

Jan. 7, 1969

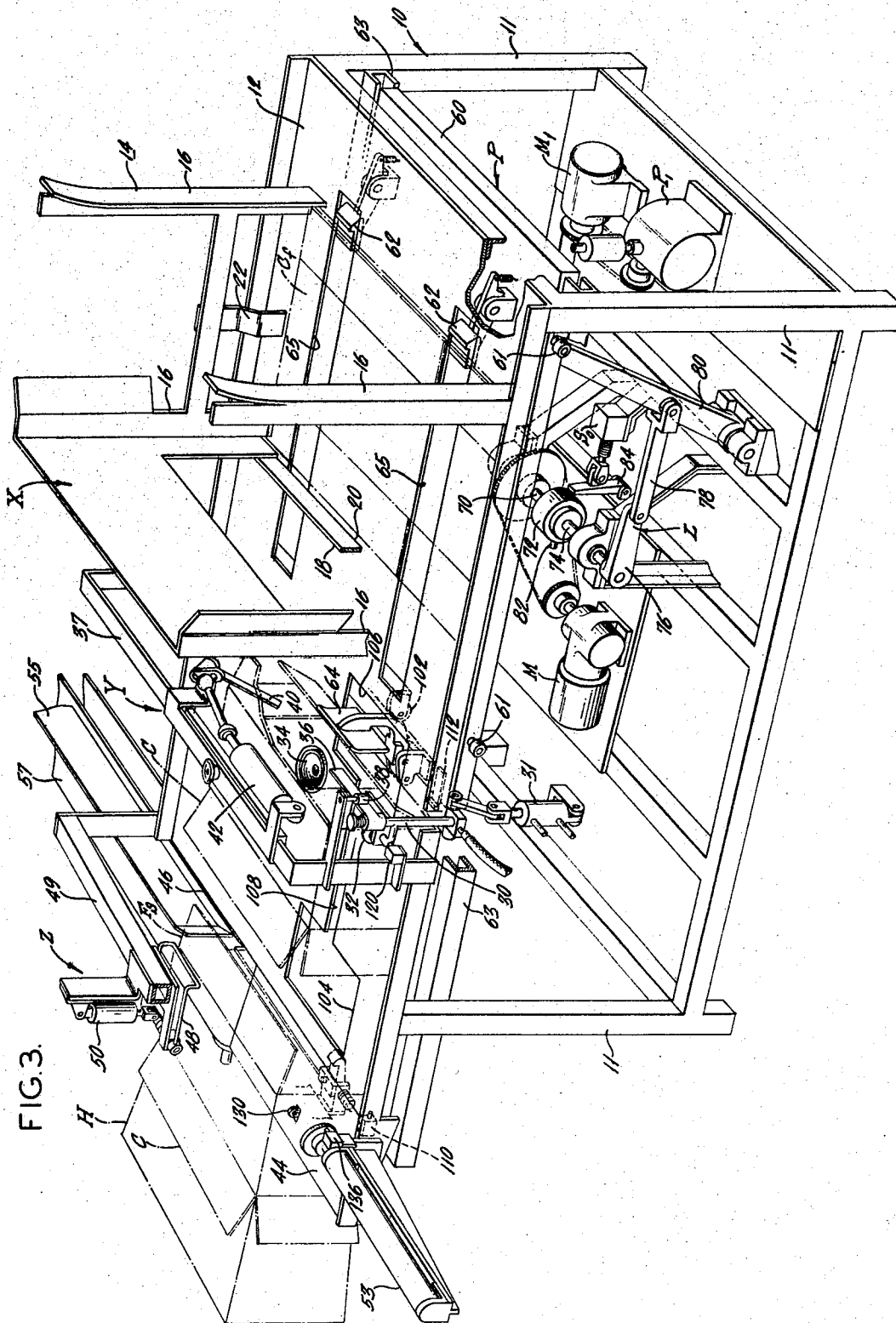
E. C. HUTCHINSON

3,420,036

CARTON HANDLING SYSTEM AND APPARATUS

Filed March 18, 1966

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FIG. 5.

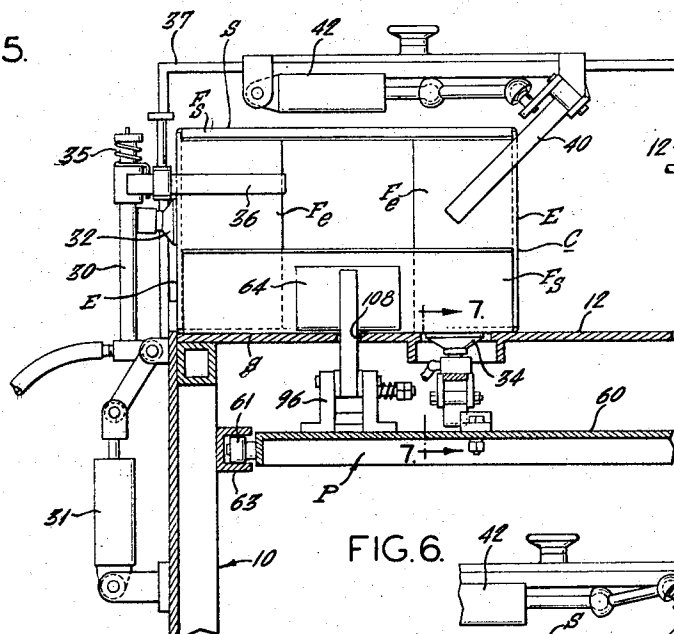


FIG. 7.

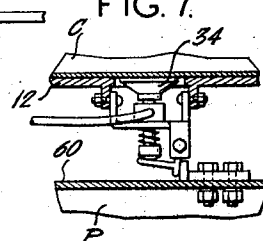


FIG. 6.

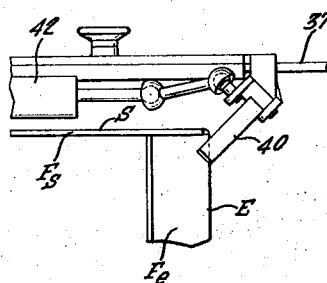
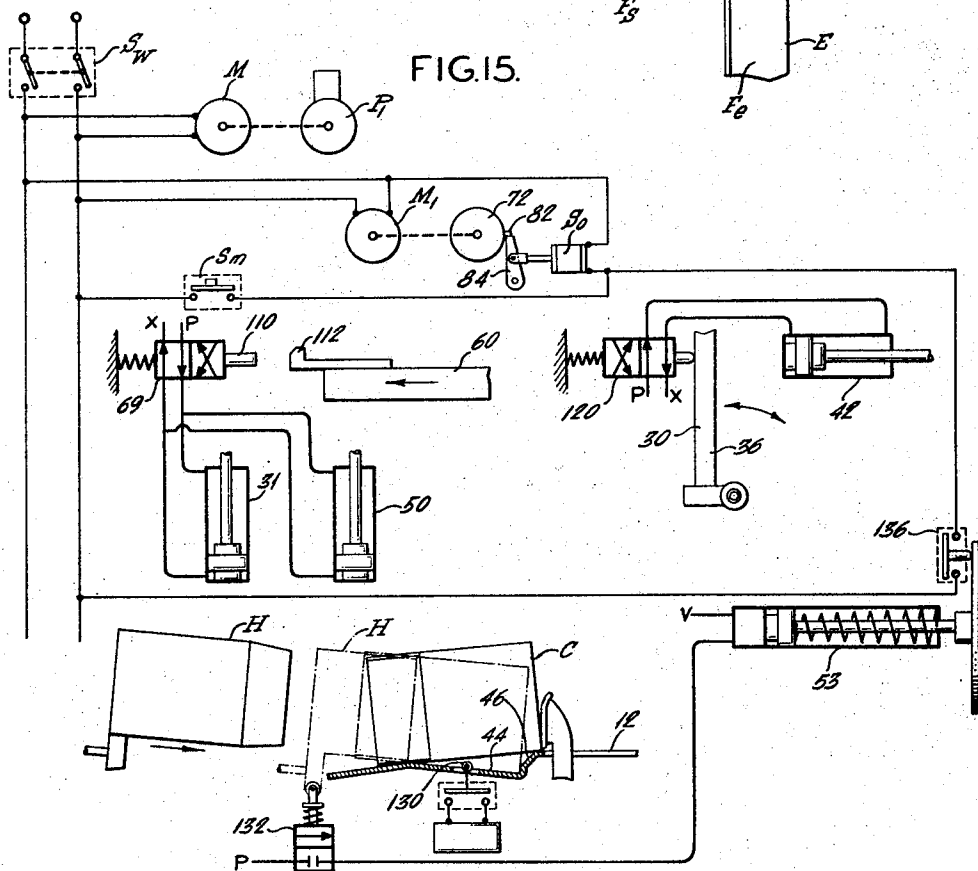


FIG.15.



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FIG. 8.

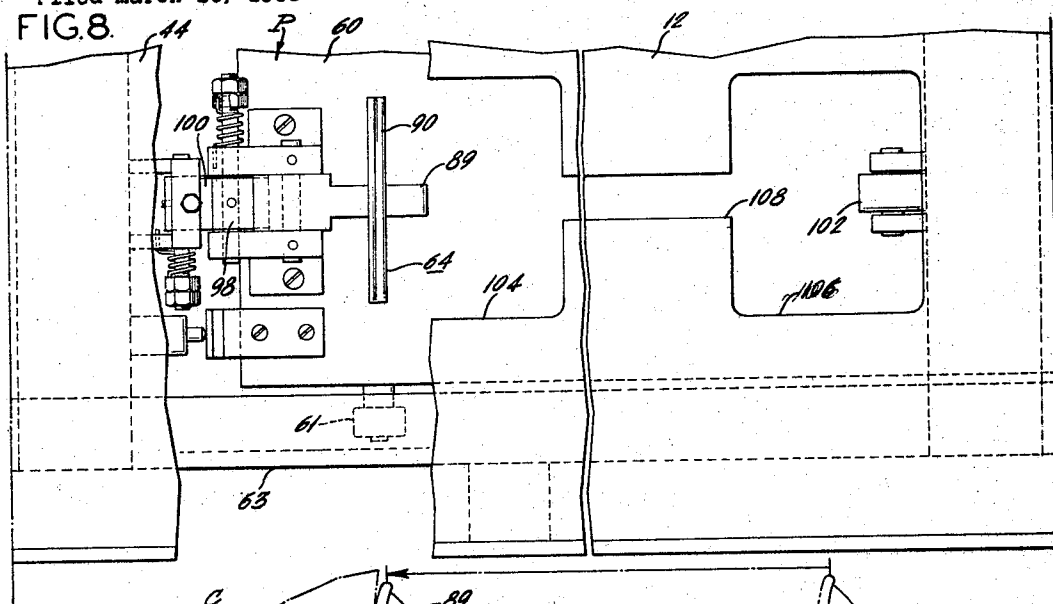


FIG. 9.

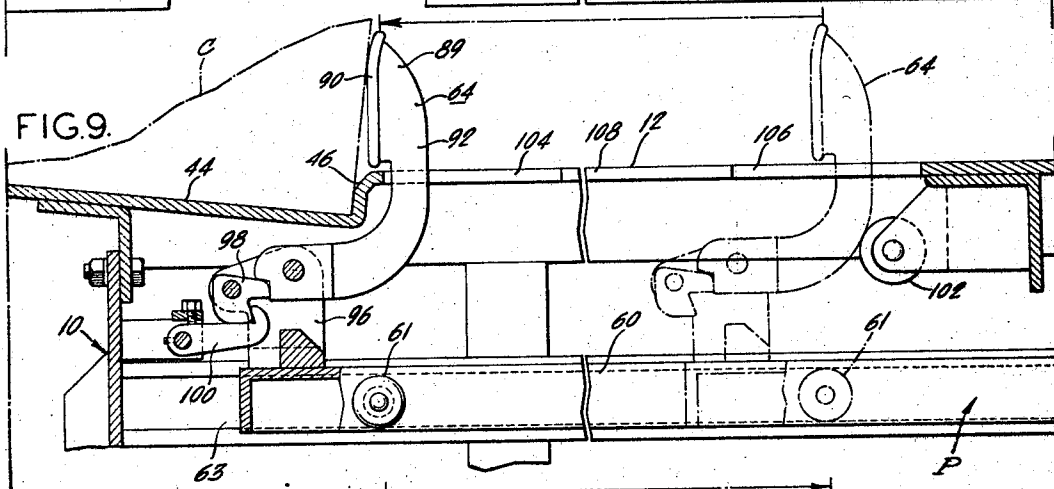
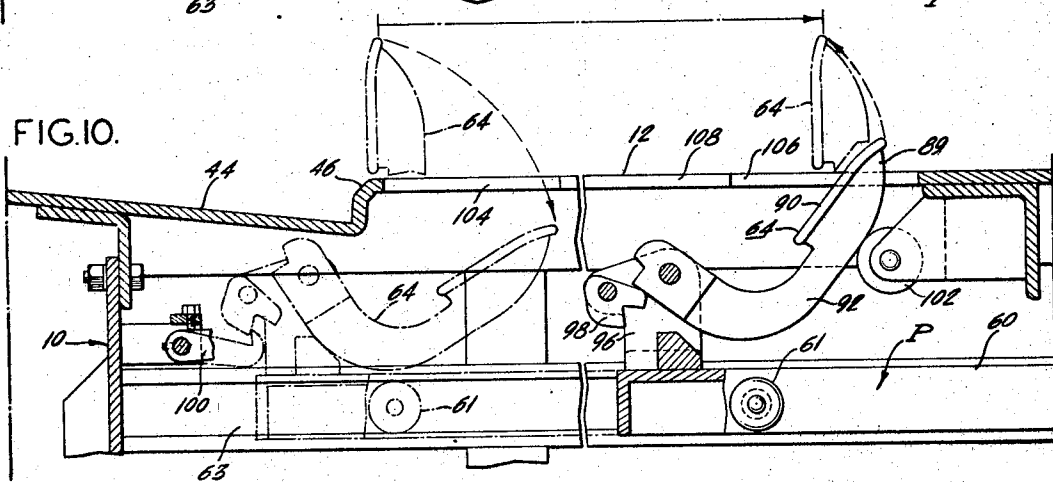


FIG. 10.



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CARTON HANDLING SYSTEM AND APPARATUS
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U.S. Cl. 53—186

6 Claims

Int. Cl. B31b 1/76

ABSTRACT OF THE DISCLOSURE

Carton handling apparatus to advance a carton from a stack of flat blanks, erect the carton and hold the carton at a loading station until it is loaded including a carton stacking station at one end of the machine to receive a stack of flat folded cartons, a carton erecting station at the center of the machine where the cartons are erected and a carton loading station at the other end of the machine where the cartons are loaded, together with reciprocal carton feed means operable during one stroke to advance a carton blank from the stacking station to the erecting station and simultaneously advance an erected carton from the erecting station to the loading station.

The present invention relates to an improved carton handling system and apparatus for converting cartons from a flat, folded form to an open form for reception of various articles such as canned goods.

In a typical carton handling apparatus, flat, folded cartons stacked one on top of another at a supply station are advanced by feed means one at a time to a forming station where the carton body is opened or squared away and the end forming flaps folded inwardly to close one end of the carton. The erected carton is then advanced to a packing station where it is filled, for example, with canned goods, by a conventional packer. The packed carton then is discharged from the packing station to be sealed and is ready for shipment.

An object of the present invention is to provide a novel carton handling system and apparatus wherein the cartons are advanced through the apparatus in a straight line path and are oriented so that the flaps of the carton extend in the direction of movement through the apparatus to minimize friction and whereby the carton feed means engages the end forming flaps thereby to minimize the possibility of damage to the carton body.

Another object of the present invention is to provide a carton handling apparatus having novel features of construction and arrangement including a novel drive arrangement for reciprocating the carton feed means between limit positions whereby the feed means during reciprocating movement in a straight line path effects synchronized actuation of various other mechanisms of the apparatus to erect and fold various flaps of the carton to fill the cartons at the packing station and to discharge the filled cartons from the packing station.

A still further object of the present invention is to provide a carton handling apparatus wherein the forward and backward stroke of the reciprocating feed means is fully utilized and wherein the feed means is actuated by a novel drive arrangement operable to effect magnified and uniformly decelerated end velocities of the feed means as it approaches opposite limit positions to provide efficient high speed advancing, forming and feeding operations.

Still another object of the present invention is to provide a carton handling apparatus including a plurality of coordinated mechanisms to simultaneously form cartons and fold certain flaps thereof without the need for any secondary internal carton or flap control fingers whereby

the carton flaps are progressively and synchronously closed while the carton is being formed without flap interference and which will handle and form cartons properly even when handling out-of-tolerance cartons.

Still a further object of the present invention is to provide a novel carton handling apparatus which can accommodate various size cartons and which is of comparatively simplified, compact construction whereby it may be manufactured economically and which is entirely efficient and effective in operation and use.

A still further object of the present invention is to provide a novel carton handling apparatus which may accommodate cartons of various sizes and is adapted for use with various commercially available carton packing devices.

These and other objects of a carton handling system and apparatus in accordance with the present invention and the various features and details of the operation and construction thereof are hereinafter more fully set forth and described with references to the accompanying drawings, in which:

FIGS. 1 and 2 are side elevational and plan views, respectively, of a carton handling apparatus constructed in accordance with the present invention;

FIG. 3 is a perspective view of the carton handling apparatus of the present invention;

FIG. 4 is an enlarged sectional view taken on lines 4—4 of FIG. 1;

FIG. 5 is a fragmentary end elevational view of the carton forming station of the apparatus;

FIG. 6 is a fragmentary view of one of the end closing flap mechanisms;

FIG. 7 is an enlarged fragmentary sectional view taken along line 7—7 of FIG. 5;

FIG. 8 is an enlarged fragmentary plan view showing the carton feed assembly in the forwardmost limit position;

FIGS. 9 and 10 are enlarged fragmentary views partly in section showing the carton feed assembly in various positions;

FIGS. 11—14, inclusive, are schematic views illustrating stepwise movement of a carton through the apparatus of the present invention; and

FIG. 15 is a schematic view of the electrical and pneumatic circuit for various elements of the apparatus.

The apparatus of the present invention is adapted for handling conventional cartons C of the type comprising a body portion B consisting of side and end forming panels S and E, respectively, hingedly connected along fold or score lines and a plurality of closure flaps F which project from and are coextensive with opposite side edges of each of the side and end forming panels and which are adapted to be folded inwardly along fold lines to close the top and bottom of the carton.

Considering now broadly the carton handling apparatus of the present invention in terms of function and with respect to the schematic views of FIGS. 11—14, inclusive, illustrating sequentially the steps in formation of a carton, folded or knocked down cartons C, stacked one on top of another at a supply station X are advanced by feed means P one at a time to a forming station Y where the carton C is opened or squared away so that the side and end forming panels S and E are at right angles to each other. (See FIGS. 11 and 12.) At the forming station Y, the closure flaps F at one end of the carton are folded in to form the bottom of the carton. The partially erected carton is then advanced to a packing station Z where canned goods or the like are deposited into the open end of the carton by a conventional packer H (see FIGS. 13 and 14). The filled carton C then is

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discharged from the packing station Z to make room for another carton for filling. As illustrated, the cartons are advanced through the apparatus along a straight line path and the feed means for advancing the cartons engage the end forming flaps F to preclude damage to the carton body.

Considering now the details and arrangement of the carton handling apparatus, the apparatus comprises a main frame structure 10 including leg support members 11 which support an elongated generally rectangular platen 12 providing a support surface for the carton C during movement through the apparatus. The carton supply station X is located at one end of the apparatus and is defined, in the present instance, by a rack 14 formed by upstanding angle members 16 projecting upwardly from the platen 12 and arranged at four corners of a rectangle. The free upper ends of the angle members 16 are flared outwardly to facilitate insertion of folded carton C_f in the rectangular area defined by the rack 14 while the front leg of the two forward members 16 are cut away to permit forward passage of the lowermost carton in the stack. An adjustable crosspiece 18 extends between the forwardmost angle members 16 transversely of the platen 12 and is spaced from the top surface thereof to provide a slotted opening 20 of sufficient height to permit a single folded carton C to be discharged there-through. The crosspiece 18 is selectively adjustable so that the size of the slotted opening 20 may be varied to accommodate cartons of various thicknesses. A spring guide 22 at one side of the rack 14 urges the cartons at the lower portion of the stack into a predetermined position on the platen 12 as they move toward the bottom of the rack 14.

Feed means generally designated P advance a flat carton C_f from the supply station X to the forming station Y where the flat carton C_f is adapted to be partially erected. To this end when a flat carton C_f is positioned at the forming station Y, a forming arm 30 pivotally mounted to a side rail of the main frame structure 10 is pivoted inwardly by a piston-cylinder actuator 31 as shown in FIG. 4 whereby a suction cup 32 mounted at the free end of the arm 30 engages an end forming panel E of the carton and presses a side forming panel S confronting the platen 12 against a spring biased vacuum cup 34 which serves to hold the carton in place on the platen 12. As the forming arm 30 pivots upwardly to the position shown in broken lines in FIG. 4, the side and end forming panels S and E of the carton C are squared away. The forming arm 30 mounts a rotatable flap closing arm 36 adjacent its free end which is normally biased by a coil spring 35 to extend in a direction parallel to the direction of movement of cartons through the apparatus and which, when the forming arm 30 is raised, engages a stationary post 38 mounted on an inverted U-shaped bracket 37 overlying the platen whereby the arm 36 is pivoted inwardly to close one of the end forming flaps F_e as illustrated. The opposite end forming flap F_e is also folded inwardly by means of a flap folding arm 40 actuated by a piston-cylinder actuator 42 mounted on the inverted U-shaped bracket 37. The folding arm assembly 40 is adjustably mounted on the bracket 37 for movement transversely of the path of travel of the cartons to handle cartons of various sizes.

The partially erected carton at the forming station is advanced by the feed means P to an inclined ramp 44 at the packing station, which ramp 44 is slightly lower than the platen 12 to define a shoulder or ledge 46 which maintains the lower side closing flap F_s closed and prevents rearward movement of the carton during the filling operation. At the packing station Z, another flap folding arm 48 mounted on an inverted U-shaped bracket 49 is pivoted downwardly by a piston-cylinder actuator 50 to close the upper side closing flap F_s thereby completely closing one end of the carton. A conventional case packer H ejects canned goods or the like into the open end of

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the carton and after the carton is filled, a piston-cylinder ejector 53 moves the filled carton away from the packing station Z onto a conventional apron conveyor 57 to make room for another carton to be filled. A guide rail 55 may be provided adjacent one side of the conveyor 57 to maintain the side and end flaps closed as the filled carton moves along the conveyor. The apron conveyor will carry the carton to conventional glueing or stapling mechanism where the filled carton will be sealed.

In accordance with the present invention, the feed means P for advancing the cartons through the apparatus is characterized by novel features of construction and arrangement to provide a reliable, compact, efficient and high speed carton handling operation. The feed means includes a slide bed 60 mounted below the platen 12 and adapted for reciprocating movement longitudinally of the apparatus and to this end carries guide rollers 61 along its opposite side edges which engage in confronting longitudinally extending U-shaped channels 63 mounted on opposite sides of the main frame structure 10. The slide bed 60 mounts adjacent its rear end a pair of spring biased feed fingers 62 which extend through transversely spaced, elongated openings 65 in the platen 12 and mounts at its forward end an advance arm assembly 64.

The slide bed 60 is adapted for reciprocating movement lengthwise of the apparatus between a rearward limit position (see FIG. 13) and a forward limit position (see FIG. 14). During the advance stroke or actuation from the rearward limit position to the forward limit position the fingers 62 strip a folded carton C_f from the stack and position it at the forming station Y and simultaneously the advance arm assembly 64 moves an erected carton from the forming station Y to the packing station Z. It is noted that on the retract stroke the advance arm assembly 64 is lowered below the platen 12 to clear a carton at the supply station Y and the spring biased fingers 62 are urged downwardly when they engage the stack of cartons at the supply station to clear the same.

In accordance with the present invention drive means is provided for cycling the slide bed 60 between limit positions in a manner to provide uniformly decelerated end velocities as the slide bed 60 approaches opposite limit positions. By this arrangement, the slide bed 60 gradually is brought up to speed as a folded carton is moved out of the stack by the feed fingers 62 precluding abrupt engagement of the carton and possible damage thereto, and at the end of the advance stroke the slide bed is gradually slowed down to preclude pushing the erected carton beyond the packing station. To this end, the slide bed feed means includes a prime mover such as a motor M which drives through suitable transmission means the drive member 70 of a clutch 72 assembly. The clutch assembly includes a driven member 74 connected to the slide bed 60 by a linkage mechanism L. The driven member 74 of the clutch 72 is normally engaged by a pawl 84 to prevent rotation of the driven member 74 and actuation of the slide bed 60. The pawl 84 is controlled by a solenoid S₀ which when deenergized positions the pawl 84 in the path of a lug 82 on the clutch 72 in which position the slide bed 60 is at rest at the forward limit position. Upon energization of the solenoid S₀, the pawl 84 disengages the lug 82 to permit one revolution of the clutch 72. One complete revolution of the clutch 72 effects through the driven member 74 and linkage mechanism L actuation of the slide bed 60 through one complete cycle from the forward limit position to its rear limit position and back to its forward limit position.

The linkage mechanism L comprises a drive link 76 and a follower link 78 connected to a crank arm 80 pivotally mounted at its lower terminal end to the frame structure and at its upper terminal end to the sliding bed 60. It is noted that by this linkage arrangement the slide bed 60 uniformly decelerates as it approaches and leaves opposite limit positions and during the central part of the stroke achieves a magnified velocity to provide for high speed operation. Thus, the fingers 62 do not abruptly en-

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gage the carton at the beginning of the advance stroke thereby precluding damage to the end flaps of the carton as they are engaged to advance cartons one at a time from the rack 14 by the feed fingers 62. Furthermore, relatively slow movement of the fingers 62 adjacent opposite limit positions insures engagement of a carton C to move it from the supply station X and also insures proper positioning of the collapsed carton C at the forming station Y. The magnifying linkage mechanism L provides these advantages, while still effecting a desired high speed movement of the slide bed 60 during the intermediate portion of the advance and retract strokes to facilitate high speed movement of cartons through the apparatus.

The structural details of the advance arm assembly 64 are shown in FIGS. 8-10, inclusive. As illustrated, the assembly includes a pusher 89 having an enlarged head 90 mounted at one end of a C-shaped support arm 92, the end of the support arm 92 opposite the head 90 being pivotally mounted in a yokelike bracket 96 mounted on the forward end of the slide bed 60. The pusher 89 is maintained in a raised position shown in FIG. 9 by means of a spring biased cam member 98 pivotally mounted between the arms of the yoke 96. The cam 98 is adapted to engage a spring biased latch 100 pivotally mounted in the forward portion of the frame 10 when the slide bed is in its forward limit position. The latch 100 rotates the cam 98 in a clockwise direction when the slide bed 60 is retracted whereby the pusher 89 is released and pivots downwardly by its own weight to a lowered position shown in broken lines in FIG. 10. At the end of the retract stroke of the slide bed 60, the pusher 89 engages a roller 102 fixed to the platen 12 which pivots the pusher 89 to a raised position, the cam 98 engaging the pusher 89 to maintain it in the raised position (see FIG. 9 by means of a spring biased cam member 98 during movement of the slide bed 60 between limit positions, enlarged openings 104 and 106 are provided in the platen 12 which are connected by a channel opening 108.

An important feature of the present invention is the provision of means for effecting a synchronized actuation of the various elements of the apparatus providing for continuous high speed handling of cartons therethrough in the manner described above. This is best exemplified by considering the complete operational cycle of operation of the apparatus. The slide bed 60 is normally disposed in the forward limit position. When it is desired to start operation, the operator closes a main control switch S_w which as shown in FIG. 15 effects operation of motors M and M_1 to condition clutch 72 for operation and drive air pump P_1 for the pneumatic piston-cylinder actuators. A manual control S_m is provided which may be temporarily closed by the machine operator to energize solenoid S_0 to release the pawl 84 whereby one revolution of the clutch 72 is permitted. Accordingly, upon actuation of clutch 72 linkage mechanism L retracts the slide bed 60 to the rear limit position whereby the fingers 62 engage a folded carton C_f in the rack 14 and advance the folded carton C_f to the carton forming station Y as shown in FIG. 11. As the slide bed 60 reverses and moves to the forward limit position, a finger 112 on the forward end of the slide bed 60 engages the plunger of a control valve 110 for the piston-cylinder actuators 31 and 50 for the flap folding arms 30 and 48, respectively. Upon engagement of the valve 110, the forming arm 30 is pivoted inwardly to engage the end forming panel E of the carton and press the side forming panel S against the vacuum cup 34. This completes the first stage of operation.

The manual control switch S_m is again depressed by the operator to again energize the solenoid S_0 and recycle the slide bed 60. As the slide bed 60 moves rearwardly from the forward limit position, the finger 112 disengages valve 110 for the piston-cylinder actuators 31 and 50 whereby the arm 30 is raised to its normal posi-

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tion as shown in FIG. 12. As the arm 30 is raised, it engages the plunger of a valve 120 for the piston-cylinder actuator 42 for the side flap folding arm 40 to pivot the same to close the upper side flap F_s as illustrated. Simultaneously, the pusher cam 98 disengages the latch 100 whereby the pusher 89 pivots downwardly to pass under the platen 12 during the retract stroke of the slide bed 60. When the slide bed 60 is fully retracted as shown in FIG. 13, the pusher 89 is raised to close the bottom side forming flap F_b of the carton at the forming station Y as shown in FIG. 13. Now as the slide bed 60 returns, the fingers 62 engage the bottom carton C_b in the stack and advance it to the forming station Y and simultaneously, the partially erected carton C at the forming station Y is advanced by the pusher 89 to the packing station Z. As noted previously, the linkage mechanism L gradually slows the slide bed 60 as it approaches opposite limit positions to preclude damage to the carton and to properly position the carton at the forming and packing stations. When the slide bed 60 is in the forward limit position, the valve 110 is again actuated by the finger 112 to lower the forming arm 30 to engage a carton at the forming station Y and also pivot the flap forming arm 48 to close the upper side flap F_s of a carton at the packing station Z as shown in FIG. 14. The partially erected carton on the inclined ramp engages a switch 130 to effect actuation of the case packer H (see FIG. 15). As the case packer H enters the carton to deposit canned goods therein, it engages a spring biased valve 132 to cycle the ejector 53 to move a filled carton C out of the case packing station Z onto the conveyor. During operation of the ejector 53, normally open switch 136 closes, to energize the solenoid S_0 thereby to recycle the slide bed 60. From this point on complete operation of the apparatus is automatic, the cycle terminating when the last carton has been discharged from the packing station Z.

From the foregoing, it may be seen that the present invention provides an apparatus for handling cartons which is characterized by novel features of construction and arrangement providing a high speed operation in a compact apparatus which is of comparatively simplified construction. Some of the features of the apparatus and system of the present invention include movement of the cartons through the apparatus in a predetermined straight line path wherein the carton flaps are oriented in a direction parallel to the line of flow to minimize sliding friction and also facilitate ejection of a single carton at a time from the rack 14 without the need for stack separating devices. Further, by this arrangement, the carton feed means engages flaps of the carton thereby precluding possible damage to the carton body. Further, operation of all of the various elements of the apparatus are synchronized to provide a continuous operation thereby requiring a minimum of maintenance or supervision. The drive means effecting decelerated end velocities of the slide bed adjacent opposite limit positions provides the advantages noted above in a high speed operation.

While a particular embodiment of the present invention has been illustrated and described herein, it is not intended to limit the invention and changes and modifications may be made therein within the scope of the following claims.

I claim:

1. Carton handling apparatus for erecting cartons having top and bottom flaps from the flat folded form and closing the bottom flaps of the carton for the reception of a product, comprising: a carton stacking station at one end of said apparatus to receive and support a stack of flat folded cartons with the top flaps of the cartons extending in a direction away from said one end of said apparatus, a carton loading station at the opposite end of said apparatus from said one end, a carton erecting station on said apparatus intermediate said stacking and loading stations, means at said carton erecting station to engage and erect cartons and close the bottom end

flaps of the erected carton, a shoulder provided at said carton loading station facing in the direction of movement of the erected carton behind which said erected carton is engaged when it reaches said loading station, said shoulder operable to hold said erected carton in position during loading and maintain the bottom end flaps closed, carton feed means mounted for reciprocal movement longitudinally of said apparatus from said one end thereof to said other end operable to engage a carton blank at said carton stacking station and advance the same in the direction of the top end flaps thereof to said carton erecting station and simultaneously therewith engage an erected carton at said carton erecting station and advance the same forwardly in the direction of the top end flaps thereof to said carton loading station, and drive means for said carton feed means operable during one complete cycle of operation to retract said carton feed means from said other end of said apparatus to said one end of said apparatus and immediately thereafter advance said carton feed means from said one end of said apparatus to said other end of said apparatus.

2. Apparatus in accordance with claim 1 wherein control means is provided including a switch member at said carton loading station engageable by an erected carton after the carton is engaged by said shoulder to initiate loading of said carton and initiate discharge of a carton from the loading station after the same is loaded.

3. Apparatus in accordance with claim 2 wherein second control means are provided operable upon discharge of a loaded carton from said carton loading station to actuate the drive means for said carton feed means and cause said carton feed means to be retracted toward said

one end of said apparatus into engagement with a carton blank and an erected carton and thereafter advance said carton blank and erected carton.

4. Apparatus in accordance with claim 3 wherein said carton feed means includes a first member operable to engage and advance a carton blank and a second member operable to engage and advance an erected carton, and means to withdraw said first and second members away from the path of travel of said carton blank and erected carton during retraction of said carton feed means toward said one end of said apparatus.

5. Apparatus in accordance with claim 3 wherein said drive means causes said carton feed means to move slowly at the beginning and end of each forward stroke and more rapidly at the center of each forward stroke.

6. Apparatus in accordance with claim 5 wherein means are provided at said carton erecting station to erect the carton and close the bottom end flaps of the carton, said means at the carton erecting station being actuatable to erect the carton and close said flaps during retraction of said carton feed means towards said one end of said apparatus.

References Cited

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TRAVIS S. McGEHEE, *Primary Examiner.*

E. F. DESMOND, *Assistant Examiner.*

U.S. Cl. X.R.

53—374; 93—53

UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,420,036

January 7, 1969

Edmund C. Hutchison, deceased,
by Elizabeth B. Hutchison, executrix

It is certified that error appears in the above identified
patent and that said Letters Patent are hereby corrected as
shown below:

Column 5, line 14, cancel "details", second occurrence; line 22, "or"
should read -- of --; line 35, cancel "by means of a spring biased cam member
98" and insert --). To permit raising and lowering of the pusher 89 --.

Signed and sealed this 17th day of March 1970.

(SEAL)

Attest:

Edward M. Fletcher, Jr.

Attesting Officer

WILLIAM E. SCHUYLER, JR.

Commissioner of Patents