingers are moved into carton blank engaging positions when said movable lip is withdrawn and are moved out of their carton blank engaging positions after said movable lip is returned to its carton blank engaging position, and whereby said suction cups are subsequently moved rearwardly to withdraw the front edge of said carton blank from said fixed ledge and engage the rear edge of said carton blank with an opposed pair of lugs on said chains, and means for releasing the vacuum in said suction cup and venting the same to atmosphere when the rear edge of said carton blank engages said lugs.

10. In a carton blank feeding machine, a magazine a fixed ledge adapted to contact and support the forward edge of a carton blank in said magazine, a movable lip adapted to support the rear edge of said carton blank, a pair of carton engaging fingers adapted to be rotated into engagement with said initial carton blank on opposite sides of said movable lip, a pair of carton blank advancing chains adjacent said magazine and moving laterally thereof, a plurality of carton blank engaging lugs on said chains in opposed relation with each other, said lugs each having a forwardly projecting nose portion, a suction cup mounted for movement toward and away from said magazine and for forward and rearward movement relative to said magazine and adapted to grip a central portion of said carton blank adjacent the rear edge thereof, means for connecting said suction cup to a source of vacuum, cam means for moving said suction cup toward and away from said magazine and said movable lip into and out of its carton blank supporting position, whereby as said suction cup moves toward said magazine said movable lip is withdrawn and as said suction cup moves away from said magazine said movable lip is returned, cam means for moving said suction cup forwardly and rearwardly and moving said fingers into and out of their carton blank engaging positions, whereby said fingers are moved into carton blank engaging positions when said movable lip is withdrawn and are moved out of their carton blank engaging positions after said movable lip is returned to its carton blank engaging position, and whereby said suction cups are subsequently moved rearwardly to withdraw the front edge of said carton blank from said fixed ledge and engage the rear edge of said carton blank beneath the nose portions of an opposed pair of lugs on said chains, and cam controlled valve means for releasing the vacuum in said suction cups and venting the same to atmosphere when the rear edge of said carton blank engages said lugs.

11. In a carton blank feeding machine, a magazine, a movable gate mechanism for controlling release of carton blanks from said magazine comprising, a movable lip adapted to engage the central portion of the rear edge of the leading carton blank in said magazine, a pair of fingers adapted to be rotated into engagement with the end portions of the rear edge of said leading carton blank, means for rotating said fingers into engagement with said leading carton blank, and means for retracting said movable lip, and means adapted to contact and grip the central portion of the rear edge of said leading carton blank and to withdraw said central portion past said movable lip, said retracting means for said movable lip being effective to return said movable lip to insert the same between the central portion of the rear edge of said leading carton blank and the rear edge of the next succeeding carton blank in said magazine, said means for rotating said fingers being effective to retract the same subsequently to the return of said movable lip.

12. In a carton blank feeding machine, a magazine, a movable gate mechanism for controlling release of carton blanks from said magazine comprising, a movable lip adjacent one side of said magazine adapted to engage the central portion of the rear edge of the leading carton blank in said magazine, a pair of fingers mounted for rotation about an axis adjacent said one side of the mag-

azine and adapted to be rotated into engagement with the end portions of the said edge of the leading carton blank, means for rotating said fingers into engagement with said leading carton blank, and means for retracting the movable lip, means adapted to contact and grip the central portion of said edge of the leading carton blank and to withdraw said central portion past the retracted movable lip, said retracting means for the movable lip being effective to return the movable lip to insert the same between the central portion of said edge of said leading carton blank and the corresponding edge of the next succeeding carton blank in the magazine, said means for rotating said fingers being effective to retract the same subsequently to the return of said movable lip.

13. In a carton blank feeding machine, a magazine, a movable gate mechanism for controlling release of carton blanks from the magazine comprising, a movable lip adapted to engage the leading carton blank in said magazine, a pair of fingers adapted to be moved into engagement with the leading carton blank on opposite sides of the movable lip, means for moving said fingers into engagement with the leading carton blank, and means for retracting the movable lip, and means adapted to contact and grip the leading carton blank and to withdraw a portion thereof past the retracted movable lip, said retracting means being effective to return the movable lip to insert the same between the leading carton blank and the next succeeding carton blank in the magazine, said means for rotating said fingers being effective to retract the same subsequently to the return of said movable lip.

14. In a carton blank feeding machine, a magazine adapted to contain a stack of folded carton blanks, means for advancing the stack of blanks in the magazine, means for bowing one edge of the leading blank in said stack forward to develop a space between said one edge of said leading blank and the next succeeding blank, a detent movably mounted adjacent the magazine adjacent said one edge, means for moving the detent into said space, and mean engageable with said leading blank to propel the same away from the magazine while the next succeeding blank is immobilized by the detent.

15. In a carton blank feeding machine, a magazine adapted to contain a stack of folded carton blanks, means for advancing the stack of blanks in the magazine, two detents mounted at opposite sides of the magazine and projecting thereinto to arrest advance of said stack, one of said detents being movable to and from arresting position, means for retracting said movable detent, means for bowing the edge of the leading blank in the stack adjacent said movable detent forward to develop a space between said edge of said leading blank and the next succeeding blank, said detent retracting means being effective to return the movable detent to its arresting position to thrust it into said space subsequently to operation of said bowing means, and means engageable with the bowed leading blank to pull the same out of engagement with the other of said detents.

16. In a carton blank feeding machine, a magazine for receiving a stack of carton blanks, a first stack repressing means, a second stack repressing means, means for actuating said first and second stack repressing means into repressing relation with one of said carton blanks at an end of said stack, means for exerting a pull on said one carton blank in a direction away from the remainder of the stack and at a point spaced from one of said repressing means, means operative while said pull is being exerted for withdrawing the other of said repressing means to enable said pull exerting means to flex said one carton blank away from the next adjacent one of the carton blanks and for inserting said other repressing means into the space thus developed between said one carton blank and said next adjacent carton blank, and means operative subsequently to insertion of said other repressing means into said space for withdrawing said one repressing means from repressing relation with said one carton blank.

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