

July 5, 1966

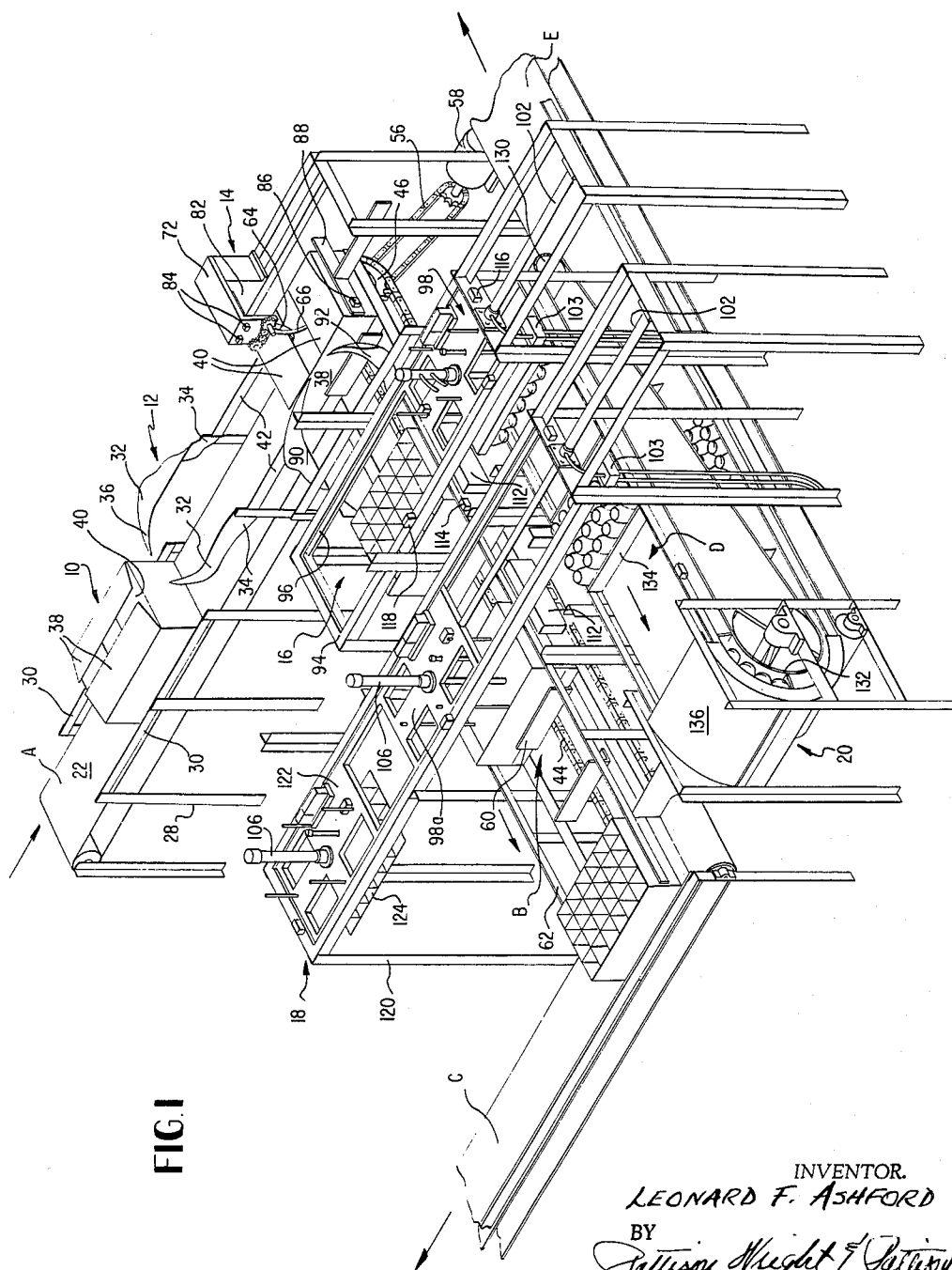
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3,258,808

CARTON AND JAR HANDLING APPARATUS

Filed Nov. 21, 1963

5 Sheets-Sheet 1



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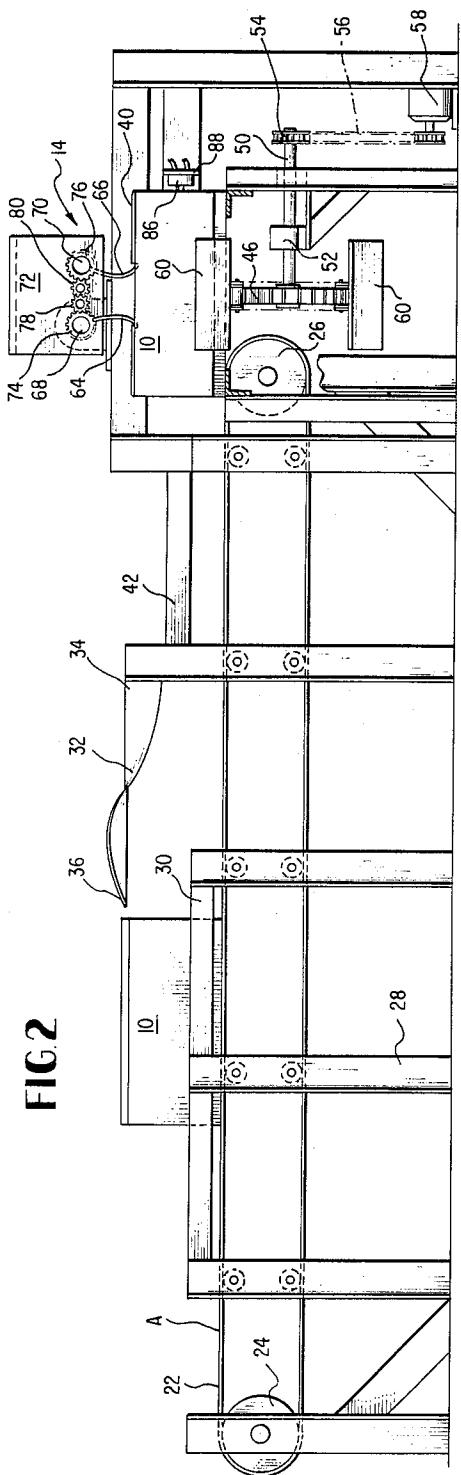


FIG 2

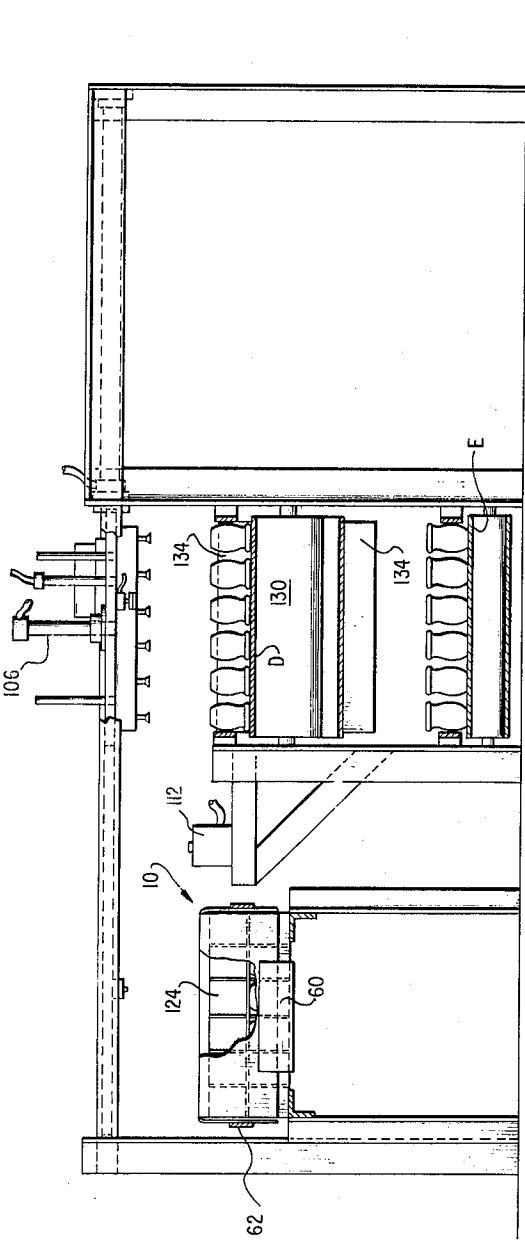


FIG 3

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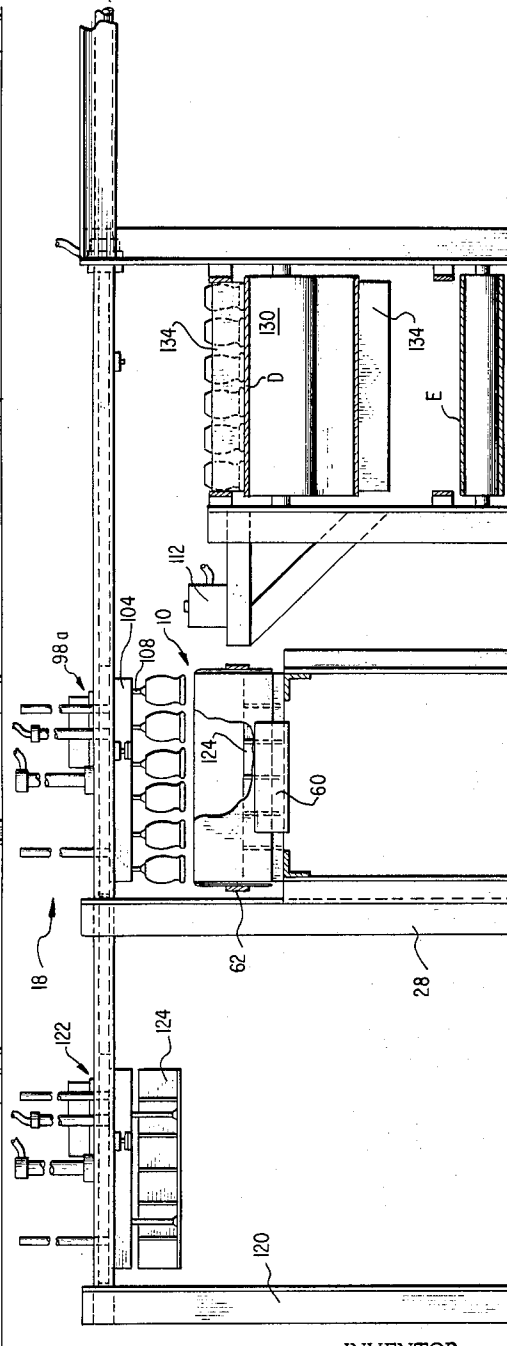
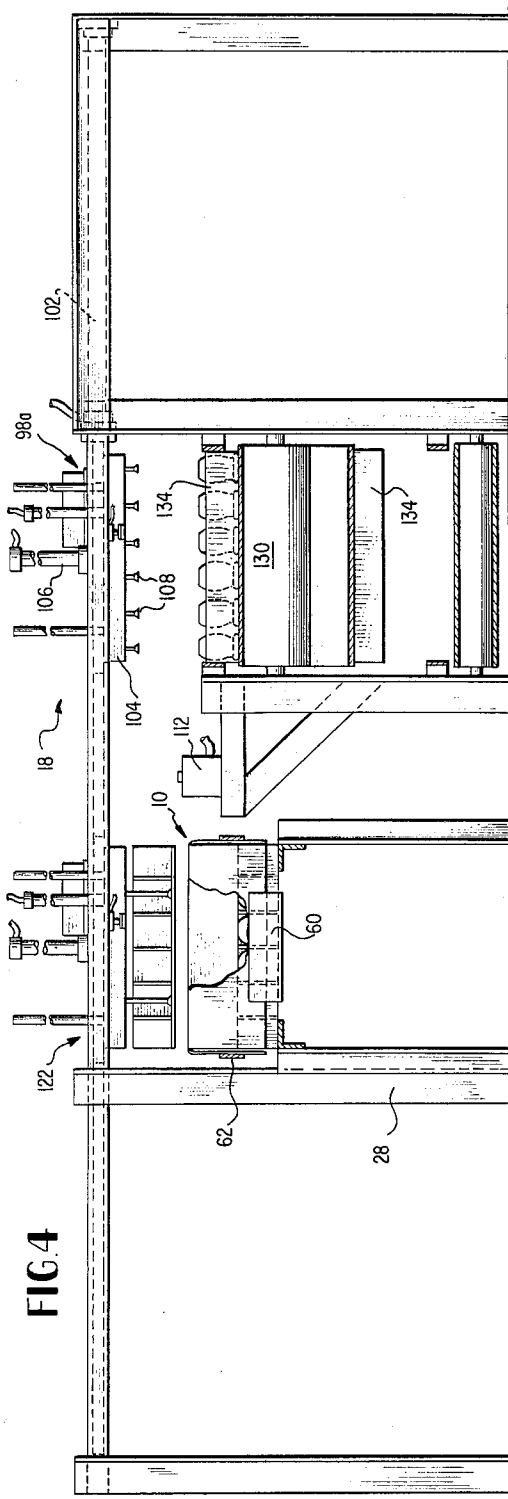
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CARTON AND JAR HANDLING APPARATUS

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5 Sheets-Sheet 3



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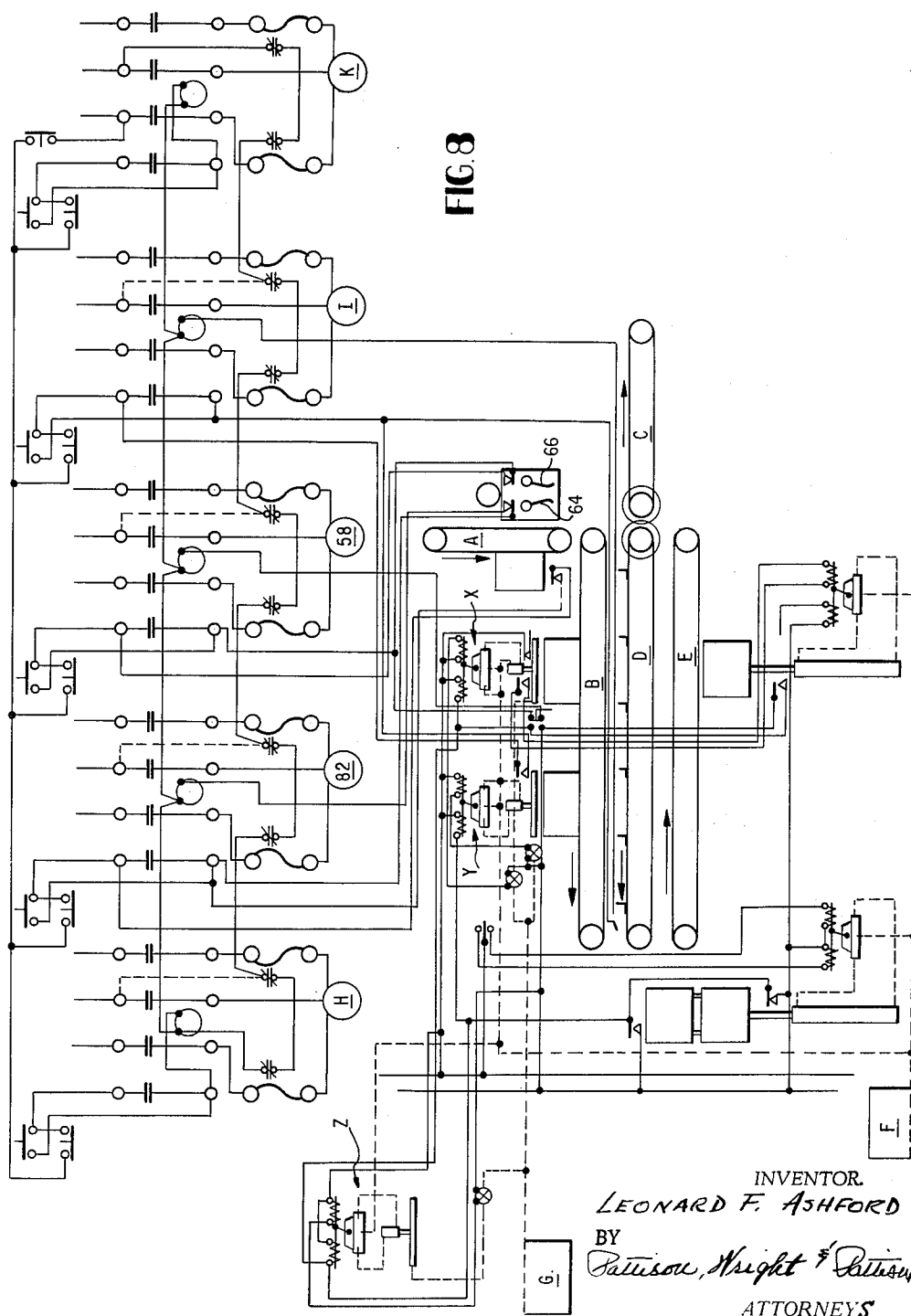
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CARTON AND JAR HANDLING APPARATUS

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CARTON AND JAR HANDLING APPARATUS

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6 Claims. (Cl. 15—304)

The present invention relates generally to article handling apparatus and more particularly and specifically to automatic carton and bottle handling equipment.

In modern food processing and packing plants, glass bottles and jars are received from the manufacturer packed in unsealed fiberboard cartons, bottom end up and without caps or closures thereon. The bottles and jars are packed within cellular separators in the carton and are in multiple layers, each separated from the other by horizontal divider boards.

It has been the practice in modern processing plants to use hand labor to remove the glass jars and bottles from the cartons in which they are received, invert them by hand, and place them on conveyors entering into the jar filling machinery.

It is a primary object of the present invention to provide automatic machinery for performing sequential steps in a process which have heretofore been handled manually.

It is another object of the present invention to provide automated equipment adapted to receive therein fiberboard cartons containing glass bottles and jars, to open said cartons, remove and clean said jars, orient said jars and deliver the same to jar filling machinery while simultaneously preparing and delivering the cartons to a carton filling station in the food processing plant.

Another object of the present invention resides in the provision of automated machinery of simple and inexpensive design, construction, maintenance and operation which will effectively and efficiently handle and process cartons and jars as aforesaid.

Still a further object of the present invention resides in the provision of article handling machinery as described which will operate to insure positive, automatic function furnishing steady, uniform flow of articles from the loading to the discharge sequence of the automated equipment.

A still further object of the present invention resides in the provision of automated equipment for the unloading, cleaning and orienting of glass jars and bottles which does in fact clean the bottles removing therefrom residual dust, dirt and the like prior to orienting the same for delivery to filling machinery.

Still further objects and advantages of the present invention will become more readily apparent to one skilled in the art when the following general statement and description are read in the light of the accompanying drawings in which:

FIG. 1 is a perspective view of the machine incorporating the inventive concept hereof;

FIG. 2 is a vertical section taken on line 2—2, FIG. 1;

FIG. 3 is a vertical section taken on line 3—3, FIG. 1;

FIG. 4 is a vertical section taken on line 4—4, FIG. 1, in one position of operation;

FIG. 6 is a side elevation of the machine illustrated in FIG. 1;

FIG. 7 is a vertical section taken on line 7—7, FIG. 1, with the machine in a different stage of operation than that shown in FIG. 6; and

FIG. 8 is a diagrammatic plan view of the electrical circuits constituting the automatic machine controls.

The nature of the present invention may be stated in general terms as relating to a machine for handling paperboard cartons and glass jars initially contained therein, said machine including mechanical components and movements actuated by automatic electrical controls, said ma-

chine designed to receive and open paperboard cartons, remove, clean and orient glass jars initially contained in said cartons, deliver said glass jars to jar filling stations, and deliver said paperboard cartons to carton loading stations.

With initial reference to FIG. 1 of the accompanying drawings, it is seen that the automatic article handling machine constituting the present invention consists of a plurality of frame members variously supporting conveyor belts, carton opening components, glass jar lifting and cleaning components, glass jar orienting components, and plural sequentially positioned and actuated electrical controls for continuous automatic operation of the cooperative component elements of the machine.

With continued reference to FIG. 1 of the drawings, it is seen generally that a carton 10 containing glass jars is introduced onto a conveyor A by which it is carried through the carton flap opening mechanisms generally designated at 12 and 14. The carton is then introduced onto a horizontal, perpendicularly extending conveyor B which carries it into the first jar removing station, generally designated 16, where the upper layer of glass jars is removed from the carton. Conveyor B then carries the carton to the station generally designated 18 where the upper layer of cellular dividers is removed from the carton, the second or lower layer of jars is removed from the carton and the upper cellular layer of partitions is repositioned in the carton.

Conveyor B then transports the carton to the carton discharge conveyor C which removes the cartons from the equipment and delivers them to the carton loading area of the processing plant.

Cooperatively with the function of the components hereinbefore described apparatus at the first jar removal station 16 cleans the jars and then deposits them upon a conveyor D moving in parallel with conveyor B. Likewise associated with the station generally designated 18 apparatus cleans the lower layer of jars removed by that station and deposits them on conveyor D. Conveyor D is provided with spacing components which hold the jars in their oriented position in which they were removed from the carton and carries them through an inverting station, generally designated 20, thereafter depositing them in their inverted positions on a conveyor E which delivers the oriented jars to typical bottle and jar filling apparatus within the processing plant.

Associated with the various conveyors and work station components are a series of cooperatively integrated electrical switches and controls which function to produce a sequential timed operation of the components to produce a uniform flow of cartons and jars through the machine.

In more particular detail, and with further reference to the accompanying drawings, the conveyor A consists of an endless flexible belt 22 trained about two remote end rollers 24 and 26 which are freely journaled in bearings (not shown) supported by an elongated vertical frame 28. Belt 22 is continuously driven by a suitable motor H (FIG. 8) supported on the frame through any conventional belt or chain drive medium. Side guide rails 30 extend longitudinally on each side of belt 22 to guide cartons 10 in proper alignment therealong.

Carton flap opening mechanism 12, located intermediate the length of conveyor A, consists of a pair of plow elements 32 located on opposite sides of the belt 22 and supported from the frame 28. Each plow element 32 consists of an elongated prong twisted through 180° longitudinally of its length and curved in a horizontal direction from end to end. The base end 34 of each plow prong is secured to one portion of the side guide rail structure and extends toward the entry end of the belt

22 curving inwardly above the belt to present a tip end 36 in the path of approaching cartons at an elevation above the plane of belt 22 corresponding with the vertical height of the cartons 10 introduced onto the belt.

As a carton 10, being of a type having side folded flaps 38, overlying end folded flaps 40, reaches plow elements 32, the leading tip ends 36 of the plow elements engage under the side infolded flaps 38 of the carton, and continued advance of the carton on belt 22 causes flaps 38 to follow the reversed curvilinear configuration of the plow by which they are forced upwardly, outwardly, downwardly, and thence inwardly adjacent the outside of the side walls of the carton. Immediately following the plow elements along the length of the belt additional side guides 42 on the frame 28 engage and retain the infolded side flaps in position against the side walls of the carton.

The discharge end of belt 22 perpendicularly abuts the receiving or loading end of conveyor B which consists of an endless sprocket chain 44 operating horizontally between and about spaced sprockets 46 and 48 rotatably supported on an extension of frame 28. Sprocket 46 carries an extended shaft 50 journaled in a bearing 52 supported on the frame and supporting a second sprocket 54 on the extended end thereof which is connected through a drive chain 56 to a driving motor 58. Sprocket chain 44 carries L-shaped pusher bars 60 fixed transversely thereon at distances spaced longitudinally therealong equal to the transverse dimension of a carton 10. Side guide rails 62 parallel chain 44 above the plane of the top pass thereof at transversely spaced distances equaling the longitudinal dimension of a carton 10.

Located above and in cooperative relationship with that end of conveyor B with which conveyor A abuts is the end flap opening mechanism 14, best seen in FIGS. 1 and 2 of the drawings. End flap opening mechanism 14 consists of a pair of arcuate fingers 64, 66, secured one each on two parallel, horizontal shafts 68, 70, respectively, which are rotatably mounted on and in projection from a housing 72 secured on the frame above and adjacent the abutment of conveyors A and B. Each of the fingers 64, 66, presents an extended free end having a hook-like configuration, and the free ends of the fingers are disposed in opposite directions transversely of conveyor B and longitudinally of conveyor A. Each shaft 68, 70, carries a gear 74, 76, respectively, and these gears are operatively interconnected by a pair of intermediate idler gears 78, 80, engaged therewith and with each other.

A motor 82 is mounted in housing 72 and its driven shaft is an extension of shaft 68 mounting arcuate finger 64 and gear 74. A pair of limit switches 84 are mounted on housing 72 one in the path of rotation of each of the fingers 64, 66, and said switches are wired into the circuit of motor 82 as will be hereinafter disclosed.

A pressure switch 86 is supported on a bumper bar 88 fixed to the frame adjacent conveyor B in alignment with conveyor A and on the remote side of conveyor B from the abutment of the two conveyors. Switch 86 is also wired into the circuit of motor 82 as will be hereinafter disclosed.

When a carton 10 is moved by conveyor A onto conveyor B, the leading end of the carton will trip pressure switch 86 actuating motor 82 causing opposite rotation of fingers 64, 66, from their normally upwardly disposed positions of rest. The fingers will move downwardly, inwardly, and then upwardly and outwardly through 360°. In the course of their rotation each finger will engage under the inner free end of one of the end flaps 40 of the carton 10 lifting and turning the flap upwardly and outwardly from above the carton until each arm engages one of the limit switches 84 which open the circuit of motor 82 and simultaneously close the circuit of motor 58 which then begins advancement of chain 44 (conveyor B).

Positioned on each side of conveyor B adjacent its abutment with conveyor A is a second pair of spaced, longitudinally twisted plow members 90, 92, which engage the end flaps 40 in their upwardly and outwardly folded positions and which, as carton 10 advances on the chain, forces the flaps out and down adjacent the end walls of the carton where they are thereafter retained in their movement on chain 44 by side guides 62 paralleling the opposed longitudinal edges of the conveyor B. At the same time the spaced pusher bars 60 on chain 44 engage and retain side flaps 38 in downward adjacency to the side walls of the carton.

At a spaced point along the length of conveyor B beyond the plow members 90, 92, is the first jar removal station 16. Station 16 consists of an elongated horizontal frame 94 extending at a spaced distance above chain 44 transversely thereof for an extended distance beyond each side thereof. Frame 94 is provided longitudinally with a horizontal slide guide 96 in which is reciprocally mounted a jar lifting head assembly 98. Assembly 98 consists of a head plate 100 connected to a longitudinally extending hydraulic piston rod 102 which is reversibly controlled through an electric reversing valve 103 connected to a source of hydraulic fluid (not shown).

Frame 94 extends to overlie conveyor D, hereinbefore referenced but not described in detail, and head 100 slides in the frame under control of hydraulic piston 102 from a position above conveyor B to one above conveyor D, and vice versa. Interposed between conveyors B and D aligned vertically beneath frame 94 is a bank of vertically disposed air nozzles 112 which are connected to a source of compressed air (not shown) through a spring loaded trip valve having a control valve in the path of head travel between conveyor B and conveyor D. The air nozzles 112 are arranged to align in registry with each longitudinal row of jars in carton 10 when the same is positioned at rest in the first jar removal station 16.

When carton 10 moving on conveyor B reaches a position of vertical alignment beneath frame 94, at which point lifting head assembly 98 is in vertical registry thereabove, the carton engages a pressure switch 114 in the circuit of motor 58 stopping the same and simultaneously actuating vertical ram 106 and the suction pump communicating with suction heads 108 through the chambered lifting head 104. Lifting head or plate 104 is moved downwardly by ram 106 to bring suction heads 108 into lifting engagement with the bottoms of the top row of the inverted jars in the open carton at which point lifting plate trips a cycling switch reversing the ram 106 causing the lifting head, suction heads, and jars to be elevated free of the carton 10.

When lifting head 104 has reached its uppermost position of travel it engages and trips a switch controlling valve 103 initiating movement of piston rod 102. Plate 104 and its supporting assembly 98 are moved by piston rod 102 above the bank of air nozzles 112, tripping the compressed air valve permitting impingement of cleaning air upwardly into the open mouths of the inverted jars as they are placed in alignment thereover. When assembly 98 is positioned above conveyor D it engages a limit switch 116 simultaneously switching control valve 103 terminating movement of piston rod 102, and engages and actuates a switch for the control valve for vertical ram 106, causing ram 106 to lower head 104 to deposit the jars on conveyor D, a solid endless belt to be hereinafter described. When head 104 has deposited the jars on conveyor D, head 104 engages a switch which closes the suction source circuit to the suction heads 108 releasing the jars and simultaneously reversing ram 106 to return head 104 to its elevated position in the assembly 98. When lifting head 104 has been fully elevated it trips switch 116 which reverses ram valve 103 to return the sliding head assembly to its original position above carton 10 from which it began the foregoing sequence of jar removal described.

When head assembly 98 has returned to its at-rest position as described it will engage a switch 118 actuating mo-

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tor 58 to advance carton 10 to the second jar removal station 18 while simultaneously moving a second carton 10 into the first jar removal station 16 and permitting a third carton 10 to be transferred from continuously operating conveyor A to conveyor B beneath the end flap lifting mechanism 14.

The second jar removal station 18 consists of a frame 120 similar to but of greater length in a direction remote to conveyor D than frame 94 of the first jar removal station. Frame 120 carries a lifting head assembly 98a identical in all respects to that provided at the first jar removal station and hereinbefore described.

In addition to the lifting head assembly 98a the second jar removal station is provided with a second lifting head assembly 122 which is formed integrally with but spaced from the assembly 98a. This second head assembly 122 is substantially identical in all respects with the heads 98 and 98a and all of their supporting components and control elements. The control elements of the second assembly head 122 are, however, separately actuated from the corresponding elements on assembly head 98a to permit independent but cooperative function of the two lifting heads at the second jar removal station.

When carton 10 reaches a position on conveyor B beneath the frame 120 it will be initially aligned vertically beneath lifting head 122 which will be actuated by a limit switch on conveyor B to lower the suction heads 108 thereof in the manner heretofore described to engage and lift from carton 10 the cellular divider board 124 which contained and supported the uppermost layer of jars previously removed at the first jar removal station 16. When the cellular divider board 124 has been elevated clear of carton 10, the two integral lifting heads 98a and 122 will be moved by piston rod 102 away from conveyor D to bring assembly head 98a above the carton 10 and locate head 122 remote from conveyors B and D with the divider 124 suspended therefrom. Head assembly 98a will then lift the lower layer of jars from carton 10, the extension of ram 106 being greater at this station than at the previous station. When the lower layer of jars is elevated above carton 10, lifting head assembly 98a will move the jars to conveyor D as previously described, while head 122 will simultaneously return the cellular divider 124 to carton 10. The two lifting assemblies will then return to their original at-rest positions. The carton 10 will be moved by conveyor B to the end thereof where it is transferred to perpendicularly extending, continuously operating conveyor C which removes the carton to a loading station in the plant.

As previously noted, conveyor D lies in parallel adjacency to conveyor B and consists of a solid, flexible endless belt trained about a small idler roller 130 at one end and a large driven roller 132 at the second end, both rollers being journaled in bearings supported by the frame structure. Roller 132 is driven in timed sequence from chain 44 so that jar receiving pockets formed between transverse bars 134 on belt 44 will be properly positioned to receive a layer transferred to the conveyor from either of the jar removal stations 16 or 18 associated with conveyor B.

Associated with that end of conveyor D trained about the larger driven roller 132 is an arcuate shield or hood 136 which is spaced concentrically from the belt surface a distance equal to the height of the jars deposited on the conveyor by the lifting and transfer mechanism hereinbefore described.

Associated with conveyor D is a conveyor E which is horizontally positioned in vertical alignment beneath conveyor D and which operates continuously in a direction opposite to the direction of travel of the conveyor D. That end of conveyor E beneath the larger roller 132 of conveyor D is spaced therebeneath a distance equal to the height of the jars deposited on conveyor D from conveyor B.

When jars are deposited on conveyor D between adjacent transverse bars 134 they will be carried on the belt around the larger roller 132 within shield 136 which

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retains them in place within the pocket formations defined by the transverse bars until they are deposited in inverted position, open mouth up, on conveyor E therebeneath which moves them to conventional filling machinery in the plant.

In FIG. 8 of the drawings there is diagrammatically and schematically illustrated a wiring circuit for the automatic controls of the mechanisms hereinbefore described. In this illustration letter designations A, B, C, D and E diagrammatically represent the conveyors of like identification hereinbefore described. The letter F identifies the hydraulic pump for maintaining pressure on all rams and pistons in the mechanism through a system of fluid lines shown in broken line in FIG. 8, and the letter G designates the vacuum pump for the lifting heads of the two jar removal stations connected by lines shown in broken line in the diagram to the lifting heads of the plural jar removal stations.

H represents the motor for the conveyor A, (not shown previously) and 82, 58, I (not shown previously) and K (not shown previously), designate the motors and associated circuits for the conveyor A, flap opening fingers 64, 66, conveyor B, conveyor D, and conveyor E, respectively.

X designates the circuit controls for the single pickup head assembly 98 of the first jar removal stations, and Y and Z designate circuit controls for the pick-up head assemblies 98a and 122, respectively, of the second jar removal station.

The interrelated wiring of the multiple of control mechanisms shown in FIG. 8 reflect an operational embodiment of an overall control system for the mechanism hereinbefore described which will permit the operation heretofore attributed to that mechanism.

From the foregoing descriptions and disclosures it may be seen that a fully automated mechanism has been provided for unloading jars from cartons, cleaning and inverting said jars and thereafter delivering the same to jar filling equipment. It is also readily evident that the structures herein described and disclosed fully satisfy and attain all of those objects and advantages attributed thereto.

From the foregoing it may also be seen that automated components and mechanism have been provided which are capable of arrangement in such a combination that they can function as carton loading apparatus for filling cartons with jars rather than unloading cartons as hereinbefore described.

I claim:

1. Carton and jar handling apparatus comprising, in combination, a continuously operating carton delivery conveyor, carton flap opening means associated with said delivery conveyor, a processing conveyor abutting said delivery conveyor and receiving cartons therefrom, jar pick-up means positioned in operable relationship to said processing conveyor, control means actuating said pick-up means in timed sequence to carton travel on said processing conveyor, compressed air jar cleaning elements fixed in operable relationship to said jar pick-up means and operating in timed sequence therewith, a jar inverting conveyor receiving jars from pick-up means, a jar discharge conveyor receiving jars from said inverting conveyor, and a carton discharge conveyor abutting and receiving cartons from said processing conveyor.

2. A combination as described in claim 1 wherein said jar pick-up means consists of a horizontally reciprocal frame mounted above said processing conveyor, a plurality of suction heads mounted on said frame for vertical reciprocation relative thereto, and said control means reciprocating said frame and said suction heads in timed sequence to carton travel on said processing conveyor and in timed sequence one to the other.

3. A combination as defined in claim 2 wherein said jar cleaning elements consist of a bank of upwardly directed air nozzles offset laterally from the path of said processing conveyor and vertically aligned beneath a portion of the horizontal reciprocal path of said jar pick-up

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means head, and control means for activating said bank of air nozzles operably associated with said jar pick-up frame.

4. A combination as defined in claim 1 wherein said jar inverting conveyor consists of a flexible belt moving from a horizontal plane 180° about a roll within a semi-circular housing spaced from said belt a distance equal to the height of said jars.

5. A combination as defined in claim 1 wherein a series of jar pick-up and cleaning stations are located successively along the path of said processing conveyor and controlled in timed sequence to successively remove, clean and transfer to said inverting conveyor successive layers of jars in said cartons introduced onto said processing conveyor.

6. A combination as defined in claim 5 wherein the jar pick-up frames at successive stations along said processing conveyor mount a pick-up assembly for cellular carton dividers, said pick-up heads being spaced on said frames from the jar pick-up heads thereon and operable vertically from said frames in timed sequence to the operation of said jar pick-up heads.

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