United States Patent

Bateman

[15] **3,655,072**

[45] **Apr. 11, 1972**

[54] CARTON HANDLING APPARATUS

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[73] Assignee: **Delamere & Williams Company Limited,** Toronto, Ontario, Canada

[22] Filed: **Sept. 18, 1969**

[21] Appl. No.: **859,135**

[52] **U.S. Cl.**.....**214/8.5 A,** 214/8.5 D, 221/176

[51] **Int. Cl.**.....**B65g 59/06**

[58] **Field of Search**.....214/8.5 A, 8.5 D, 8.5 R; 221/225, 211, 176

[56] **References Cited**

UNITED STATES PATENTS

3,451,563	6/1969	Luginbuhl	214/8.5
3,478,899	11/1969	Pitchford	214/8.5 A
3,499,199	3/1970	Mojden	214/8.5 A X

FOREIGN PATENTS OR APPLICATIONS

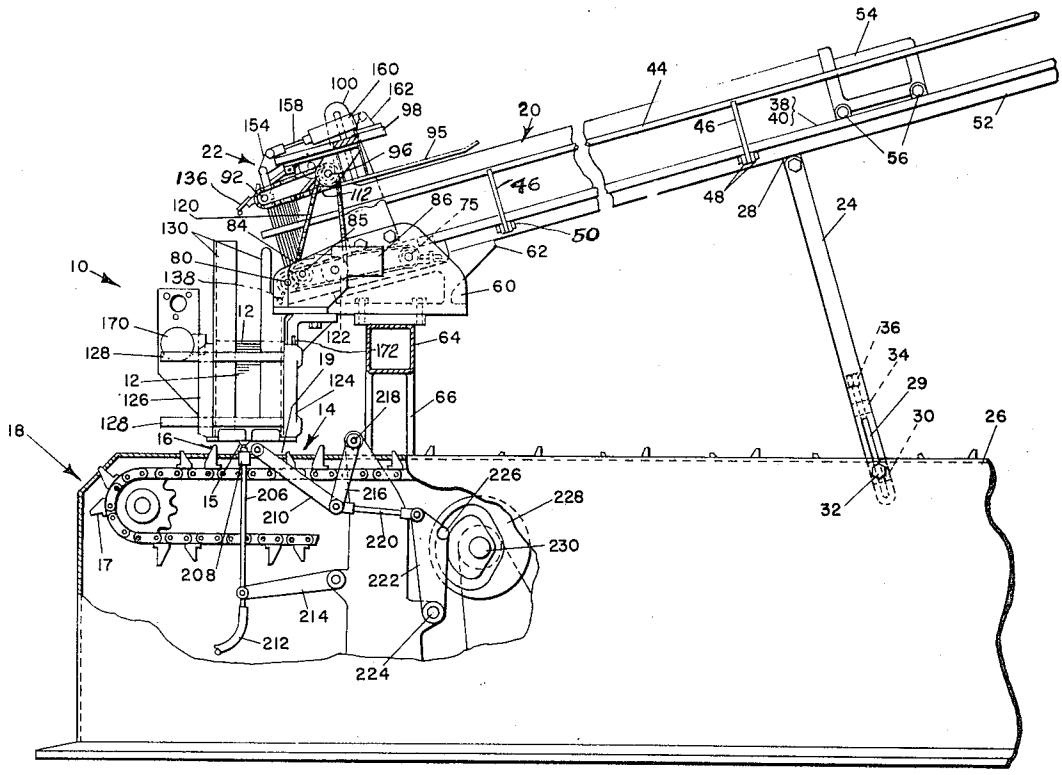
689,812	4/1953	Great Britain	214/7
116,671	5/1961	U.S.S.R.	221/76
193,811	1/1965	Sweden	214/8.5 D

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Assistant Examiner—George F. Abraham
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[57] **ABSTRACT**

The apparatus includes a short upright magazine having a vertical stack of cartons from which successive lowermost cartons are withdrawn, and an elongated inclined supply magazine in response to a reduction in height of the stack whereby to maintain a substantially uniform supply therein to facilitate withdrawal of successive cartons and to require less frequent manual replenishment of the supply.

19 Claims, 12 Drawing Figures



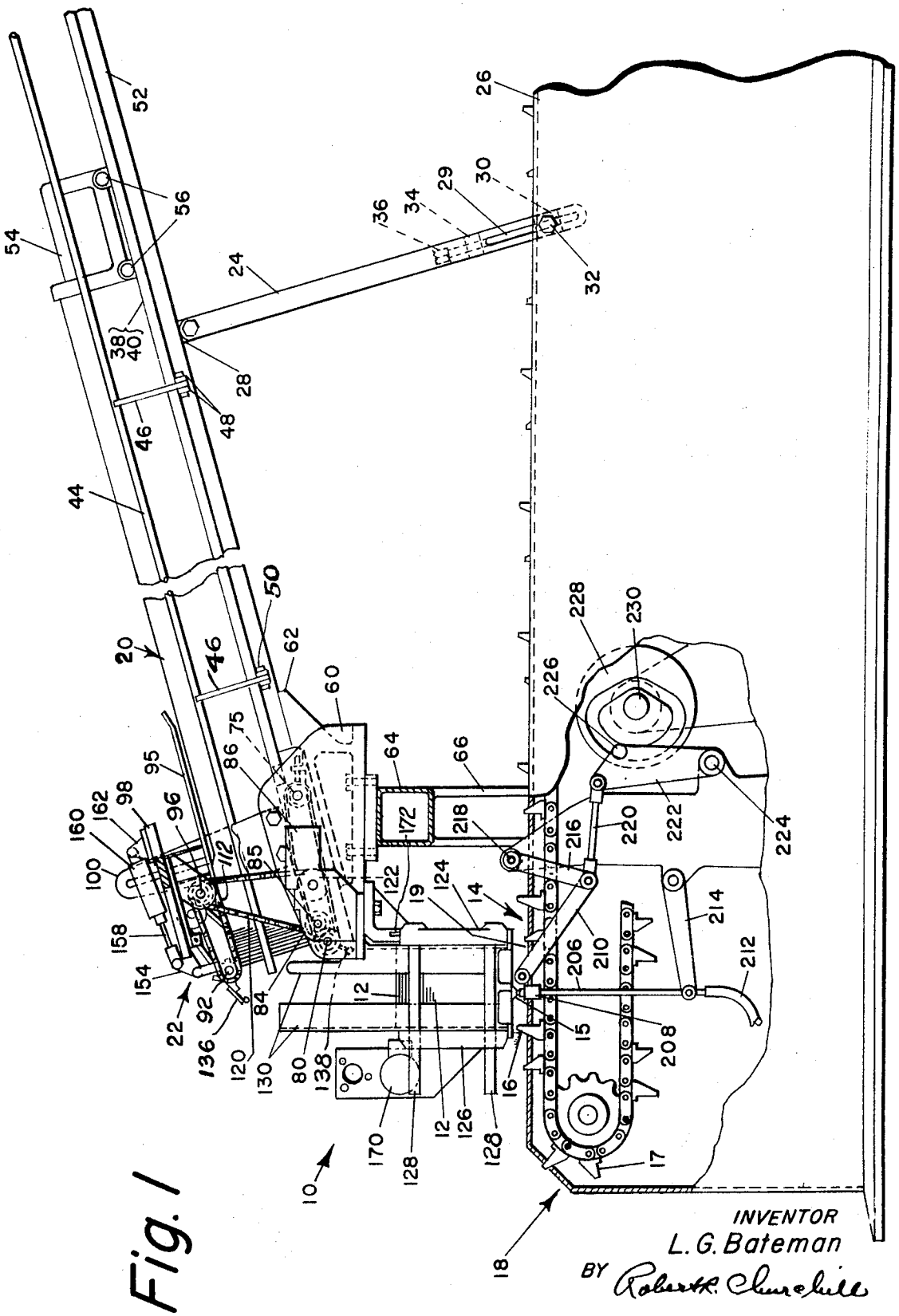

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Fig. 1

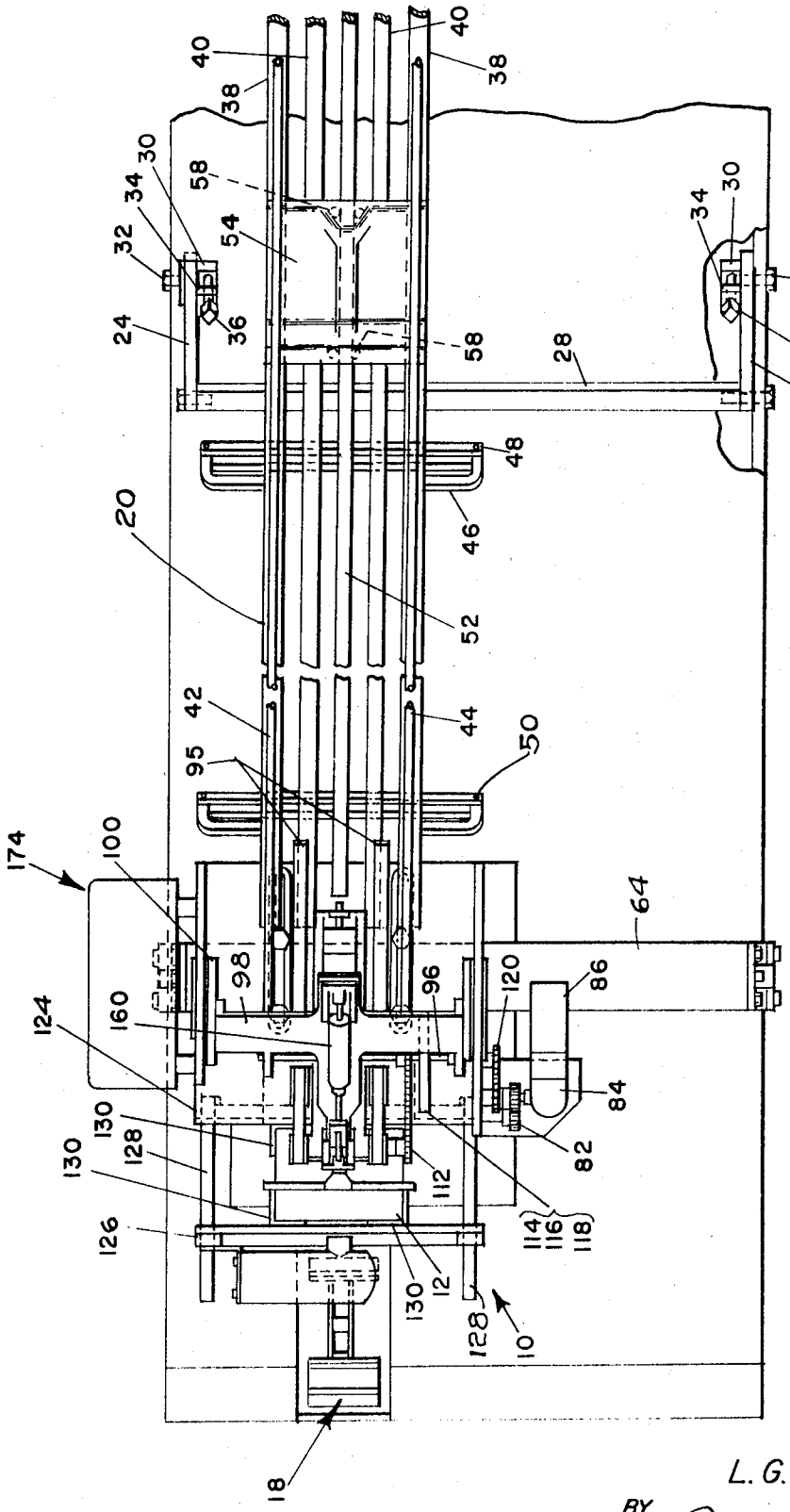


Fig. 2

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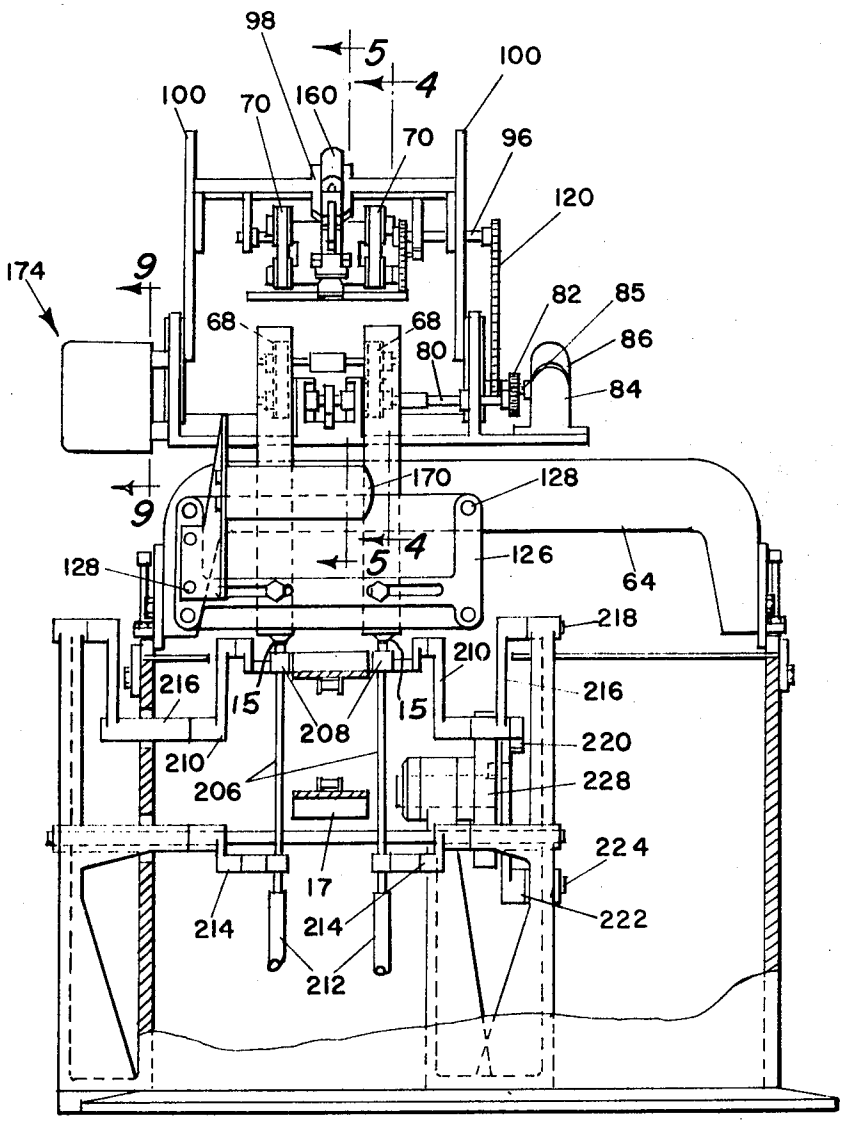


Fig. 3

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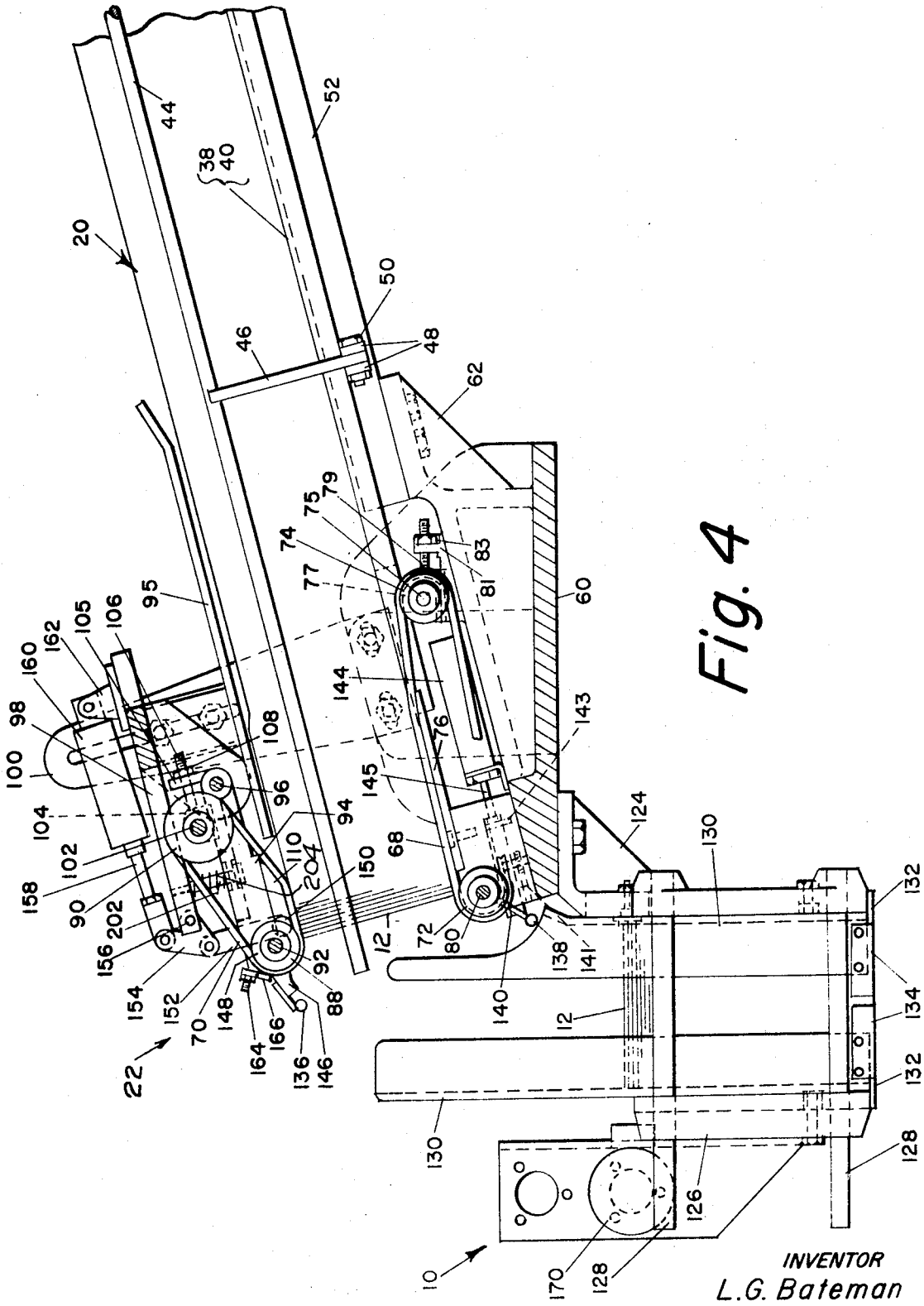


Fig. 4

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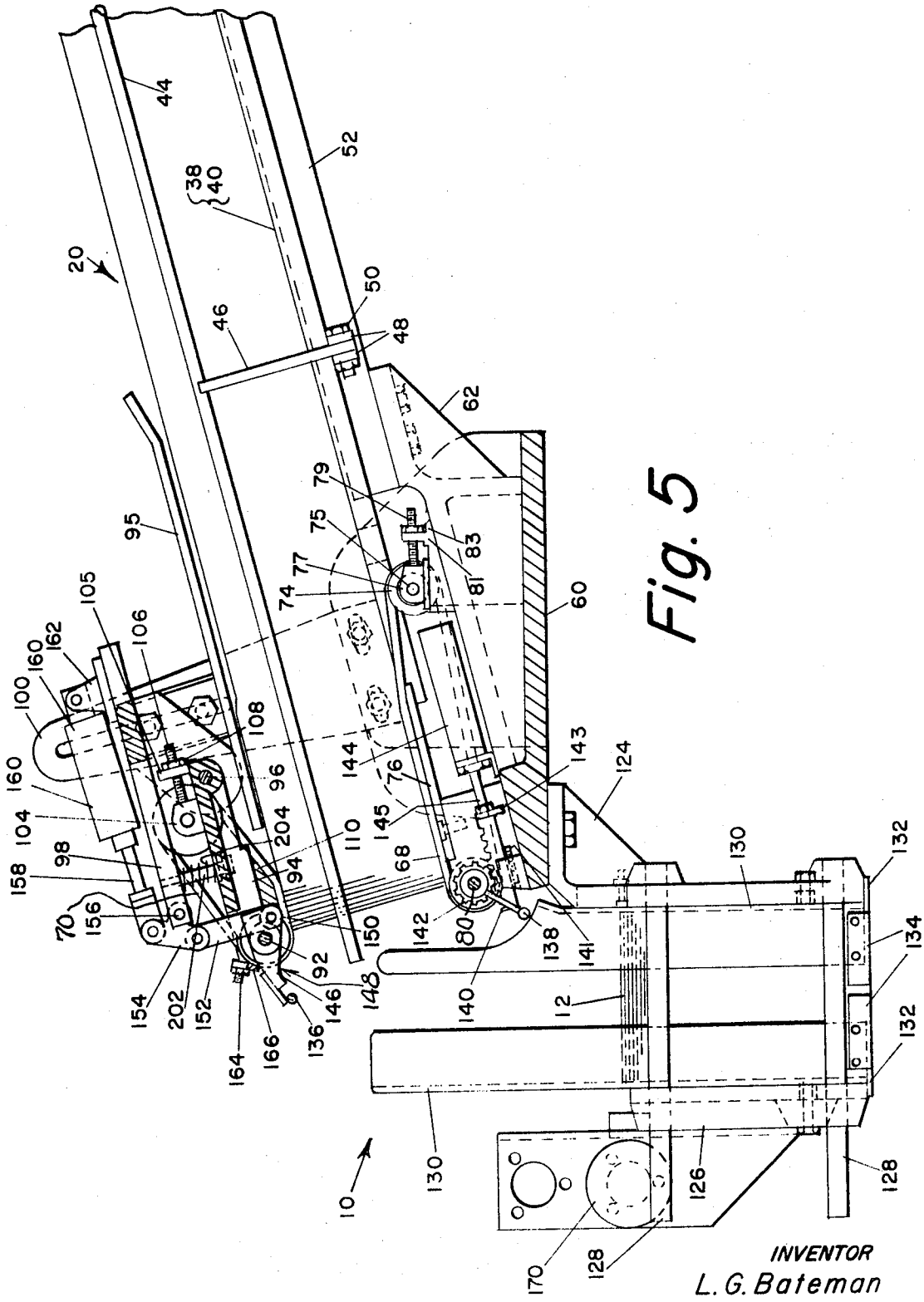


Fig. 5

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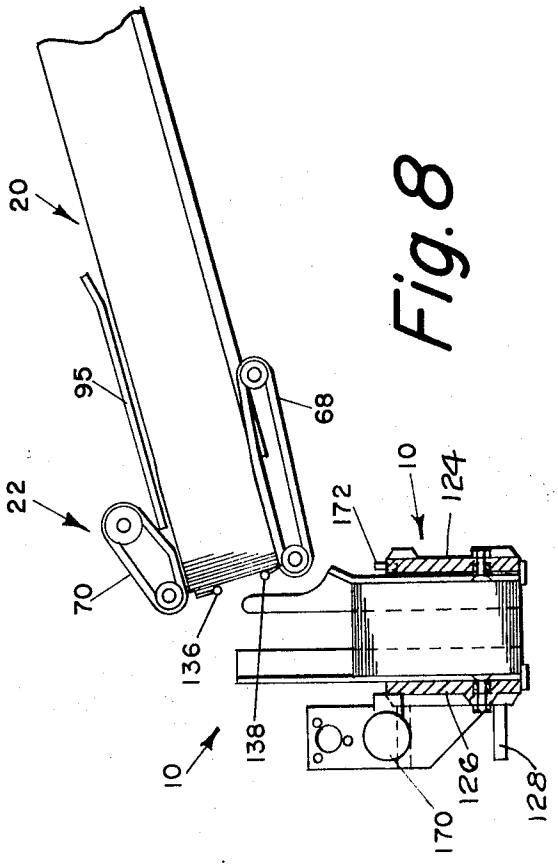


Fig. 8

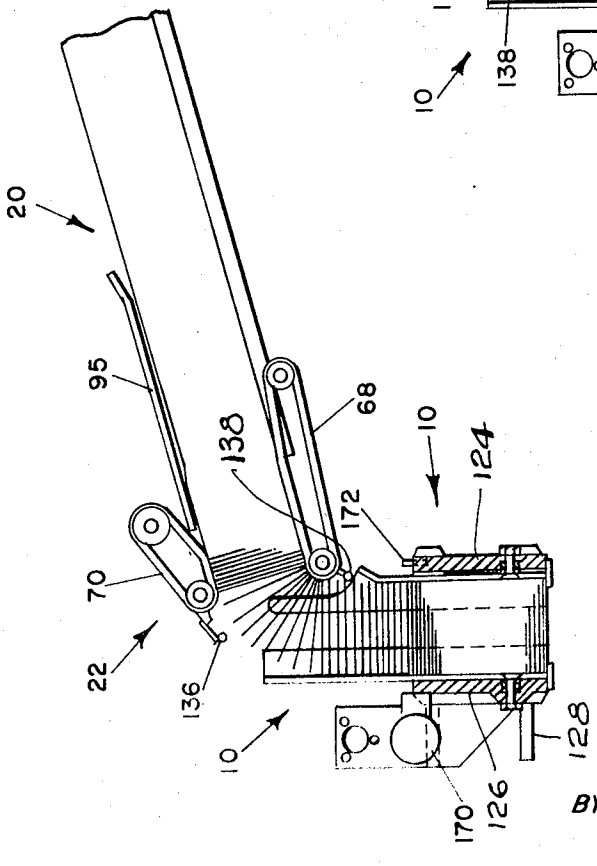


Fig. 6

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Fig. 12

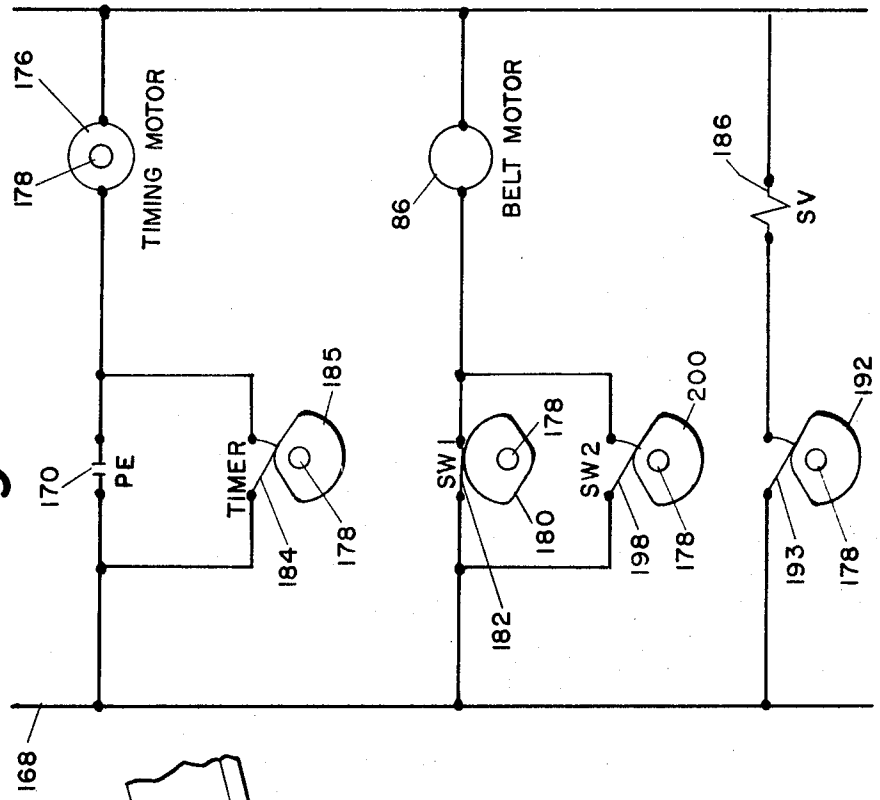
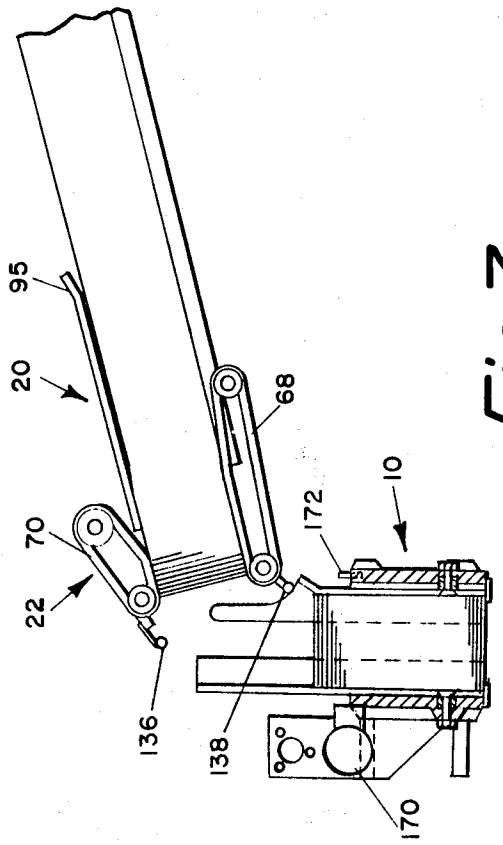


Fig. 7



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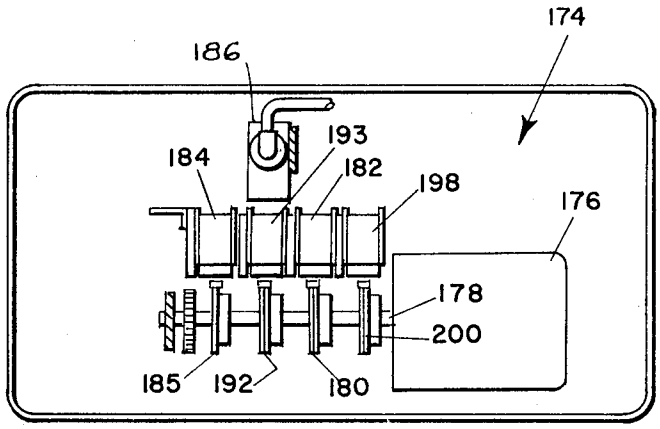


Fig. 9

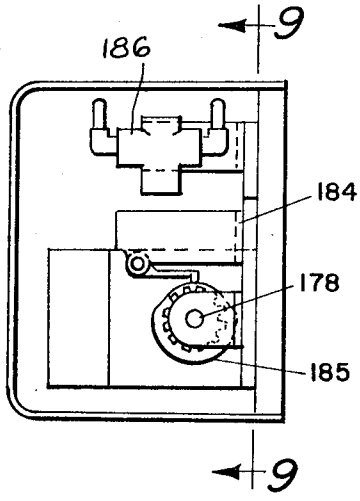


Fig. 10

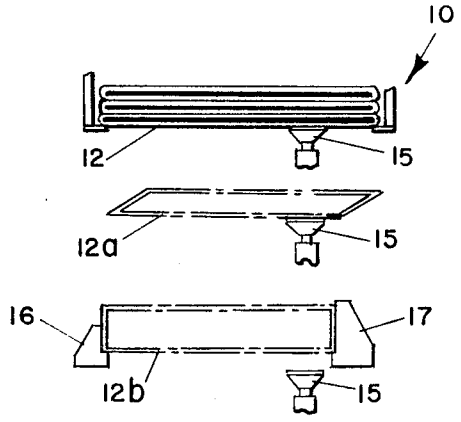


Fig. 11

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CARTON HANDLING APPARATUS

SUMMARY OF THE INVENTION

This invention relates to carton handling apparatus embodying an upright magazine from which successive lowermost cartons are withdrawn. In practice, high speed machines require that cartons be withdrawn at a rapid rate and as a result a large supply of cartons supported in an elongated vertical magazine must be used in order to avoid constant manual replenishment of cartons in the magazine. However, an elongated vertical stack has the disadvantage of excessive weight resulting in undue and variable pressure against the lowermost carton in the stack so that withdrawal of successive cartons is difficult to control.

Accordingly, it is an object of the present invention to provide novel and improved carton handling apparatus embodying a carton magazine wherein provision is made for automatically replenishing the supply of cartons withdrawn from the magazine in a novel and superior manner.

The invention has for a further object to provide a novel and improved carton magazine adapted to support a vertical stack of cartons and having a relatively small capacity so as to avoid undue pressure from the weight of the stack on the lowermost carton and wherein provision is made for automatically depositing cartons into the magazine in response to depletion of the cartons to a predetermined level in the magazine.

BRIEF DESCRIPTION OF THE DRAWINGS

In the drawings illustrating the preferred embodiment of the invention:

FIG. 1 is a side elevation of the carton handling apparatus embodying the present invention;

FIG. 2 is a plan view of the apparatus shown in FIG. 1;

FIG. 3 is a front elevation of the carton handling apparatus shown in FIG. 1;

FIG. 4 is a detail view in cross section as taken on the line 4—4 of FIG. 3;

FIG. 5 is a detail view in cross section taken on the line 5—5 of FIG. 3;

FIGS. 6, 7 and 8 are diagrammatic views illustrating the different conditions of the apparatus at different stages of operation to be described;

FIG. 9 is a detail view in side elevation of a timer forming a part of the control mechanism as seen from the line 9—9 of FIG. 10;

FIG. 10 is an end view of the timer shown in FIG. 9;

FIG. 11 is a diagrammatic view showing a carton being opened up and inserted between lugs of a conveyer during the withdrawing operation; and

FIG. 12 is a wiring diagram to be referred to.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to the drawings and particularly to FIGS. 1 and 2, in general, the illustrated carton handling apparatus comprises a relatively short upright magazine 10 having a vertical stack of flat side seamed cartons 12 therein, known in the trade as "knockdown cartons," successive lowermost cartons being removed by carton withdrawing means indicated generally at 14, and which includes a vertically reciprocable suction cup 15 which first separates opposed walls of a carton to open the same and then withdraws the carton from the magazine to present the same in a squared up condition between lugs 16, 17 defining pockets 19 of a conveyer 18. The apparatus further includes an elongated magazine 20 arranged at an incline and which supports a large supply of cartons on edge. The inclined magazine 20 has mechanism as indicated generally at 22 for advancing the cartons and depositing the same into the upper end of the upright magazine 10 to replenish the stack whereby to compensate for the cartons being withdrawn.

The elongated inclined magazine 20 is supported at its upper end by a pair of elongated arms 24 adjustably secured at their lower ends to a frame member 26 and at their upper ends

to a tie piece 28. As herein shown, the upper ends of the arms 24 are bolted to the opposite ends of the tie piece 28. The lower end of each arm 24 is slotted as indicated at 29 to receive an adapter 30. A bolt 32 which extends through the adapter and through the slot 29 is fastened to the frame member 26. The arm 24 is provided with a block 34 welded thereto and disposed a short distance above the upper end of the slot. A jack screw 36 threaded through the block is arranged to engage a counterbored opening in the top of the adapter 30. In operation, when it is necessary to adjust the height of the upper end of the inclined magazine 20, the upper and lower bolts may be loosened slightly and the jack screw may then be adjusted to permit lengthening or shortening of the arms 24 whereupon the bolts may again be tightened.

The inclined carton magazine 20 further includes bottom rails 38, 40 and side rails 42, 44. The side rails comprise rods secured to the upper ends of upright bars 46 which are secured at their lower ends between arms 48 laterally extended from a center rail 52 and through which a bolt 50 extends. In practice, the cartons are supported on edge on the bottom rails including the center rail 52. A carton backing weight or follower 54 is arranged to engage the back of the cartons and to follow along therewith by gravity. As herein shown, the follower 54 is provided with rollers 56 which engage the outer rails. Spaced dowels 58 which depend from the underside of the follower loosely embrace the center rail 52 to prevent lateral displacement of the weight. In operation, the follower moves by gravity down the inclined chute to maintain the cartons in close proximity as the cartons are depleted from the front of the stack.

The lower end of the inclined magazine 20 is supported by a base bracket 60 having a central rearward extension 62 to which is bolted the center rail 52. The base bracket 60 is bolted to a laterally extended support 64 which extends from an upright bracket 66 attached to and vertically adjustable with respect to the frame member 26. The bracket 60, in addition to supporting the lower or delivery end of the inclined magazine 20 also supports the carton advancing mechanism 22 which comprises a pair of spaced lower advancing belts 68 whose upper runs engage the bottom edges of the stack of cartons in the inclined magazine, and a pair of spaced upper advancing belts 70 whose lower runs engage the top edges of the stack of cartons.

As herein shown, the lower belts 68 are arranged to run over pulleys 72, 74 and are further guided by a belt support plate 76 secured to the base bracket 60. The belt support plate 76 is arranged to back up the belts along the upper run over which the cartons are advanced. The forward pulleys 72 are fast on a shaft 80 which is connected by spur gears 82 to the output shaft 85 of a speed reducing unit 84. The input shaft of the unit is powered by a drive motor 86 housed integrally with the speed reducing unit. The rear pulleys 74 are rotatably mounted on a shaft 75 fixed in a belt tightener member 77 adjustably carried by the base bracket 60. The member 77 is provided with an adjusting screw 79 extended through a slotted clearance opening in an upstanding lug 81 of the base bracket. The adjusting screw 79 is provided with a nut 83 to effect tensioning of the belts 68.

The upper advancing belts 70 are also arranged to run over front and rear pulleys 88, 90, respectively, the front pulleys 88 being mounted fast on a shaft 92 journaled in a bearing bracket 94, the latter being pivotally carried by a shaft 96 journaled in a bridge bracket 98. The bridge bracket is adjustably supported in spaced upright supports 100 attached to the base bracket 60. The rear pulleys 90 are rotatably mounted on a shaft 102 fixed in a belt tightener member 104 adjustably carried by the bracket 94 and which is provided with an adjusting screw 106 extended through a slotted clearance opening in an upstanding lug 105 of the bearing bracket, the screw being provided with a nut 108 to effect tensioning of the belts. The upper belts 70 are further guided by a belt support plate 110 attached to the underside of the bearing bracket 94 and which defines the course of those portions of

the lower runs of the belts **70** which engage the top edges of the cartons in the inclined magazine. The magazine **20** is further provided with top rails **95** for guiding the upper edges of the stack into engagement with the upper belts **70**. The rails **95** are supported by the bridge bracket **98**.

As herein shown, the drives to the upper belts **70** include a chain and sprocket drive **112** from the shaft **96**, the chain being guided over a take-up guide **114** carried by a block **116**. The block **116** is secured to a support arm **118** which is attached to the bridge bracket **98**. The shaft **96** is connected by a chain and sprocket drive **120** to the output shaft **85**. The drive **120** further includes an idler sprocket **122**.

From the description thus far it will be seen that in operation the cartons arranged on edge on the inclined magazine **20** are engaged between the upper and lower belts **70, 68** at the delivery end of the magazine and as the cartons are advanced by the belts successive leading cartons are released by the belts to fall "fanwise" by gravity into the upper end of the upright magazine **10**. As the cartons are released from the inclined magazine the back up weight or follower **54** rolls down the incline in engagement with the rear of the stack to advance the cartons toward the delivery end of the magazine.

As illustrated herein, the relatively short upright magazine **10** is supported from the underside of the base bracket **60** and includes a side frame **124** bolted to the bracket **60**. The side frame **124** is adjustably connected to an opposing side frame **126** by rods **128**. Upright angle guides **130** L-shaped in cross section are provided, one in each corner, which are bolted to the side frames **124, 126**. Bottom plates **132, 134** secured to the underside of the side frames **124, 126** and to the lower ends of the angle guides **130**, respectively, are arranged to support the marginal edges of the cartons in a manner such as to permit withdrawal of successive lowermost cartons by means of the vertically reciprocable suction cups **15**. It will be observed that the pulleys defining the leading ends of the lower belts **68** are set forwardly of the pulleys defining the leading ends of the upper belts **70** so that in operation the upper edges of the cartons are first released from the upper inclined delivery belts **70** whereby to permit pivotal movement of successive cartons on the lower belts **68** to fall fanwise by gravity into the magazine **10**. In operation, the weight of the vertical stack of cartons in the magazine **10** remains substantially constant and applies a substantially uniform pressure on the lowermost carton in the stack so as to facilitate withdrawal of successive lowermost cartons.

Provision is made for controlling the release of cartons from the inclined magazine **20** into the upright magazine **10** in a manner such as to start the feed into the magazine **10** when the height of the stack is reduced from a nominal height to a predetermined lower level and to continue the release of cartons from the inclined magazine for a predetermined time sufficient to reach such nominal height whereupon the feed is discontinued.

Provision is also made for reorganizing or squaring up the stack of cartons arranged on edge in the inclined magazine **20** whereby to bring the cartons at the forward end of the stack into close proximity so as to permit a substantially uniform release of cartons when feeding is again initiated. The reorganizing operation occurs immediately after the carton feeding operation has stopped. It will be understood that withdrawal of cartons continues during the carton feeding operation so that in practice the feeding rate must be timed to supply cartons at a faster rate than that at which they are being withdrawn. During the reorganizing operation the foremost cartons in the inclined stack are brought up against movable barriers provided at the release end of the inclined magazine **20**.

As herein shown, the barriers which serve to hold back the cartons in the inclined conveyer **20** comprise upper and lower horizontal bars **136, 138** which are rockingly mounted on their respective upper and lower pulley shafts **92, 80**. The lower bar **138** is arranged to be rocked from a lowered position to an operative position against the front of the stack by a rack **140** which meshes with a gear **142** formed integrally with the bar as shown in FIG. **5**. The rack **140** is slidingly mounted in the base bracket **60** and is connected to the stem or piston rod **145** of an air cylinder **144** also supported on the bracket **60**. The rack is limited in its clockwise movement, viewing FIG. **4**, by a stop screw **141** carried by the base bracket **60** which cooperates with a plate **143** attached to and movable with the rack **140**. In its opposite direction the bar **138** engages a portion of the base bracket **60**.

The upper bar **136** is also mounted to rock on its pulley shaft **92**, and provision is further made for pivotally rocking the entire unit carrying the belt **70** upwardly out of operative engagement with the upper edges of the cartons. As herein shown, the bar **136** is bolted to one arm **146** of a rocker member **148** mounted on the shaft **92**, the second arm **140** being connected by a link **152** to a connecting member **154** which is pivotally mounted at **156** in the stationary bracket **98**. The member **154** is further connected by a piston stem **158** to an air cylinder **160** which is pivotally connected at its other end to a bracket **162** also attached to the bracket **98**. As previously described, the bracket **94** on which the upper belts **70** are carried is pivotally mounted at **96** and, in operation, when the cylinder is actuated to rock the linkage in a direction to move the bar **136** in engagement with the front of the stack, one arm of the rocker member **148** engages a stop screw **164** carried by a plate **166** bolted to the pivoted bracket **94**. Thus, continued actuation of the cylinder **160** effects upward rocking of the pivoted bracket **94** to lift the belts **70** up away from engagement with the cartons. It will be understood that in practice the bar **136** remains in engagement with the front of the stack when the belts **70** are rocked up as described. Upon squaring up of the cartons at the leading end of the inclined stack, the belts **70** are again lowered and the bars **136. 138** are rocked back to an out of the way position.

As herein shown, the pivotally mounted bracket **94** is supported by a bolt **202** which extends through a slotted opening in the bracket **94** and is threadedly engaged with the bridge bracket **98**. A spring **204** coiled about the bolt **202** is interposed between the bridge bracket **98** and the bearing bracket **94** and serves to resiliently urge the upper belts **70** into engagement with the upper edges of the stack in the inclined conveyer **20**. The head of the bolt **202** serves to limit the downward rocking movement of the belts. Conversely, the pivotally mounted belt supporting unit is rocked upwardly against the tension of the spring **204** during the reorganizing operation.

As herein illustrated, the control means for initiating the carton feeding or transferring operation comprises an electrical circuit **168** including a photoelectric cell **170** having a light source **172** and arranged with respect to the magazine to detect depletion of cartons from the vertical stack at a predetermined level, which may be at a point about 2 inches below a nominal height for example. In operation, when the electric eye detects such depletion, an amplified signal energized a timer unit indicated generally at **174** which includes a motor **176** having a one revolution cam shaft **178**. The cam shaft **178** is provided with a cam **180** which cooperates with a normally closed microswitch **182**. The cam **180** holds the switch open until the shaft **178** starts its rotation whereupon the switch **182** closes to start the motor **86** and to initiate the feed of cartons from the supply magazine **20** into the magazine **10**. A second microswitch **184** cooperates with a cam **185** on the cam shaft which is arranged to open the circuit to the timer motor **176** at the end of one revolution. In operation, the feed of cartons continues for a portion of such revolution whereupon the switch **182** is opened to discontinue the feed of cartons. For the remainder of the revolution, the cartons at the delivery end of the magazine are reorganized, that is, the cartons are squared up and compacted together to correct any loosened or disorganized state whereby to provide a uniform feed to the upright magazine **10**.

As herein illustrated, another cam **192** cooperates with a microswitch **193** arranged to close a circuit to a solenoid

operated air valve **186**. The air valve **186** is operatively connected to a source of compressed air and to the air cylinders **144, 160**. The cylinders effect rocking of the bars **136, 138** into engagement with the front of the stack in the inclined magazine **20** and also effects elevation of the upper belts **70** away from the stack, as described, whereupon a normally open microswitch **198** is caused to be closed by a cam **200** on the shaft **178** to again start the motor **86** which drives the belts **68, 70**. This action serves to straighten up and compact the cartons at the forward end of the stack against the bars **136, 138**. The cam **200** then effects opening of the switch **198** to discontinue operation of the belts, and the cam **192** opens the circuit to the microswitch **193** to close the solenoid operated valve **186**. The bars **136, 138** then return to their inoperative position and the upper belt unit is lowered into engagement with the upper edges of the stack. At this time the cam **185** effects opening of the motor control switch **814** to discontinue rotation of the cam shaft **178**. In operation, cartons are being continuously withdrawn from the magazine **10**, and when the height of the stack is again reduced to a point where the electric eye is again actuated, another feeding and reorganizing cycle is initiated.

As illustrated in FIG. **1**, the carton withdrawing means **14** is cam operated, the suction cup **15** being secured to one end of a hollow pipe **206** supported in an adapter **208** pivotally connected to a rocker arm **210**. The lower end of the hollow pipe **206** is provided with a flexible pipe connection **212** leading to a source of vacuum and is also swivelly supported at the end of a rocker arm **214**. The rocker arm **210** is formed integrally with a depending arm **216** pivotally mounted at **218**. The depending arm **216** is connected by a link **220** to a cam lever **222** pivotally mounted at **224**. The cam lever carries a cam roller **226** which cooperates with a cam **228** mounted on a shaft **230** which may be rotated by conventional driving means.

As diagrammatically illustrated in FIG. **11**, the withdrawal of a carton **12** from the magazine **10** occurs when the lowermost carton is engaged by a suction cup **15** and pulled downwardly. This action separates the walls of the carton and causes the same to assume a quadrilateral shape as indicated at **12***a*. Continued downward movement of the suction cup **15** brings the narrower side walls of the carton into engagement with the lugs **16, 17** of the conveyer **18**. This action squares up the carton as indicated at **12***b* with the carton open at both ends. It will be understood that in practice two suction cups **15** are employed with duplicate operating mechanisms as indicated in FIG. **3**. At subsequent stations of operation along the conveyer **18**, one end of the carton is closed; an article is inserted into the carton; and the other end of the carton is provided with a top closure.

As illustrated in FIG. **12**, the elementary wiring diagram for the control mechanism comprises the electrical circuit **168** having the timing motor **176** provided with a one revolution cam shaft **178** and arranged to be actuated upon energization of the photoelectric unit **170** when depletion of the cartons in the magazine below a predetermined level is detected. Normally closed switch **182** effects substantially immediate starting of the belt drive motor **86** and after a predetermined length of time the switch **182** is opened to discontinue the advance and release of cartons from the supply magazine **20** to the vertical magazine **10**. The reorganizing operation is then commenced upon closing of switch **193** by cam **192** to energize the normally closed solenoid valve **186**. During this operation the switch **198** is momentarily closed by the cam **200** whereupon the switches **193, 182** and **184** are opened to permit: closing of the solenoid valve; stopping of the belt drive motor **86** and stopping of the timing motor **176**, respectively, to await another signal from the photoelectric unit **170** to repeat the operations.

In operation, a feeding cycle is initiated when the level of the stack in magazine **10** is reduced and reaches a point where the photoelectric unit **170** is energized, such condition being indicated in FIG. **1**. This starts the feed belts **68, 70** to release cartons from the magazine **20** to fall fanwise into the magazine **10** as illustrated in FIG. **6**. FIG. **7** illustrates the condition just as the feed belts have stopped, showing the magazine filled to a nominal height. The condition of the operating mechanisms during the reorganizing operation is indicated in FIG. **8** wherein the barriers **136, 138** are in operative position and the belts **68, 70** are operated momentarily to compact the foremost cartons against the barriers while the belts **70** are rocked upwardly.

From the above description it will be seen that the present invention provides novel carton handling apparatus wherein a large reserve supply or reservoir of cartons is provided and that provision is made for automatically replenishing the cartons in a vertical magazine from which successive lowermost cartons are withdrawn. The height of the stack in the vertical magazine may thus be made very short and varies only slightly whereby the resistance to withdrawal is reduced and remains substantially uniform so that the work of the withdrawing means is facilitated and made more consistent. The provision of a large reservoir of cartons arranged to deposit cartons into the vertical magazine when needed necessitates only periodic manual replenishment of the supply in the reservoir. It will also be observed that the stroke required of the withdrawing means is very short compared to the stroke required for withdrawing endmost cartons in an inclined stack and depositing the same in successive pockets of a horizontal conveyor.

Having thus described the invention, what is claimed is:

1. In apparatus for handling cartons, in combination, an upright magazine having a short vertical stack of cartons from which successive lowermost cartons are withdrawn, a reservoir of cartons arranged on edge adjacent said magazine, and means including upper and lower driven belts engageable with the top and

bottom edges of the cartons for transferring cartons from said reservoir into said magazine to replenish those withdrawn therefrom.

2. In apparatus for handling cartons, in combination, a relatively short upright magazine having a vertical stack of cartons, means for withdrawing successive lowermost cartons from the stack, an elongated inclined magazine containing a reservoir of cartons on edge, and means including upper and lower driven belts engageable with the top and bottom edges of the cartons for transferring cartons from said reservoir to said upright magazine to replenish those withdrawn therefrom.

3. In apparatus of the character described, in combination, a relatively short upright magazine having a vertical stack of cartons, means for withdrawing successive lowermost cartons from the stack, an elongated inclined magazine containing a reservoir of cartons on edge, and means for transferring cartons from said reservoir to said upright magazine including means engageable with the top and bottom edges of the cartons comprising upper and lower driven belts for advancing and releasing successive foremost cartons to fall by gravity from an upright to a horizontal position into the upper end of said upright magazine.

4. In apparatus of the character described, in combination, an upright magazine having a vertical stack of cartons from which successive lowermost cartons are withdrawn, a substantially horizontal magazine supporting a supply of cartons on edge, and means for transferring cartons from the supply to the upright magazine comprising means including upper and lower driven belts engageable with the top and bottom edges of the cartons for advancing the cartons in the supply, and means for releasing the top edges of successive endmost cartons from the supply to fall fanwise into the upper end of said upright magazine.

5. In apparatus of the character described, in combination, an upright magazine having a vertical stack of cartons from which successive lowermost cartons are withdrawn, an elongated inclined magazine supporting a reservoir of cartons on edge, means for transferring cartons from the reservoir to the upright magazine comprising means including upper and lower driven belts engageable with the upper and lower edges

of the cartons for advancing and releasing successive cartons in the reservoir to fall by gravity into said upright magazine, and means for controlling said transfer operation including means for engaging and disengaging the upper driven belts to maintain a substantially constant supply of cartons in said upright magazine.

6. In apparatus of the character described, in combination, a relatively short upright magazine having a vertical stack of cartons, means for withdrawing successive lowermost cartons from the stack, an elongated inclined magazine containing a reservoir of cartons on edge, means including upper and lower driven belts engageable with the upper and lower edges of the cartons for transferring cartons from said reservoir to said upright magazine, and control means including means for detecting partial depletion of the cartons in said upright magazine, and means responsive to said detecting means for initiating operation of said transfer means.

7. In apparatus of the character described, in combination, a relatively short upright magazine having a vertical stack of cartons, means for withdrawing successive lowermost cartons from the stack, an elongated inclined magazine containing a reservoir of cartons on edge, means including upper and lower driven belts engageable with the upper and lower edges of the cartons for advancing and releasing successive cartons from the reservoir to fall by gravity into said upright magazine, and control means including means for detecting a partial depletion of the cartons in said upright magazine, and means responsive to said detecting means for initiating operation of said advancing and releasing means.

8. Apparatus as defined in claim 7 wherein the detecting means includes a photoelectric cell disposed a short distance below a nominal height of said vertical stack.

9. In apparatus of the character described, in combination, a relatively short upright magazine having a vertical stack of cartons, means for withdrawing successive lowermost cartons from the stack, an elongated inclined magazine containing a reservoir of cartons on edge, means for advancing and releasing successive cartons from the reservoir to fall by gravity into said upright magazine, and control means including means for detecting a partial depletion of the cartons in said upright magazine, and means responsive to said detecting means for initiating operation of said advancing and releasing means, said advancing means including upper and lower driven belts engageable with the corresponding edges of the cartons at the forward end of said inclined magazine.

10. Apparatus as defined in claim 9 wherein the advancing means further includes an electrical circuit having a motor for driving said upper and lower belts, said control means further including means for limiting the operation of said advancing means.

11. Apparatus as defined in claim 10 wherein said control means further includes means for periodically barring release of cartons from the reservoir and for operating said advancing belts for a short time to reorganize in contiguous relation the group of cartons at the forward end of the reservoir whereby to maintain a uniform release during a succeeding transfer operation.

12. Apparatus as defined in claim 11 wherein the barring means includes barriers mounted to rock into and out of engagement with the front of the reservoir of cartons.

13. Apparatus as defined in claim 11 wherein provision is made for lifting said upper belts out of engagement with the upper edges of the cartons during the reorganizing operation.

14. Apparatus as defined in claim 11 wherein the control means includes provision for effecting a reorganizing operation after each transfer operation.

15. Apparatus as defined in claim 11 wherein provision is made for operating the transfer means at a rate substantially faster than the rate of withdrawal from the upright magazine.

16. In apparatus of the character described, in combination, an upright magazine having a vertical stack of cartons from which successive lowermost cartons are withdrawn, an elongated inclined magazine supporting a reservoir of cartons on edge, a weighted follower engaging the rear of said reservoir, means for transferring cartons from the reservoir to the upright magazine comprising means for advancing and releasing successive cartons from the reservoir to fall by gravity into said upright magazine, means for controlling said transfer operation to maintain a substantially constant supply of cartons in said upright conveyer, and means for periodically reorganizing in contiguous relation the group of cartons at the forward end of the reservoir whereby to maintain a uniform release during a succeeding transfer operation.

17. Apparatus as defined in claim 16 wherein the control means includes an electrical circuit having a timing motor provided with a one revolution cam shaft, a plurality of microswitches in said circuit, and cams on said shaft for cooperation with said switches to effect said transfer and reorganizing operations.

18. In apparatus of the character described, in combination, a relatively short upright magazine having a vertical stack of cartons, means for withdrawing successive lowermost cartons from the stack, an elongated inclined magazine containing a reservoir of cartons on edge, means including upper and lower driven belts engageable with the upper and lower edges of the cartons for advancing and releasing successive cartons from the reservoir to fall by gravity into said upright magazine, control means including means for detecting a partial depletion of the cartons in said upright magazine, means responsive to said detecting means for initiating operation of said advancing and releasing means, and means operative after each transferring operation for reorganizing in contiguous relation the cartons at the forward end of the reservoir, said last named means including means for barring forward movement of the leading end of the reservoir.

19. In apparatus of the character described, in combination, a relatively short upright magazine having a vertical stack of cartons, means for withdrawing successive lowermost cartons from the stack, an elongated inclined magazine containing a reservoir of cartons on edge, means for advancing and releasing successive cartons from the reservoir to fall by gravity into said upright magazine, said advancing means including upper and lower driven belts engageable with the corresponding edges of the cartons at the forward end of said inclined magazine, the lower belts extending forwardly of said upper belts whereby the upper edges of the cartons are first released to permit pivoting of the lower edges of the cartons on the lower belts to fall forwardly into said upright magazine.

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