United States Patent

Prete et al.

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[54] APPARATUS FOR SIMULTANEOUSLY LOADING GROUPS OF ARTICLES INTO PACKING CASES

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[21] Appl. No.: **94,463**

[52] **U.S. Cl.** **53/61**, 53/247, 53/248

[51] **Int. Cl.** **B65b 57/10**

[58] **Field of Search** 53/61, 62, 247, 248

[56] **References Cited**

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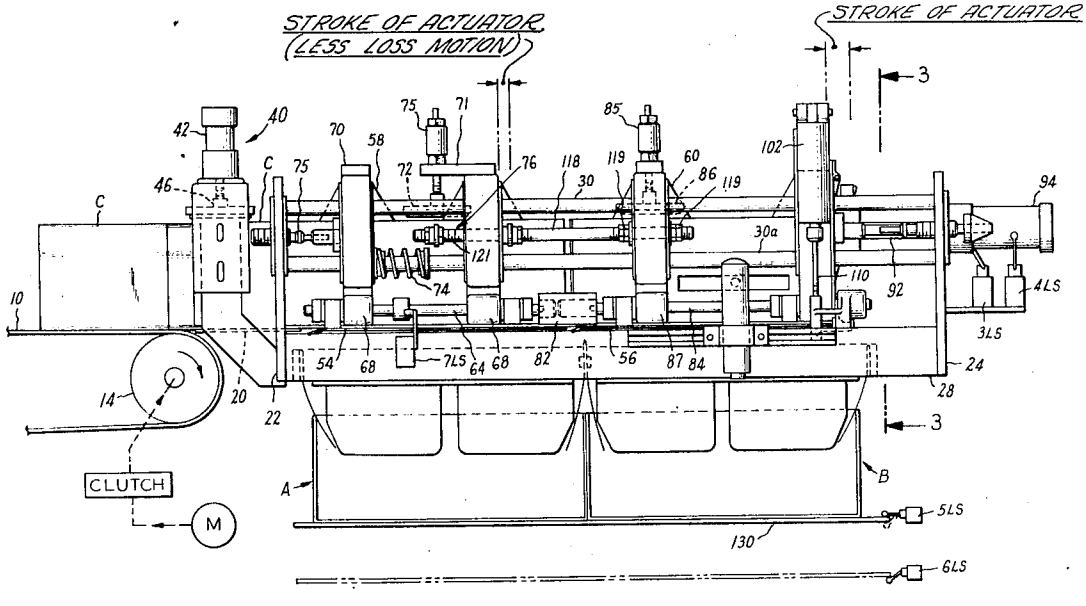
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[57] **ABSTRACT**

An infeed conveyor advances side-by-side lines of rectangular cartons, such as six pack cartons, into a grid structure from which the cartons are to be dropped, in two groups of four cartons each, into two upwardly open packing cases. The grid structure includes means for detecting the presence of eight cartons therein, and a line brake is set in response to the detecting means to hold back cartons on the infeed conveyor. The grid structure includes a fixed frame in which two shifting carriage portions are slidably mounted for movement through different displacements in the downstream direction, and each carriage portion carries one of said carton groups. After being so shifted the two carton groups are dropped downwardly through doors in these carriage portions and into the upwardly open packing cases.

14 Claims, 9 Drawing Figures



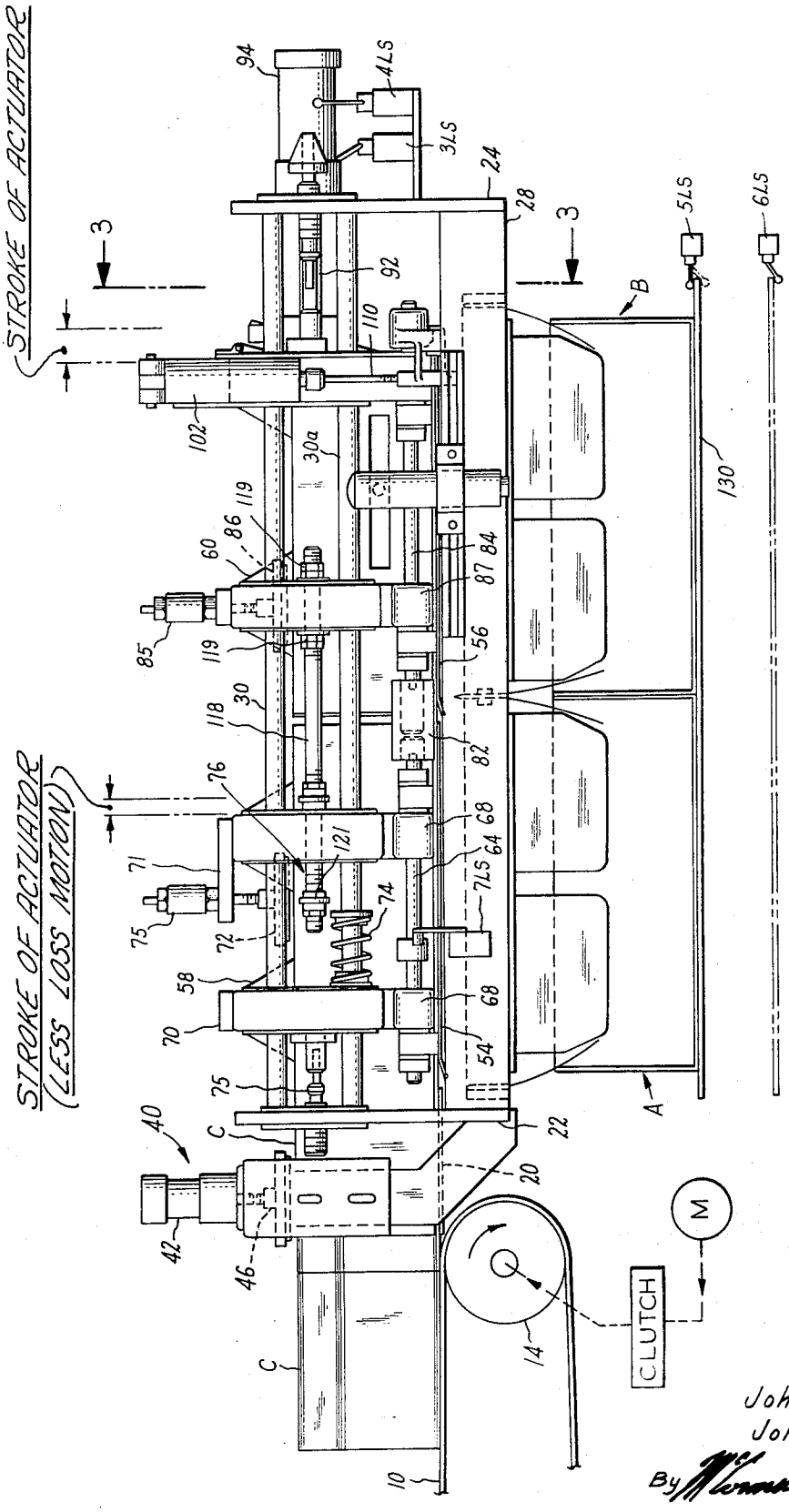


FIG. 1

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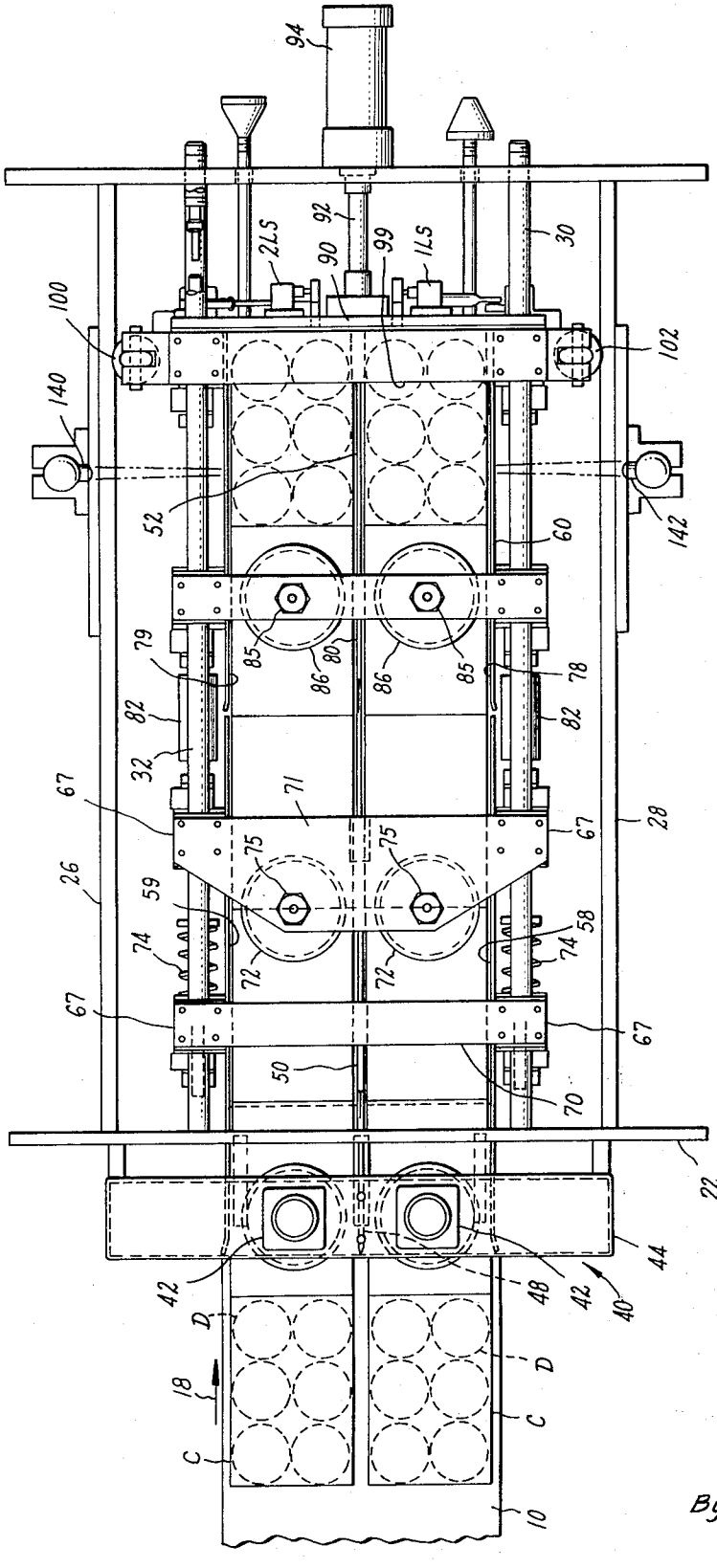


FIG.2

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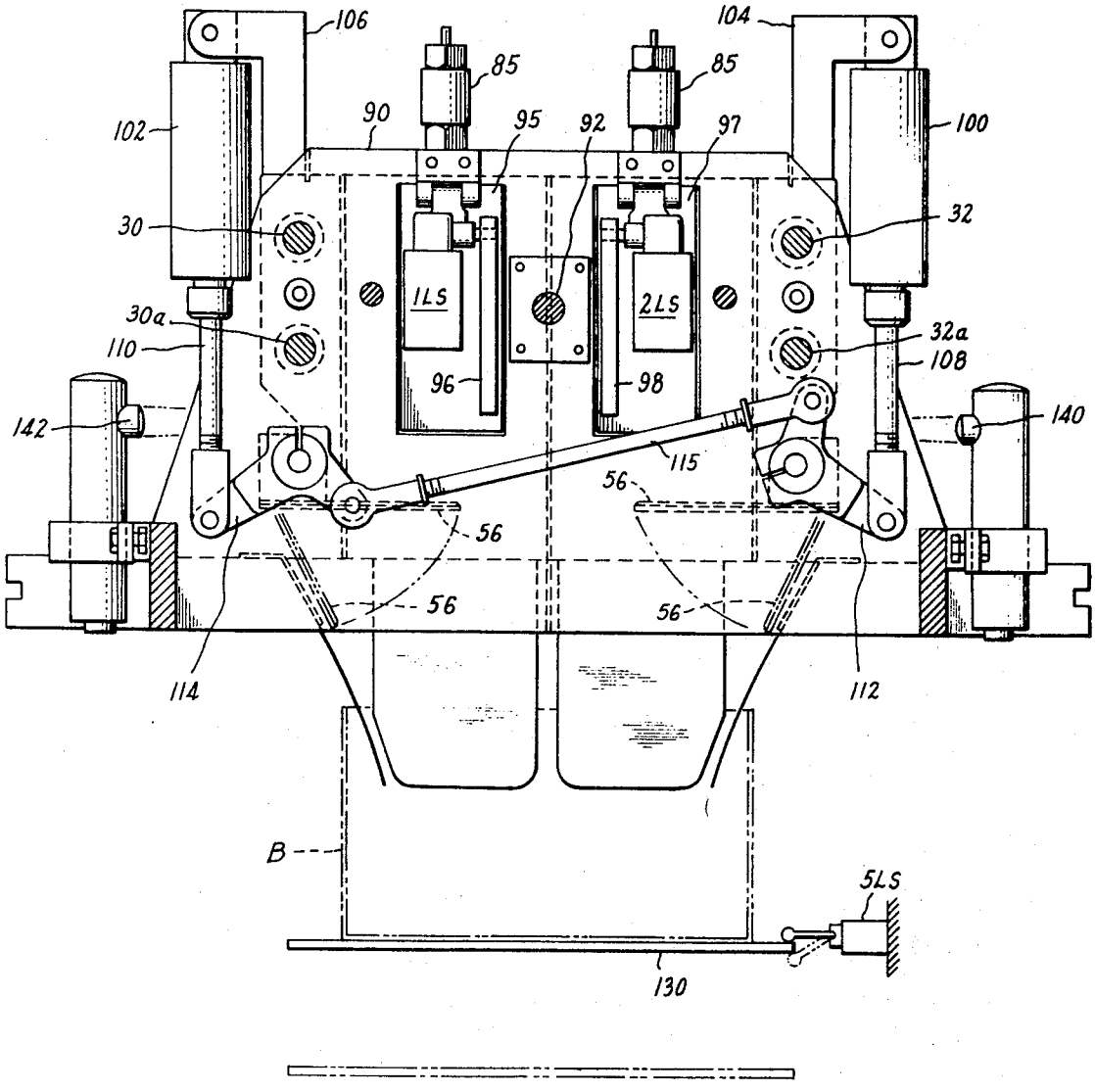


FIG. 3

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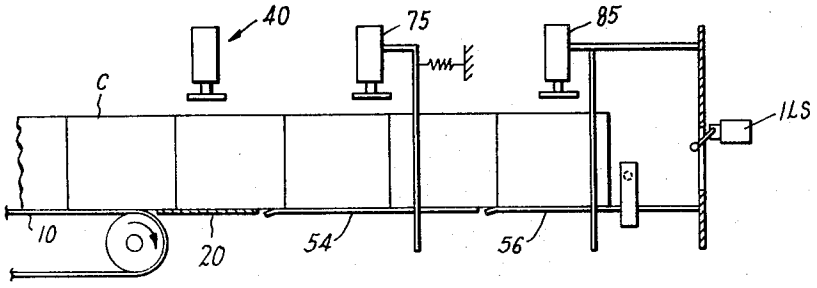


FIG. 4

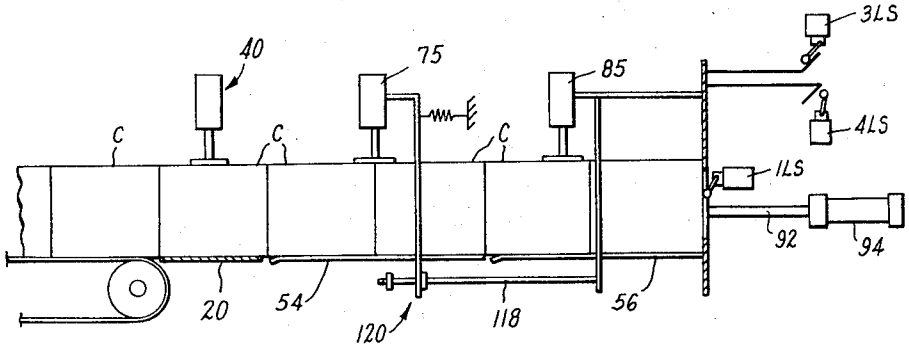


FIG. 5

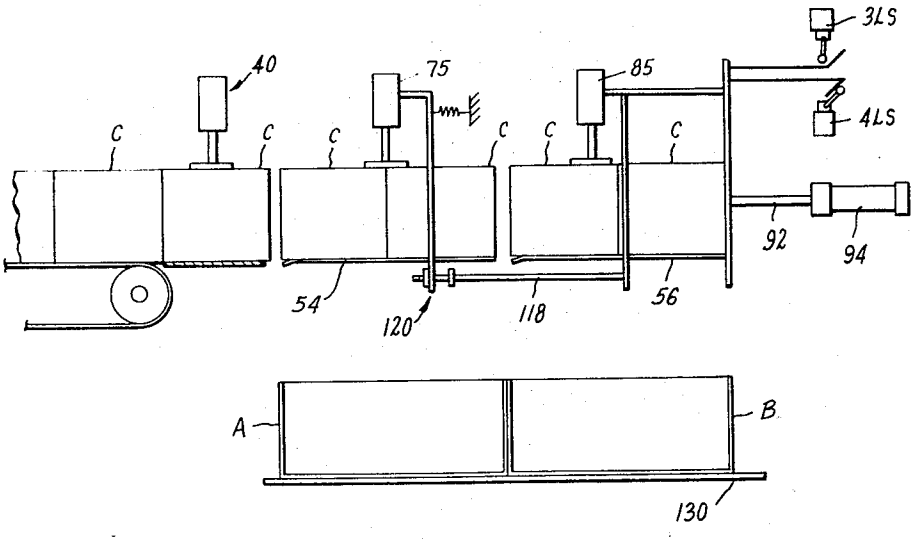


FIG. 6

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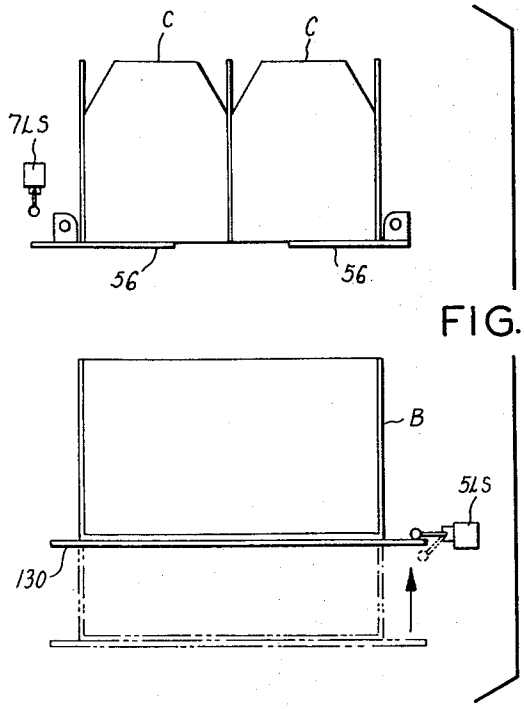


FIG. 7

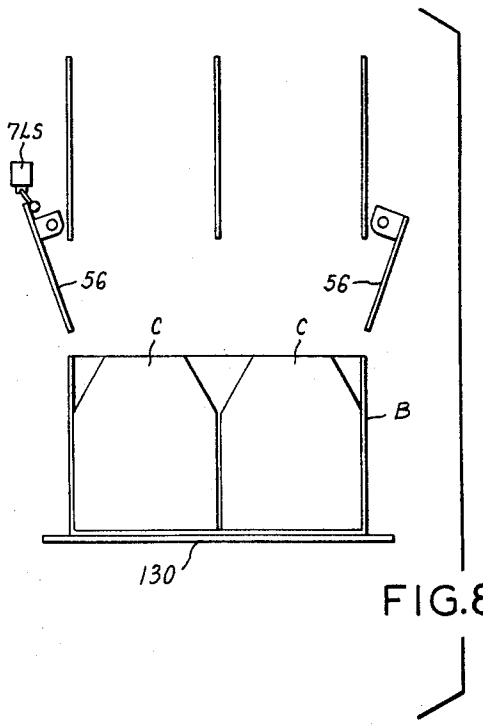


FIG. 8

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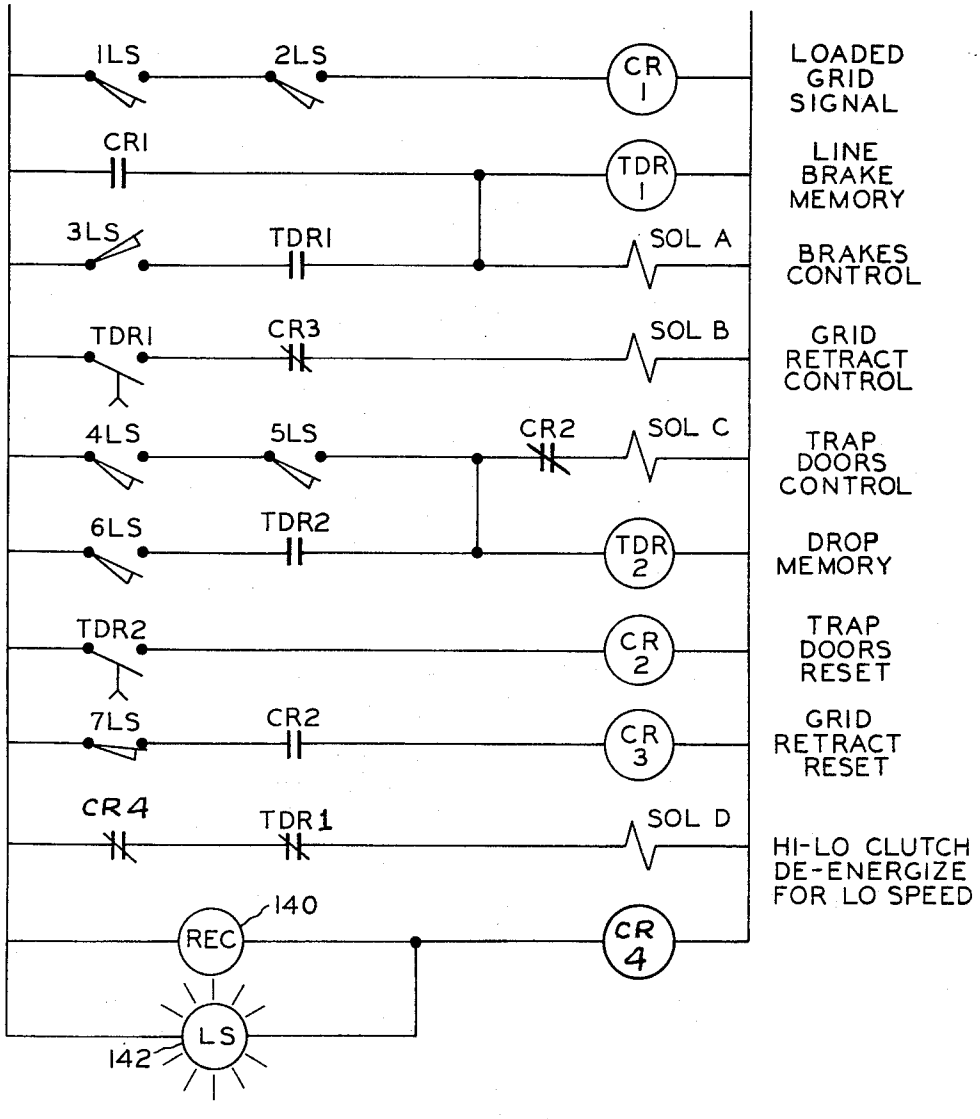


FIG. 9

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APPARATUS FOR SIMULTANEOUSLY LOADING GROUPS OF ARTICLES INTO PACKING CASES

SUMMARY OF INVENTION

This invention relates to packaging machines, and deals more particularly with an apparatus for simultaneously loading groups of articles into a like number of packing cases.

The preferred apparatus shown and described herein provides for the simultaneous loading of several groups of articles and includes an infeed conveyor for feeding one or more lines of articles across a deadplate and into a grid structure. The grid structure has two lane defining carriage portions movable from initial positions, wherein they receive these articles, to drop positions, wherein each carriage portion is moved with respect to its adjacent carriage portion and with respect to the fixed grid structure. A single actuator moves these carriage portions through their predetermined displacements, and the carriage portions further include bottom doors against which the articles can be clamped by means associated with each carriage portion. These doors also serve to drop the article groups into the upwardly open packing cases at the proper time in the cycle of operation.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a side elevational view of an apparatus which embodies the present invention.

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

FIG. **3** is an end view of the apparatus shown in FIGS. **1** and **2**.

FIGS. **4**, **5** and **6** are schematic elevational views of the apparatus shown in FIGS. **1** through **3**, illustrating the sequence of operation of its various components.

FIGS. **7** and **8** are schematic end views of the apparatus shown in FIGS. **1** through **3** showing a further sequence of operation of its components.

FIG. **9** is a schematic electrical control circuit suitable for operation of the apparatus of FIGS. **1** through **3**.

DETAILED DESCRIPTION

Turning now to the drawings in greater detail, FIG. **1** shows an infeed conveyor **10** of the continuously operated type, but in the present case fitted with a high-low speed clutch **12** interposed between the drive roll **14** and the motor **16** to operate said conveyor **10** at either of two selected speeds. As shown in FIG. **2** the conveyor **10** is adapted to feed articles, in the form of six pack cartons, continuously in the downstream direction, as indicated generally by the arrow **18**, across a deadplate **20** located in the same plane as the upper run of the conveyor **10**. The articles being handled in the apparatus shown comprise rectangular cartons C, C each of which has been previously packaged with six generally conventionally shaped bottles or cans as indicated generally at D, D in FIG. **2**. Each of these cartons C,C is adapted to be fed by line pressure across the deadplate **20** and into the grid structure to be described.

The grid structure includes a fixed frame having an upstream end plate, or cross member **22**, as well as a corresponding cross member **24** at the downstream end. Longitudinally extending support members **26**, **28** are connected at either end to these cross members **22** and **24**, as best shown in FIG. **2**. These longitudinally extending members **26** and **28** are arranged slightly below the level at which the cartons C,C are fed into the grid structure. Two sets of fixed guide rails **30** and **32** are provided to further support the grid structure cross members **22** and **24** in parallel relationship with one another. The lower set of guide rails **30***a* and **32***a* are provided immediately below the upper set of guide rails **30** and **32**, and these sets of guide rails **30**, **30***a*, **32** and **32***a* slidably support shifting carriage portions of the grid structure to be described hereinbelow. The upstream cross member **22** of the fixed grid structure includes a cantilevered yoke or frame which carries a line brake means, indicated generally at **40** in FIGS. **1** and **2**. The line brake means **40** is adapted to selectively hold back the cartons C,C on the infeed conveyor, and more particularly

clamps the carton which is located on the deadplate **20**, to permit operation of the shifting carriage portions A and B. The line brake means **40** is of conventional construction, and comprises a pair of pneumatic actuators, indicated generally at **42**, **42**. A fixed part of each actuator **42** is mounted to the cantilevered frame **44** and a movable portion **46** of each actuator carries an abrasive disc for frictionally engaging the carton C on the deadplate to clamp said carton therebetween.

As mentioned above with reference to FIG. **2**, two side-by-side lanes of cartons C,C are adapted to be fed into the grid structure, and it is a feature of the grid structure that each of the carriage portions A,B is slidably mounted on the rods **30**, **30***a* and **32**, **32***a* to define longitudinally extending lanes for receiving each of these lines of cartons C, C. A fixed plate **48** is provided between the line brakes associated with deadplate **20**, and lane defining plates are provided in each of the shifting carriage portions, as indicated generally at **50** and **52**, in longitudinal alignment with the fixed plate **48** for achieving this lane defining function in the grid structure. To further define the lanes in the grid structure a pair of bottom doors **54** and **56** are also provided in each of the shifting carriage portions of the grid structure so that the cartons C,C are fed across these doors and between these lane defining plates **50** and **52** in response to the line pressure of the cartons on the infeed conveyor **10**. Finally, and still with reference to the lane defining portion of the grid structure, left- and right-hand outer extremities of each of the lanes are defined by vertically extending side plates **58**, **59** and **60**, **62**.

The bottom doors **56** and **56** of the upstream or first carriage portion A hingedly connected to rock shafts **64** and **66**, which rock shafts are in turn rotatably supported at either end in bearing blocks **68**, **68** and **70**, **70**, respectively. These bearing blocks **68** and **70** are in turn mounted to the side walls **58** and **59**, respectively. The center plate **50**, which is located between the two side-by-side lanes in the bridge structure, is hung from a cross member **70** provided for this purpose at the upper ends of each of the bearing blocks **68** and **68**. Each bearing block **68**, **68** defines a pair of slide bushings for slidably receiving the fixed guide rods **30** and **32** mentioned previously in the fixed grid structure. Still with reference to the upstream carriage portion A of the grid structure, a second cross member **71**, located in spaced relationship to the cross member **70**, supports a pair of small actuators slaved to the line brake actuators **42**, **42** for operation therewith. The movable portions of these actuators carry pucks **72**, **72** for engaging the two cartons C,C located immediately therebeneath the pucks **72**, **72** so as to hold these cartons in contact with the bottom doors **54**, **54** mentioned previously. As best shown in FIG. **2**, the first carriage portion A defined by the structure described hereinabove can be seen to be slidably supported on the fixed guide rods **30**, **30***a* and **32**, **32***a* by means of the four slide bearings indicated generally at **67**, **67**. Each of the lower fixed guide rods **30***a*, **32***a* includes a fixed flange **73** which engages one end of a coil compression spring **74** acting between this flange and the rear face of the slide block **67** associated with the upstream end of the firs carriage portion A. It will be apparent that these springs **74**, **74** serve to urge the first carriage portion A upstream against a limit stop defined by the pair of snubbers **75**, **75** mounted for this purpose in the fixed cross member **22** of the fixed grid structure. These snubbers are of conventional construction, and can be adjusted to vary the limit of travel of the carriage portion in the upstream direction.

The second lane defining sliding carriage portion B of the grid structure is similar to the first but not connected thereto except through a lost motion mechanism, indicated generally at **76** to be described in greater detail hereinbelow. As shown in FIGS. **1** and **2**, the second carriage portion B also includes lane defining side plates **78** and **79**, together with a central plate **80**, and also includes bottom doors **56**, **56** as mentioned hereinabove, each of which is rotatably supported by means of rock shafts **84**, **84** located in axial alignment with respect to the rock shafts **64**, **64** in the first carriage portion A. The rock

shaft 84 is connected to the rock shaft 64 by means of a splined collar 82. Each of these rock shafts 84, 84 is rotatably supported in bearing blocks 87, 87 similar to the bearing blocks 68, 68 described above, and each of these bearing blocks 87, 87 includes an upstanding portion which permits the second carriage portion B to be slidably received on the fixed guide rods 30, 30*a* and 32, 32*a* in the same manner as the first carriage portion A described hereinabove. The upstream cross member 85 associated with the second carriage portion B is similar to the cross members 70 and 71 described above, and like the cross member 71, carries a pair of small slaved pneumatic actuators which operate in conjunction with the line brake 42 so as to clamp a carton C between their associated pucks 86, 86 and the doors 56, 56 associated with the second carriage portion B.

Still with reference to the second carriage portion B associated with the downstream group of cartons, the downstream end of said second carriage portion B includes an end wall 90 against which the cartons can abut as they are fed into the grid structure by the line pressure of the cartons on the infeed conveyor 10. An actuator 94 has a fixed part carried by the downstream cross member 24 of the fixed grid structure and a movable part connected to the end wall 90. As so constructed and arranged, extension of the movable portion of this actuator 94 causes the second carriage portion to move in the upstream direction so as to contact the first grid defining portions and to move it into contact with the fixed stop defined by the snubbers 75, 75 so as to permit loading of the grid structure by a predetermined number of articles, in this case by eight cartons arranged in two side-by-side lines.

Means is provided in the end wall 90 of the second carriage for detecting the presence of containers C, C in the configuration mentioned above. Preferably, said detecting means comprises the lane detection switches 1LS and 2LS mounted on the end wall 90 and having sensing arms 96 and 98 adapted to close the switches 1LS and 2LS whenever the swinging panels or doors 95 and 97, associated with the two lanes in the grid structure, are moved into their closed positions by the cartons. Means is provided for normally biasing these doors 95 and 97 to an open condition so that each of them is adapted to be closed in response to the pressure of articles or cartons fed into the grid structure.

Turning now to FIG. 3, it will be seen that a pair of actuators 100 and 102 are pivotally mounted on brackets 104 and 106, respectively, provided for this purpose on the downstream cross arm 99 of the second carriage portion B. These actuators 100 and 102 include depending movable portions 108 and 110, respectively, each of which is connected to one arm of two bell cranks 112 and 114, respectively. These bell cranks 112 and 114 are clamped to the rock shafts 84, 84 associated with the bottom doors 56, 56 and are adapted to open these doors in response to pressurizing of these actuators 100 and 102. An equalizer, or crossover arm 115, is provided between secondary crank arms of the bell cranks 112 and 114 so as to assure that both of these doors 56, 56 operate in synchronism with one another.

The grid retract cylinder 94 is adapted to be moved from its extended position shown in FIGS. 1 and 2 in response to energizing of a solenoid, indicated generally at solenoid B in FIG. 9, so as to pull the second carriage portion B from the position shown to a downstream position, best shown schematically in FIG. 6, and a lost motion mechanism, indicated schematically in FIGS. 4, 5 and 6 at 120, is provided for moving the first carriage portion A a slightly smaller distance in response to the travel of the grid retract cylinder 94. This lost motion mechanism comprises a pair of rods 76, 76 rigidly attached to the second carriage B and located on either side of the grid structure generally between the fixed guide rods 30, 30*a* and 32, 32*a*. Each rod 76 is clamped to the second carriage portion B by nut means 119, 119 and the grid retract cylinder 94 is retracted in response to energizing of solenoid B as shown in FIG. 9, so as to pull the second carriage portion B from the normal position illustrated in FIG. 5 to a downstream position wherein it is spaced from the first carriage A as best shown in FIG. 6. The first carriage portion is also pulled downstream, but only through a lesser displacement, as a result of the lost motion mechanism 120. Thus, in FIG. 6 the first carriage portion is spaced downstream from the carton C held by the line brake 40. Preferably, the upstream ends 119, 119 of the rods 76, 76 are threaded to receive pre-positioned lock nuts 119, 119 which are adapted to contact the upstream face of the slide bearing blocks 67, 67 on the first carriage portion.

Thus, in response to a predetermined travel of the actuator 94 and as limited by snubbers 75*a*, 75*a*, the first carriage portion A will have shifted through its predetermined displacement and the second carriage portion will have shifted through a second predetermined displacement slightly greater than that of the first. As indicated schematically in FIGS. 5 and 6, the line brake 40 together with the carton clamping devices associated with each of the carriage potions, 75 and 85, are adapted to clamp the associated cartons C, C to the bottom doors, 54 and 56, respectively. This carton clamping function is accomplished upon the closing of the limit switches 1LS and 2LS which comprise the lane detection device for indicating when the cartons are in position so as to be ready for separation within the grid structure. From FIG. 5, it will be readily apparent that the line brake 40 is adapted to clamp only one carton C against the deadplate 20, which deadplate comprises a fixed portion of the grid structure. The carton clamping devices 72, 72 on the carriage portion A are adapted to clamp four cartons C,C at substantially the same time that line brake 40 is energized, and in response to energizing solenoid A. The downstream clamping devices 86, 86 associated with the second carriage portion B are adapted to clamp two cartons C, C against the bottom doors 56, 56. The cartons downstream of the devices 86, 86 are securely held between the clamped cartons and the end wall 90 of the second carriage portion B. After the cartons are so clamped and following a predetermined time delay introduced by relay TDR–1, the grid retract cylinder 94 is energized, pulling the first and second carriage portions A and B through their predetermined linear displacements so as to provide a space between the cartons held in said carriage portions and between the fixed cartons associated with the line brake 40 and the upstream-most cartons held in the first carriage portion A.

Means is provided for raising a pair of packing cases C and D in position on a lift table 130 so as to be readily packed when the doors 54, 54 and 56, 56 are opened so as to drop the cartons C,C. The mechanism for so raising the packing cases C and D comprises a conventional component of the present combination and need not be described in detail herein. However, it should be noted that when the lift table 130 has raised the cartons C and D to be filled in position for accepting these cartons, a limit switch 5LS is closed, and as a result of the circuitry shown in FIG. 9, a trap door solenoid C is energized, providing air under pressure to the actuators 100 and 102 associated with opening the doors from their closed positions shown in FIG. 7 to their open positions best shown in FIG. 8. A time delay relay TDR–2 is also energized simultaneously with solenoid C, and after the expiration of a predetermined time delay, the contacts TDR–1 associated with the relay TDR–2 will be closed, energizing control relay CR2. This relay CR2 controls the de-energizing of solenoid C through normally closed contacts CR, and returns the trap doors to the closed position following this delay. With further reference to control relay CR2, a set of normally open contacts 2CR associated therewith are adapted to effect retracting of the grid to its normal position for receiving a second group of articles. This is done through a third control relay CR3 which has associated therewith normally closed contacts for de-energizing solenoid B.

Turning now to a more detailed specific description of the control circuitry shown in FIG. 9, the normally open lane detection switches 1LS and 2LS are adapted to be closed when the grid structure has received a full complement of cartons C,C to be loaded. Upon closing of these switches, a first con-

trol relay CR1 is energized, closing contacts 1CR and energizing time delay relay TDR–1. At the same time, solenoid A is energized, setting the brakes 42 associated with the deadplate 20, as well as the clamping devices associated with the first and second carriage portions A and B. Since the cartons in these carriage portions will be dropped from the grid structure and the switches 1LS and 2LS will reopen long before a second charge of articles is fed into the grid, means is provided for retaining the brakes and clamping devices in their clamped condition, and said means comprises a limit switch 3LS which is normally closed and which is only opened when the grid retract cylinder 94 has again returned the carriage portions to their initial position for accepting a second charge of articles. FIGS. 5 and 6 show the cam means 140 for closing switch 3LS. The time delay relay TDR–1 has contacts which when timed out will energize solenoid B for retracting the grid retract cylinder 94, and thereby moving the carriage portions A and B from their FIG. 5 to their FIG. 6 positions. Having reached the position shown in FIG. 6, carriage portion B will close limit switch 4LS as a result of cam means 150. Limit switch 5LS will be closed if a pair of packing cases C and D have been raised into position on the lift table 130, and solenoid C will then be energized causing the doors to be opened and allowing the cartons in the first and second carriage portions A and B to drop downwardly into the awaiting packing cases C and D. These doors 54 and 56 are reset upon the expiration of a predetermined time delay through the contact 2TDR which will be timed out when relay TDR–2 is energized. Time delay relay TDR–2 is energized simultaneously with the energizing of solenoid C associated with opening the doors themselves. Its contacts 2TDR control relay 2CR which in turn controls solenoid C. A limit switch 7LS associated with these doors as shown in FIGS. 5 and 6 will be closed when the doors return to their closed position, energizing relay CR3, and causing the control solenoid B for the grid retract cylinder to allow the latter to return to its normal position.

Finally, and still with reference to FIG. 9, means is provided for normally operating the infeed conveyor 10 at a predetermined low speed except when it is necessary to speed up the conveyor so as to advance the cartons C,C into the grid structure. In order to accomplish this function, a photocell and light source combination is provided, as indicated generally at 140 and 142, respectively. Whenever the photocell 140 does not detect a light from the light source 142, a solenoid E will be energized, causing clutch 12 to remain in position for low speed operation. On the other hand, high speed operation is is achieved whenever the opposite situation obtains. In this manner the infeed conveyor 10 is sped up whenever cartons are dropped into the awaited packing cases C and D and remains at high speed operation until a charge of cartons C,C is fed into the grid structure so that a carton blanks out of the photocell and the light path thereto, namely just prior to filling of the grid structure with such a charge of cartons.

We claim:

1. Apparatus for loading groups of articles into upwardly open packing cases arranged adjacent one another, said apparatus comprising an infeed conveyor for feeding articles in line toward one end thereof, a deadplate at said end of said conveyor and across which said articles travel by line pressure, line brake means associated with said deadplate for holding back articles on said infeed conveyor, a fixed frame downstream of said infeed conveyor and located above said cases to be filled, first and second lane defining carriage portions slidably mounted in said fixed frame and arranged in line with one another and with said infeed conveyor, each of said carriage portions including bottom doors movable between open and closed positions, means associated with each carriage portion for selectively engaging the upper surface of those articles in each of said groups to clamp them against said doors for movement with said carriage portions, and means for moving said carriage portions through predetermined linear displacements to provide a predetermined space between the article group held by said line brake means and the article group on said first carriage portion as well as to provide a predetermined space between said first and second carriage portions.

2. The apparatus of claim 1 wherein said means for moving said first and second lane defining carriage portions comprises, a single actuator having a fixed part carried by said fixed frame and a movable part connected to one of said lane defining portions, and a lost motion mechanism between said first and second lane defining carriage portions for moving said first portion through a slightly smaller displacement then said second portion.

3. The apparatus of claim 2 further characterized by article detection means on said second lane defining portion for generating a first signal when first and second groups of articles have been fed into said first and second carriage portions respectively, and means for setting said line brake means and said group clamping means in response to said first signal.

4. The apparatus of claim 3 further characterized by means for energizing said actuator following a predetermined time delay to allow said line brake and clamping means to operate as aforesaid, and timed means for returning said actuator to its initial position to reposition said carriage portions for receiving a second charge of article groups from said infeed conveyor.

5. The apparatus of claim 4 further characterized by means for opening said doors when said lane defining carriage portions have been so separated, said door opening means comprising at least one actuator on one of said lane defining portions with a fixed part carried by said portion and a movable part carried by one of said doors, and said doors on both portions being connected to one another by a common rock shaft having a telescoping splined portion to permit relative sliding movement between said lane defining portions.

6. The apparatus of claim 5 further characterized by snubber means for slowing said second carriage portion as it reaches its limit of travel in the downstream direction and for defining said limit of travel in said downstream direction, and additional snubber means for slowing said first carriage portion as it reaches its limit of travel in the return direction and for defining said limit of return travel.

7. The apparatus of claim 4 wherein said timed means also returns said doors to their closed positions, and control means for sensing return of said carriage portions to generate a signal for release of said line brake means and for return of said article clamping means.

8. The apparatus of claim 7 further characterized by means for controlling the speed of operation of said infeed conveyor to speed-up said conveyor prior to return of said carriage portions and prior to return of said clamping means so that upon release of said line brake means articles advance at high speed across said deadplate and into said in line carriage portions.

9. The apparatus of claim 8 wherein said means for controlling the speed of operation of said infeed conveyor comprise means for slowing down said infeed conveyor just prior to generating said first signal.

10. The apparatus of claim 9 wherein said means for slowing said infeed conveyor comprises a photocell mounted on said fixed frame upstream of said article detection means on said second lane defining carriage portion.

11. Apparatus for loading groups of articles into upwardly open packing cases, and comprising in combination an infeed conveyor for feeding articles in a downstream direction, a deadplate adjacent the downstream end of said infeed conveyor line brake means associated with said deadplate for holding back articles on said deadplate conveyor, a fixed frame downstream of said deadplate and located above the case to be filled, a lane defining carriage slidably mounted in said fixed frame for movement toward and away from said deadplate to provide a space between the articles held by said line brake means and those on said carriage, and means for controlling the speed of operation of said infeed conveyor to speed up said conveyor prior to movement of said carriage toward said deadplate.

12. The apparatus of claim 11 further characterized by article detection means on said carriage for generating a first signal when an article group has been fed into said carriage portion, and means for setting said line brake means in response to said first signal, said means for controlling the speed of operation of said infeed conveyor comprising means for slowing down said infeed conveyor just prior to generating said first signal.

13. The apparatus of claim 12 wherein said means for slowing said infeed conveyor comprises a photocell mounted on said fixed frame upstream of said article detection means on said carriage.

14. The apparatus of claim 13 further characterized by bottom doors on said carriage movable between open and closed positions, and means for opening said doors in response to movement of said carriage away from said deadplate, and means for clamping the articles on said carriage against said doors prior to movement of said carriage away from said deadplate.

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