United States Patent [19]

Webb et al.

[11] **3,788,496**

[45] **Jan. 29, 1974**

[54] **CAR LOADING APPARATUS**

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[21] Appl. No.: **161,587**

[52] **U.S. Cl.** ..... **214/6 C,** 214/6 S, 214/38 CC, 214/41

[51] **Int. Cl.** **B65g 57/28,** B65g 67/04

[58] **Field of Search** .... 214/41, 1 Q, 1 QA, 6 C, 6 S

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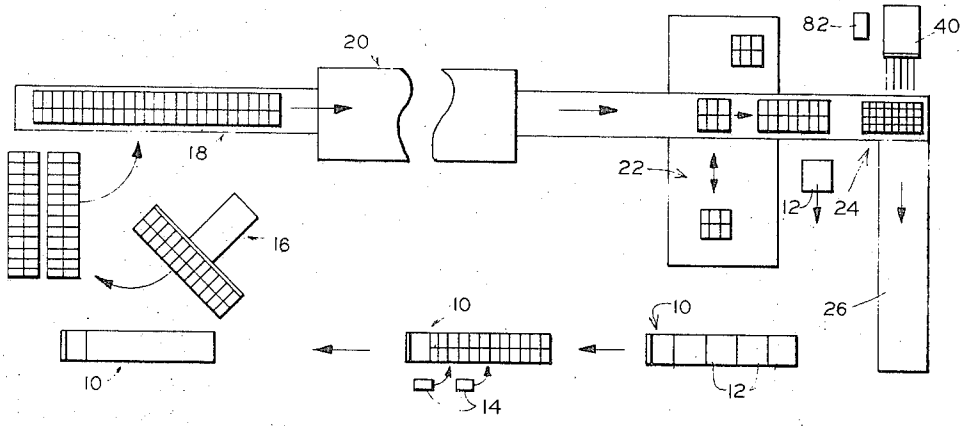
Primary Examiner—Robert G. Sheridan

Attorney, Agent, or Firm—Charles M. Fryer et al.

[57] **ABSTRACT**

There is disclosed a method and apparatus for assembling and loading cartons into transport vehicles such as trucks and railway cars. The apparatus includes a turning mechanism in combination with a conveyor for orienting a plurality of cartons into unit stacks which are assembled into tiers of stacks having preselected dimensions to fit a given cargo space. Mechanical means are then used for inserting the assembled stacks into available cargo space to make a tight fit.

7 Claims, 22 Drawing Figures



PATENTED JAN 29 1974

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SHEET 1 OF 8

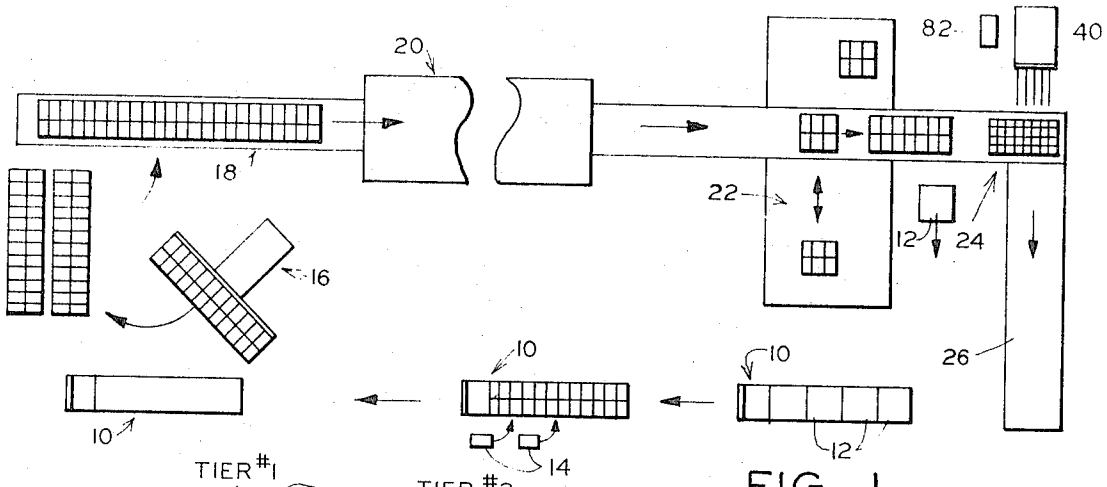


FIG 1

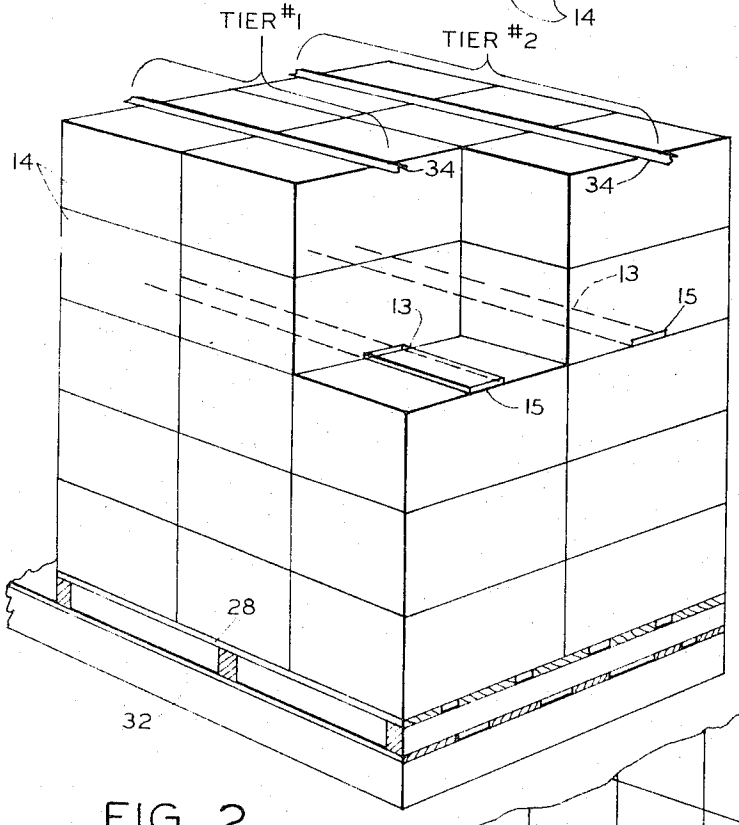


FIG 2

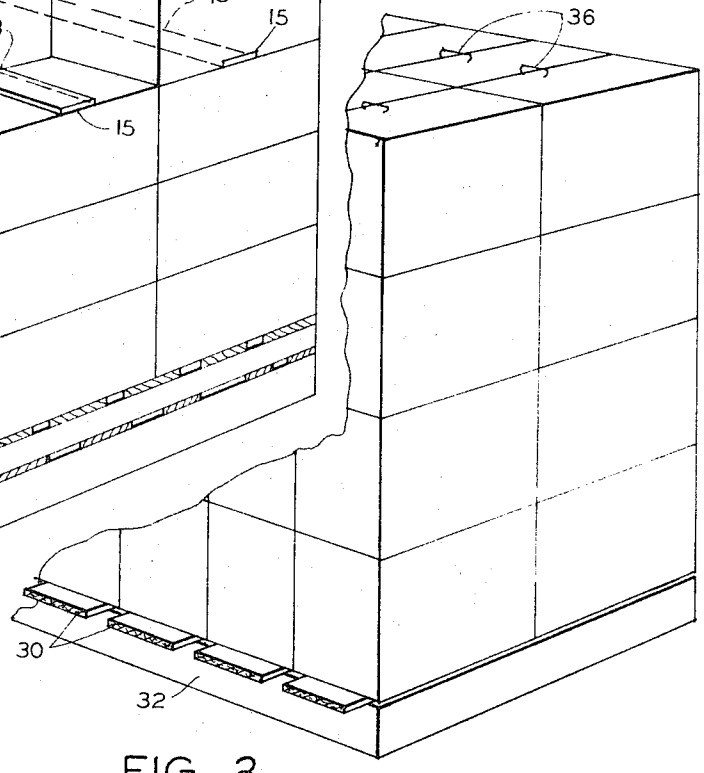


FIG 3

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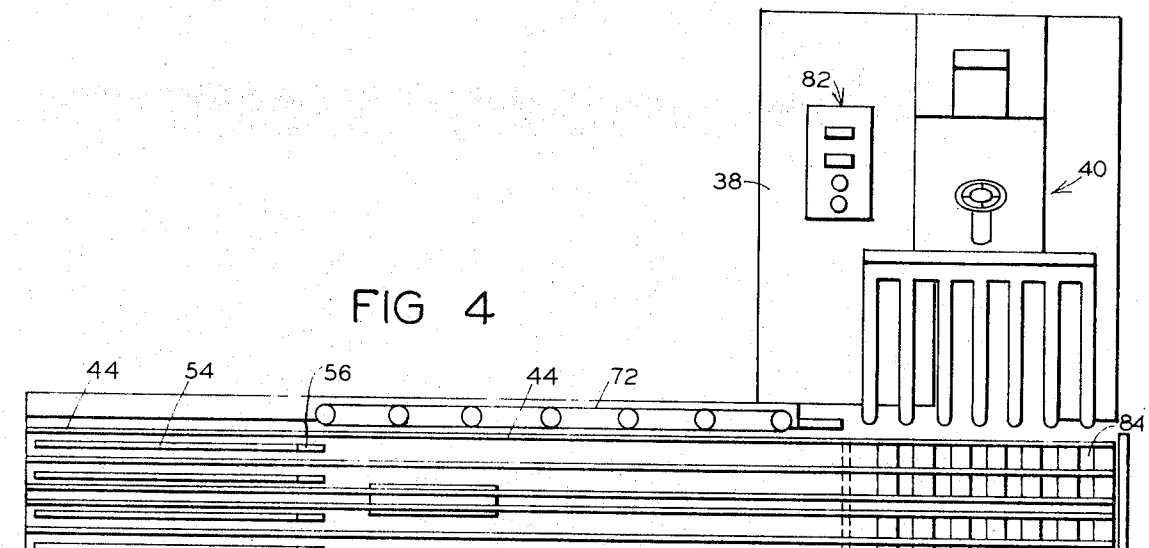


FIG 4

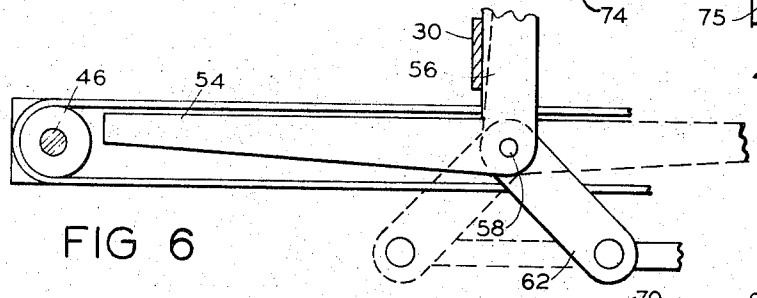


FIG 6

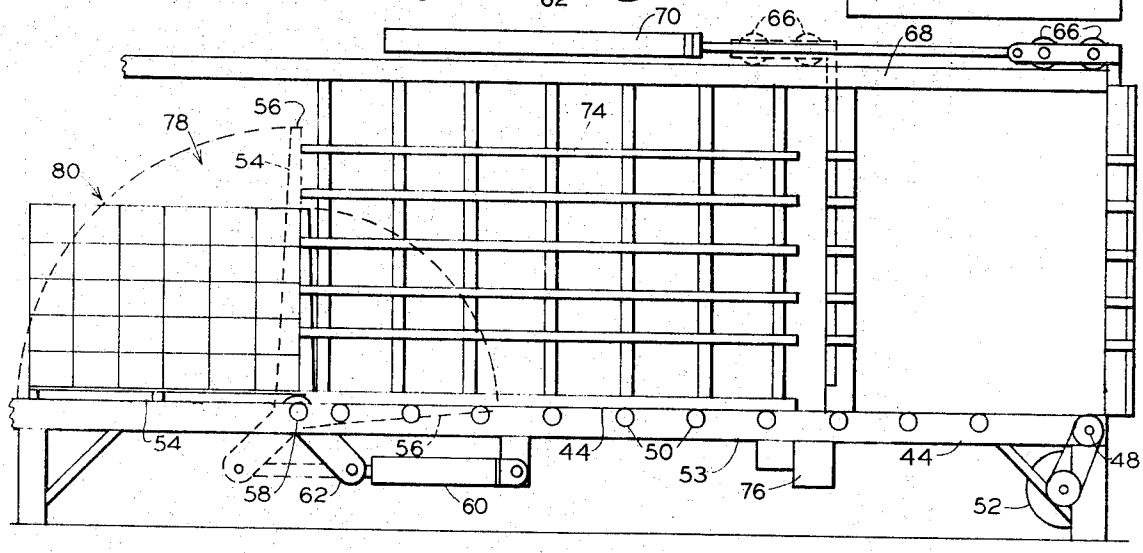


FIG 5

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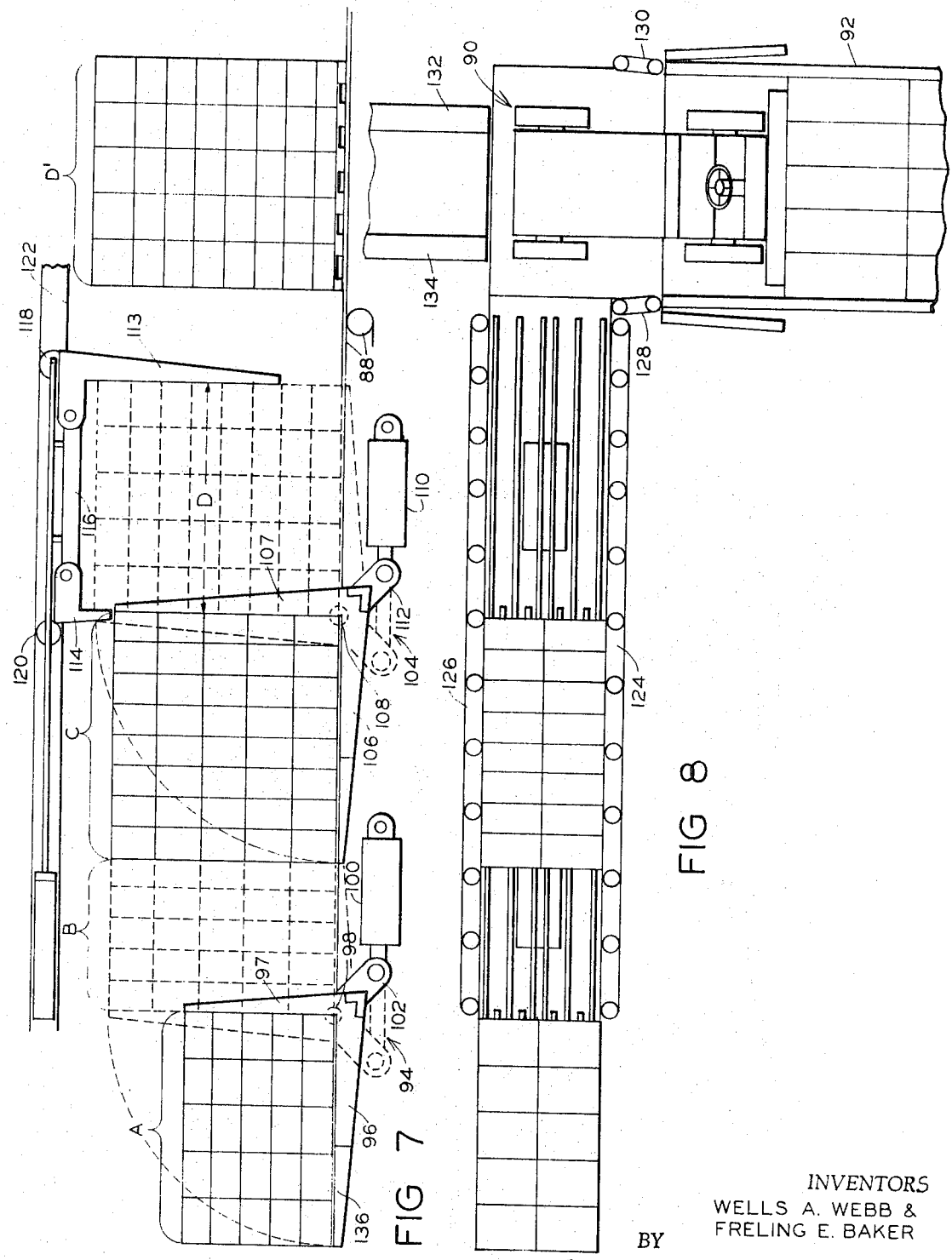


FIG 7

FIG 8

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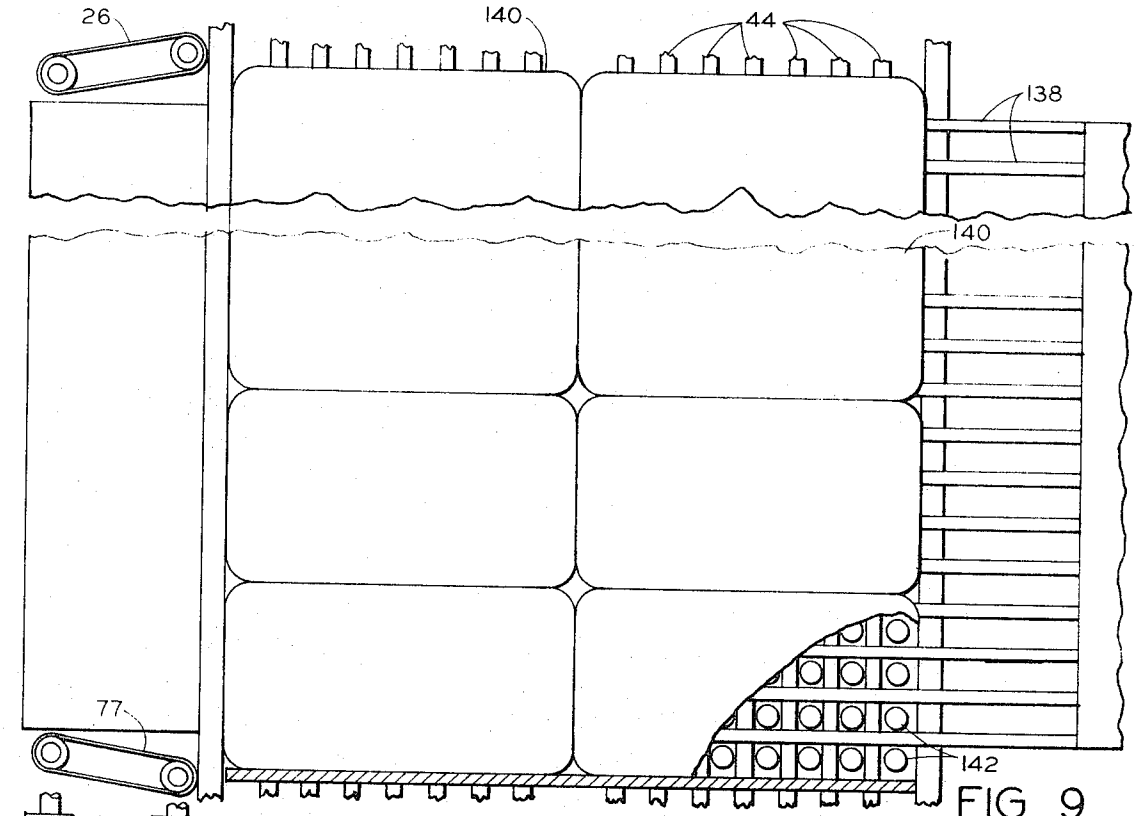


FIG 9

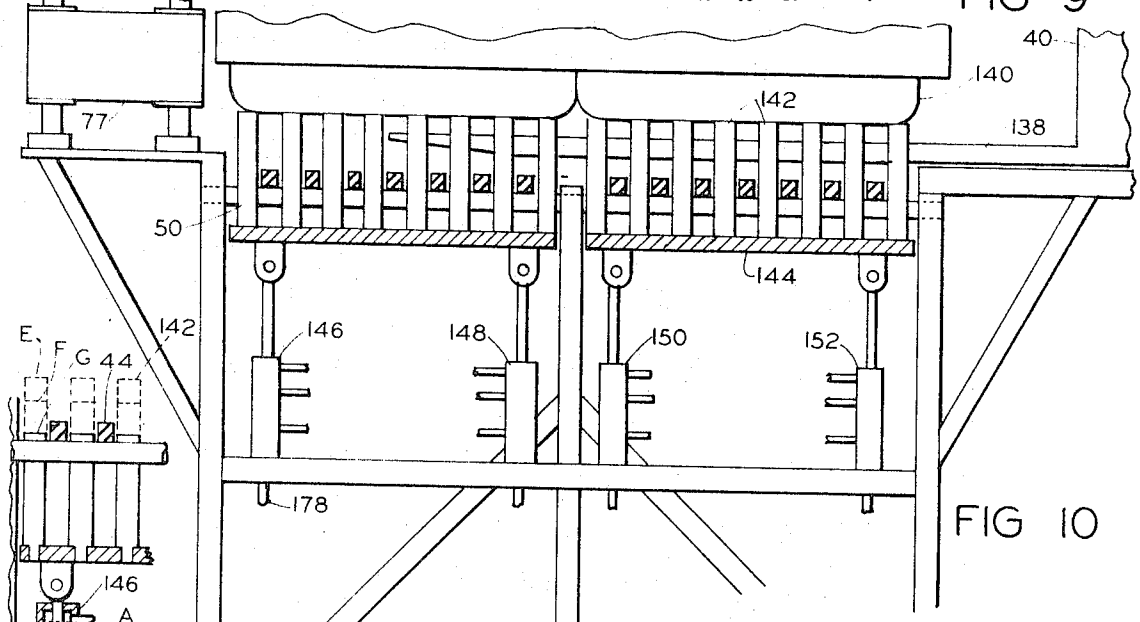


FIG 10

FIG 11

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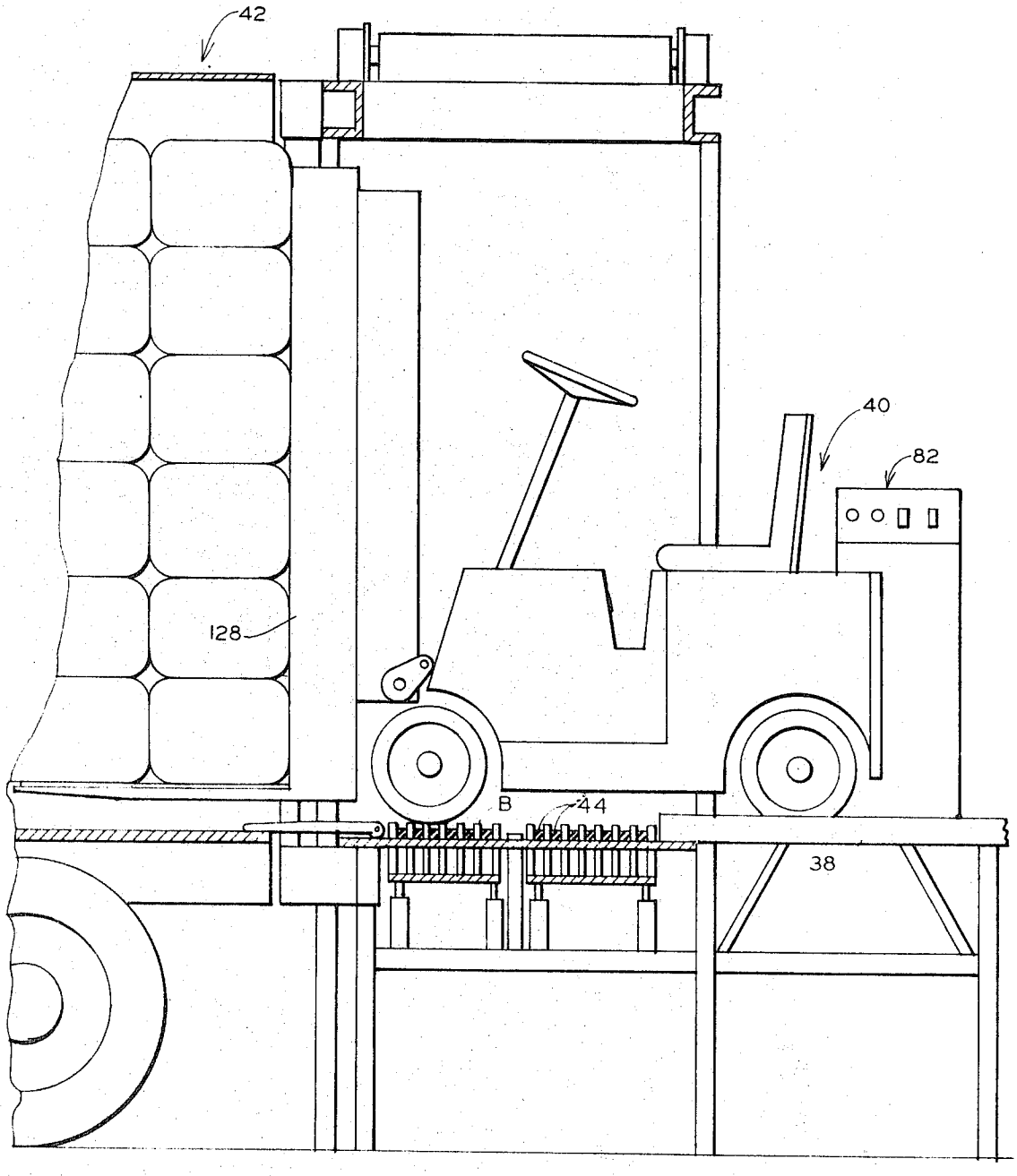


FIG 12

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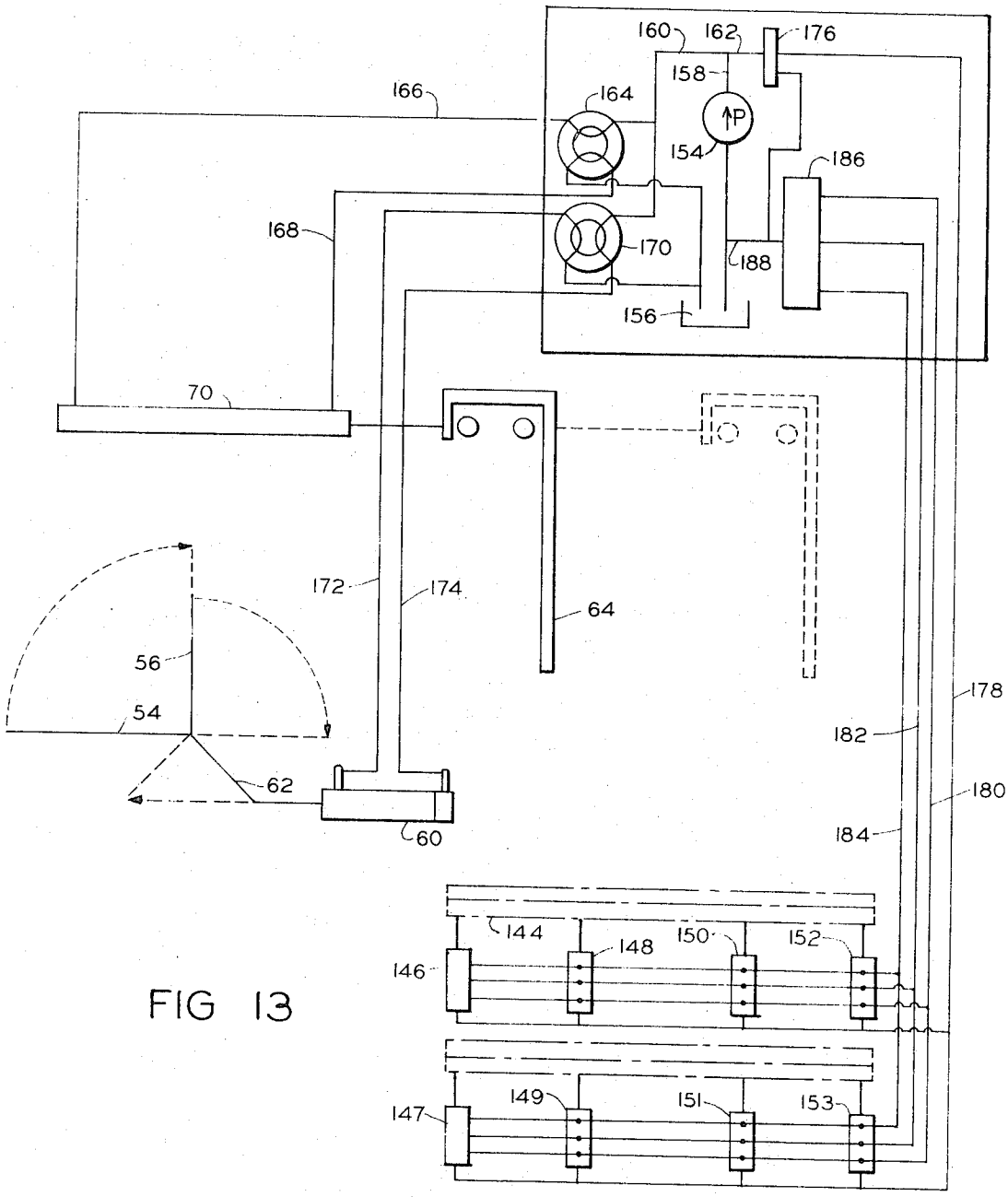


FIG 13

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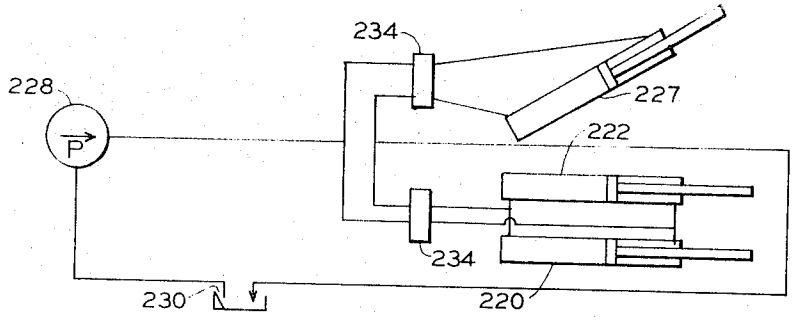


FIG 17

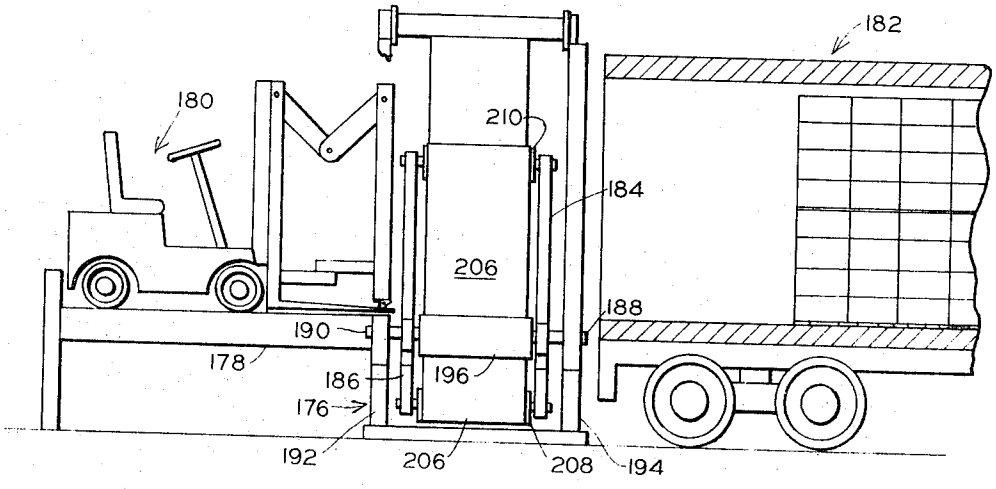


FIG 14

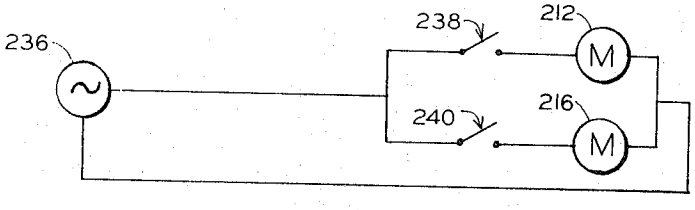


FIG 18

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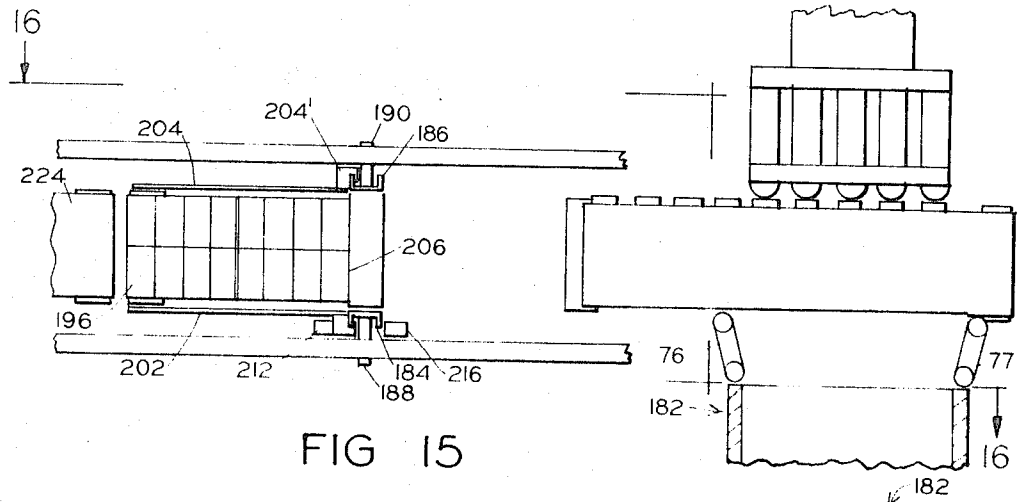


FIG 15

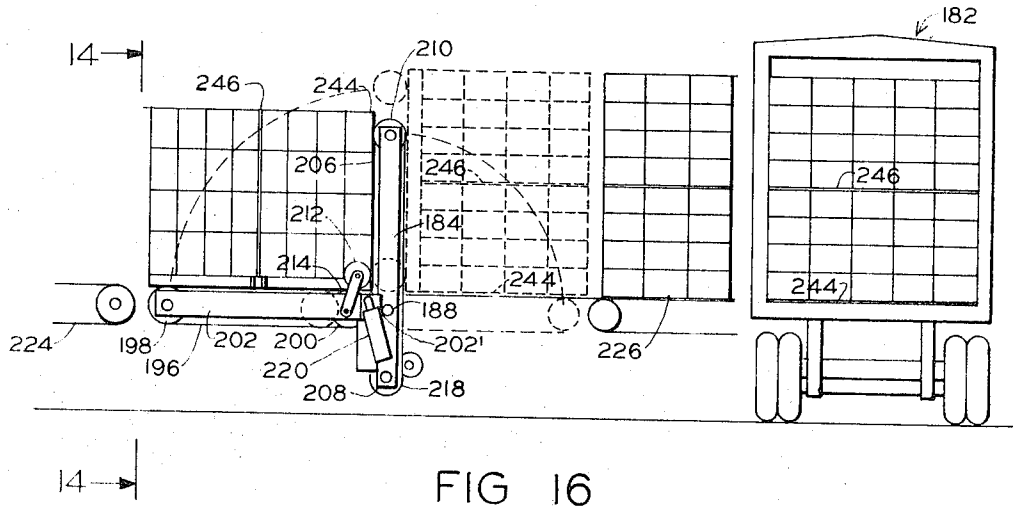


FIG 16

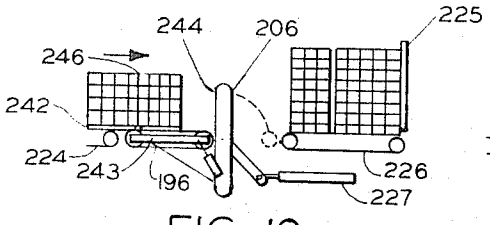


FIG 19

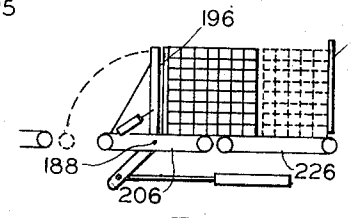


FIG 20

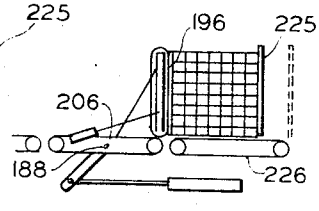


FIG 21

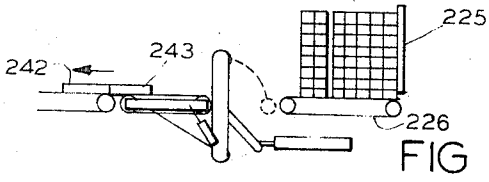


FIG 22

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CAR LOADING APPARATUS

BACKGROUND OF THE INVENTION

The present invention is related to article or carton handling, and pertains more particularly to a method and apparatus for assembling cartons into stacks of predetermined dimensions to fit a particular cargo space.

Fruits, vegetables and other produce are usually shipped from packaging plants to consumer outlets in cartons having generally rectangular sides. Such cartons usually have to be handled several times before being loaded on a transport vehicle to be shipped to consumer outlets. For example, the cartons may be loaded onto pallets and placed in storage areas until loaded into trucks or freight cars for transport. The cartons usually have to be loaded or stacked by hand onto the pallets and then transferred again by hand from the pallets to a truck or freight car. The loaded pallets normally cannot be loaded into the transport vehicle because of incompatible dimensions. That is, the cartons normally will not closely fit the space available either as to lateral dimensions or vertical dimensions. For example, the vehicle may be wide enough to take 2 ½ pallet loads and high enough to take 1 ½ pallet loads. Moreover, the roof of most vans and railway cars are not high enough to permit a lift truck to raise a pallet high enough to place it atop another stack. Thus, a great deal of manual handling which is both slow and expensive becomes necessary.

This problem is compounded because cartons differ in size from packer to packer and trucks and freight cars also differ in dimensions. Skilled loaders are normally employed to stack cartons in a truck or railway car in a manner so that they will not shift or vibrate when the vehicle is under way. Such cartons are normally overlapped and interlocked to make a snug pack. Loading in this manner is slow, and also expensive because of the time involved and because loaders normally receive a premium for stacking cartons over a certain height.

The above-described manner of handling cartons is particularly troublesome in industries where cartons must be handled a number of times before being placed on a transport vehicle for shipment to a distant market. An example of such an industry is the lettuce industry.

In accordance with present practice, heads of lettuce are placed in boxes or cartons when harvested in the field, placed on a field truck, as shown in "Industrial Refrigeration" May, 1954, page 16, and then taken to a cooling plant where they are cooled before loading into railway cars and vans for shipment to consumers. Existing cooling chambers are not tall enough or of correct width to receive stacks of cartons of sufficient height and width to fit the cargo space of present railway cars and vans. Therefore, in order to fill railway cars and large vans to capacity, layers must be added to such stacks, and the shape of the stacks must be altered by hand.

SUMMARY OF THE INVENTION

It is the primary object of the present invention to provide a method and apparatus to overcome the above problems of the prior art by providing means to assemble cartons into stacks of a pre-determined dimension.

Another object of the present invention is to provide apparatus for orienting layers of cartons into unit stacks and assembling said unit stacks into multi-unit stacks.

A further object of the present invention is to provide an apparatus for arranging layers for cartons into stacks to fit a given cargo space.

A further object is to provide method and apparatus to transport and deposit arranged stacks into given cargo space.

A further object is to arrange tiers on paper pallets that facilitate mechanical loading and unloading of the vehicle by lift trucks.

A further object is to teach a method for loading lettuce cartons on field trucks to facilitate later mechanical handling.

In accordance with the present invention, a conveyor mechanism is provided with an apparatus for orienting layers of cartons into tiers of selected height and assembling a plurality of the tiers and layers into a stack of selected dimension. The assembled stack is then oriented and deposited into the cargo space.

BRIEF DESCRIPTION OF THE DRAWINGS

The above and other objects and advantages of the present invention will become apparent from the following description when read in conjunction with the accompanying drawings wherein:

FIG. **1** is a plan view of a harvesting and shipping operation employing the present invention;

FIG. **2** is a perspective view of a preferred arrangement of cartons at point of harvest for presentation to the apparatus of the present invention;

FIG. **3** is a perspective view similar to FIG. **2**;

FIG. **4** is a plan view of a preferred embodiment of the apparatus of the present invention;

FIG. **5** is an elevational view of the apparatus of FIG. **4**;

FIG. **6** is a detailed view of the turning mechanism of the apparatus of FIG. **5** and FIG. **6**;

FIG. **7** is an elevational view of an alternate embodiment of the present invention;

FIG. **8** is a plan view of the apparatus of FIG. **7**;

FIG. **9** is a detailed plan view of an assembler and lift section such as shown generally at the right hand portion of the system shown in FIG. **4**;

FIG. **10** is an elevational view partially in section of a portion of the assembler and support means of FIG. **9**;

FIG. **11** is a fragmentary view of a portion of FIG. **10**;

FIG. **12** is an elevational view of a portion of the support mechanism of FIG. **10**;

FIG. **13** is a schematic layout of a hydraulic circuit for the apparatus of FIG. **4**;

FIG. **14** is a front elevational view of an alternate embodiment of the present invention;

FIG. **15** is a plan view of the embodiment of FIG. **14**;

FIG. **16** is a side elevational view of the embodiment of FIG. **14**;

FIG. **17** is a schematic layout of a hydraulic control system for the embodiment of FIG. **14**;

FIG. **18** is a schematic layout of an electrical system for the embodiment of FIG. **14**;

FIGS. **19–22** are schematic illustrations of the operation of the embodiment of FIG. **14**.

DETAILED DESCRIPTION OF THE DRAWINGS

Referring now to the drawings and in particular to FIG. **1**, there is illustrated a schematic layout of a har-

vesting and shipping operation as carried out, for example, in the lettuce industry and incorporating the present invention. In accordance with the flow diagram of FIG. **1,** a field truck **10** is provided with a plurality of suitable pallets **12** covering the bed or load-carrying platform. As the field truck or vehicle **10** is moved through the fields, cartons **14** are hand-loaded onto the pallets on the trucks without cross locking (Stabliization of the stacks may be accomplished by inserting sheets **13** between upper layers of the stack as shown in FIG. **2.**) in a manner as shown in FIG. **2** and FIG. **3.** Sheets **13** are pulled stepwise by handles **15** to stabilize added cartons. After the truck is loaded, it is taken to the processing or cooling plant where the load is removed by means of a giant lift truck **16** where the cartons are either placed in a storage area during the busy season or placed directly onto conveyor means **18** for movement into a cooling chamber **20.**

After the cartons of lettuce have been cooled in a cooling chamber **20,** they are then moved by suitable conveyor means to a storage area **22** to await shipment, or directly to a carton stacking and arranging machine according to the present invention. The apparatus of the present invention generally designated by the numeral **24,** is constructed and arranged for turning and assembling the cartons into stacks and loading the cartons into a suitable transport vehicle, such as a van or railway car.

The present invention has its greatest efficiency and, hence, utility when loading an end-loading van or railway car. That is, a vehicle having a door at one end and opening to the full width of the cargo space. With such vehicles, stacks of cartons fitting the width and height of the vehicle can be moved by lift truck through the door and fitted into place between the side walls of the vehicle. The entire cargo space of the vehicle can then be easily filled with stacks in this manner.

Vehicles having side doors (e.g. railway cars) present a special problem because a lift truck must turn 90° after entering the door to deposit its load. If the cargo door is wide enough, then at least the ends of the cargo space can be filled with little difficulty, leaving the turning space at the door unfilled. At least a part of the cargo space near the door can also be filled. However, if the proper dimensions exist with respect to the door width, cargo space width, and lift truck width, this space can be entirely filled. In other words, the present invention is useful in connection with filling all types of cargo spaces, although it is particularly adaptable to end-loading vehicles.

As applied to the lettuce industry, cartons of lettuce are preferably stacked in a manner as shown in FIGS. **2–3,** on conventional wooden pallets **28** or on special fiberboard slip pallets **30** such as disclosed in Application Ser. No. 133,795, entitled "Loading-Handling Pallet and Method" and filed Apr. 14, 1971. The cartons are loaded in this manner on pallets carried by the field truck. These loaded pallets are then normally transferred at the cooling plant to the bed or platform of a dolly **32.** The pallets are loaded preferably with one carton directly over another in individual or unit stacks forming two tiers, as indicated, of multi-unit stacks of a height which can be accommodated by a cooling chamber **20.** This height is normally five layers for existing cooling chambers whereas existing transport vehicles, such as vans and railway cars, may take from six to twelve layers of cartons per tier. Thus, we solve the problem of mechanical handling of stacks of cartons which must be accomodated by a cooling chamber having a maximum of five layers permissible and a transport vehicle that can accomodate a larger number of layers.

In order to avoid confusion, the term unit stack will be used to designate a single vertically oriented row of cartons. A plurality of these unit stacks constitute a multi-unit stack or simply, a stack. A row of unit stacks will constitute a tier. Thus, a stack may constitute one or more tiers of two or more unit stacks.

The width of the transport vehicle is also another dimension that must be accomodated by the system. Because of the absence of the interlocking of the tiers, as shown in FIGS. **2–3,** some means such as tape **34** or staples **36** may be necessary to enhance the stability of the stack of cartons. Sheets **13** are used for temporary stability in the field loading phase, and are normally removed completely when the field truck load **10** is completed.

Referring now to FIGS. **4–6,** there is illustrated a preferred embodiment of a loading platform and stacking machine in accordance with the present invention. The apparatus comprises suitable support means including a platform **38** for supporting suitable loading means, such as a conventional fork lift truck **40** and for supporting the load at a suitable height to accomodate the support floor of a transport vehicle **42.** The stacking apparatus comprises in combination, suitable conveyor means comprising a plurality of endless belts **44** supported by an idler pully **46,** driving pulleys **48** and a plurality of support rollers **50.** The conveyor is driven by a suitable motor **52** which is preferably reversible for purposes to be described and which may be either electric or hydraulically driven. This stacking machine includes an upending or rotating mechamism comprising a plurality of substantially L-shaped arms having a normally horizontally-directed arm **54** and a normally vertically-directed arm **56** pivotally mounted for rotation about a shaft **58.** This mechanism is operated by means of suitable power means such as a hydraulic motor **60** connected to an arm **62** attached in a suitable manner to the shaft **58.** Suitable guide and stop means such as a stop member **64** may be provided for stopping the stack of cartons at a suitable position in front of the door and aligned with the interior walls of the transport vehicle. This stop means is preferably movable and mounted, such as by means of a pair of wheels or rollers **66,** to ride on overhead rails **68** above the cartons and is adjusted to a suitable stop position by means of hydraulic motor or ram **70.** Suitable guide means, such as a plurality of vertically spaced belts **72** and **74,** may also be mounted or disposed adjacent each side of the conveyor to prevent cartons from tumbling from the stack as it passes along the conveyor to a loading position. This guide means may be driven by a suitable motor **76.**

In operation, the above-described apparatus receives two stacks of thirty cartons per stack, as shown in FIG. **2.** The belts **44** move the two stacks to vertical arm **56.** The machine now carries a pair of pallet loads **78** and **80,** each of which comprises a stack like that represented in FIG. **2.** Each pallet load comprises two tiers; each tier comprising five layers of three cartons in a tier. The two pallet loads together contain sixty cartons stacked five cartons high. These cartons, or stacks of cartons, are moved with the forward end or edge

against the upright arms **56**, with the lower cartons and pallets resting on the conveyor itself and the lower arms **54** extending out to the edge of the sixth tier in the stack. This entire stack is then rotated 90° completely re-orienting the stack such that the once horizontal layers become vertical stacks and the once vertical stacks become now horizontal layers with the cartons each standing on its edge, as shown in broken line just to the right of shaft **58**. In this position, the once upright arms **56** have tilted to the right between the plurality of belts, lowering the stack of cartons such that they now rest again on the plurality of belts **44**.

Repeated action as just described results in the accumulation of stacks of cartons held between belts **72**.

The accumulated tiers of cartons are then moved by the belts **44** to the right between guide belts **72, 74**, driven by a motor **75**, to stop member **64**, thus forming an appropriate stack of such a width that the correct numbers may be selected to fit snugly into the open end of a van **42**.

The number of stacks upended by the turning mechanism is usually different than the number required to fill the cargo space. The conveyor area behind the turnover mechanism is preferably long enough to permit accumulation of several stacks in excess of that required for each lift truck load deposited in the cargo space.

The lift truck **40**, now having lift platform or forks adjusted to a width suitable to fit the van or vehicle **42**, moves forward from the position shown in FIG. **4** and selects a stack of a width to fit the van **42**. The lift truck then moves directly forward across the conveyor belts **44**, between guide and compression means comprising belts **76–77**, and deposits the load into the van. It is, of course, necessary that the motion of the conveyor be stopped, or at least the movement of the cartons to the right stopped, during the time that the lift truck **40** moves across the conveyor belt. The compression and/or guide means **76–77**, may be necessary in most instances where a close fit normally exists between the stack and van walls. The lower cartons in the stack will tend to bulge or expand due to the weight of cartons from above. This expansion and space between the stacks may cause the selected stack or stacks to exceed the width of the van. Thus, the compression means permits the formation of a closely packed and stable load. When the cartons settle onto the floor of the van, the lower cartons bulge or expand into engagement with the side walls.

A control station or console **82** within reach of the lift truck operator when the truck is in the position as shown in FIG. **4**, permits the operator merely to reach to one side to the control panel **82** and manipulate the necessary buttons and switches necessary for arranging the cartons in a properly oriented stack and presenting them to a position to be selected and loaded into the awaiting transport vehicle.

The above-described operation, of course, assumes that the orientation described properly fits the receiving van or transport vehicle and that transporting the cartons on the side as illustrated is satisfactory. Alternate orientations of the stack can be accomodated in that the above-described conveyor is reversible, and also an alternate embodiment for such contingency is provided in FIGS. **7–8**, as will soon be described.

It is also apparent that some provision must be made for removing the cartons from the conveyor by means of lift truck **40** without interference of the lift truck with the conveyor belts when no pallets are used in a loading operation. In this connection, suitable supporting means, such as a plurality of support members **84**, extend between the belts **44** and are provided wit sufficient space therebetween **86** to receive the forks of the loading truck **40**. These support members **84** are preferably movable vertically between and with respect to the belts **44** to lift and support the cartons above the belt, allowing sufficient clearance to permit the forks to extend beneath the cartons. An embodiment of this type support means will be described in detail below with respect to FIGS. **9–11**.

It is, of course, apparent that pallets either of the wooden type or of the paperboard type may be used to support the stacks in the van. If pallets are to be used, they are simply placed against the upright arms **56** so that when the stack is rotated 90°, it then rests upon a pallet which in turn is resting on the conveyor belt **44**. With the use of such pallets, the above-mentioned lift and support mechanism becomes unnecessary.

It is, of course, possible to operate the above machine in a manner that the above-described cartons may be loaded in their upright position as originally presented to the machine. Such an operation would be necessary where cartons are designated as having a top or a side which must be kept up or where the cartons must rest in such a particular position. With this operation, of course, it would be necessary for the conveyor and rotating mechanism to be reversible and the lift truck runway and support platform be positioned at the left side of the rotating mechanism, as viewed in FIG. **4**. With such an arrangement, the cartons are separately received and assembled to the right, as shown in FIG. **5** and described above, until a suitable number of tiers are received. The conveyor is then reversed and the rotating mechanism then loaded with a sufficient number of tiers to form the lift truck load and rotated back to the left or counterclockwise direction to rest in the original upright position.

If the cartons have no preferred or designated top position, then a suitable mechanism or apparatus, as illustrated in FIGS. **7–8**, may be utilized to accomplish the desired result where the cartons must be flatwise rather than edgewise.

Referring specifically to FIGS. **7–8**, there is illustrated an apparatus comprising a conveyor belt **88** for moving stacks of cartons to a position on a loading platform to be manipulated by a lift truck **90** and placed and loaded on a van or railway car **92**. This arrangement comprises a first rotating or turnover mechanism generally designated by the numeral **94** and comprising a plurality of arms of generally L configuration having a horizontal arm **96** and a vertical arm **97** mounted for rotation about an axis or shaft **98** and powered by hydraulic motor means **100** connected such as by an arm **102** to the arms **96–97**. A second rotating or turnover means **104** is mounted or disposed downstream of the first turnover mechanism and comprises generally a plurality of L-shaped arms having horizontal arms **106** and vertical arms **107** mounted for rotation about an axis or shaft **108** and powered by a hydraulic motor **110** connected by an arm **112** to rotate the arms **106–107**.

Suitable guide and retaining means, such as a stop arm or plate **113** and a latch dog **114**, may be supported on an overhead carriage **116** which is supported by suitable wheels **118** and **120** on suitable overhead

rails **122.** This guide-and-retaining means serves to hold the stack together with the tiers in their upright position, as the entire stack is moved to the right along the conveyor to a position in front of the lift truck to be placed into the transport vehicle. The entire apparatus may be provided with suitable guide means such as a plurality of belts **124** and **126,** as described above, for retaining the stack in its upright position as it travels the length of the conveyor belt. Suitable guide means for guiding and compressing the load or stack may comprise suitable short belt arrangements such as indicated by numerals **128** and **130.** The support platform may be provided with suitable guide ways **132** and **134** for engagement by the wheels of the lift trucks **90** to assist the lift truck operator in properly guiding the stack into the transport vehicle.

The above-described arrangement permits an almost continuous straight line mode of operation in assembling and stacking a plurality of cartons and loading them directly into a transport vehicle. In carrying out the present invention, stacks of cartons normally comprising two tiers, each comprising three stacks, five cartons high for each stack, are fed onto the conveyor belt, at the left, normally resting on suitable pallets **136** and are moved forward against the upright arms **97** and above the horizontal arm **96.** At this point, it is necessary to determine the dimensions of the transport vehicle into which the cartons will be loaded. Once the dimensions are established, a suitable number of tiers are selected to fill the cargo space. The arms **96–97** are preferably telescopic with the end thereof extended outward to the edge of the selected number of stacks. This selected number of stacks, designatd by the letter A, is then rotated 90° to stand on the edges of the cartons to form a stack B, which is then moved to the right along the conveyor **88** where it assembles together with othe similar stacks against the L-shaped upright arm **107** and resting over the horizontal arm **106.** The horizontal arm **106** is extended sufficiently to select the desired number of stacks which will form the horizontal layers to fit the height dimension of the transport vehicle. A suitable number of stacks are selected to form a large stack designated by the letter C and rotated clockwise 90° to form a stack D of a size properly oriented to fit the dimensions of the transport vehicle. This stack is then appropriately seized between the retaining means **113** and **114** and moved by conveyor means **88** to an assembly area **89** in front of the lift truck where it is then manipulated by the lift truck into the vehicle **92,** as shown in FIG. **8** when pallets are used, the assembly area **89** may simply be a smooth flat platform such as stainless steel having a slick surface. The pallet **136** under the first stack is removed when the second stack is formed, but may be positioned to receive the final stack by placing it against the upright arm **107** such that the stack rests thereon when rotated again to rest on the conveyor means **88.**

The use of pallets can greatly improve the handling of the load with the transport or lift truck, and eliminates the need for special support means to lift and support the stacks of cartons above the conveyor belt.

In the event that it is necessary or desirable to load the cartons into a vehicle without the use of pallets, some means as mentioned before must be provided for permitting the lift truck to remove the cartons from the conveyor belt without interference.

Referring now to FIGS. **9–12,** such means are provided and illustrated primarily in connection with the embodiment of FIGS. **4–6,** although it may be readily provided for the embodiments illustrated with respect to FIGS. **7–8** and FIGS. **15–20.** This apparatus for supporting the load above the conveyor belt will be described with respect to the embodiments of FIGS. **4–6,** and thus will have like numerals designating like elements.

Referring now to FIG. **9,** there is illustrated a top fragmentary view of a portion of the apparatus of FIG. **4** as viewed from directly above the area of the conveyor means where the lift truck removes the stack of cartons from the conveyor. In this view, a plurality of belts **44** are shown traversed by a plurality of tines **138** of a lift truck **40** with the overlying position of the plurality of cartons **140** shown in solid lines. A plurality of round elongated pegs **142** are shown extending upward between the belts and between the tines or fingers **138** of the lift truck **40.** These pegs are preferably supported by means of a movable plate or platform **144** which is moved in various positions by means of a plurality of hydraulic motors **146, 148, 150** and **152** (FIGS. **10–11**). As can best be seen in FIG. **10,** the pegs **142** extend between the belts and engage the bottom of the cartons **140** and push them a few inches above the belts **44.** The pegs **142** are also spaced apart to permit the tines **138** of the lift truck to extend therebetween above the belt and below the cartons **140.** The lift truck then lifts the stack of cartons above the belts **44** and moves across the belt, as illustrated in FIG. **12,** with the wheels riding on pegs **142** above the belt and deposits the load or stack of cartons into the vehicle **42.** After the cartons have been placed in the vehicle **42,** the lift truck **40** then backs across the belt or conveyor riding on the pegs **142** and moves back onto the platform **138** where the operator then, from control panel **82,** controls the assembly and the depositing of another stack into position in front of the lift truck to be taken into the transport vehicle.

The pegs **142** are preferably operable by means of the control motors **146–152** to be positioned in three different positions, as shown in detail in FIG. **11.** The pegs are preferably provided with the means to maintain an uppermost position designated by E, an intermediate position F, and a lower position G. The G position is below the belts **44** and permits the cartons to rest directly on the conveyor belts **44.** The two upper positions E and F lift the cartons a slight bit above the belt to permit the insertion of the forks **138** and to support the lift truck in a position above the belts.

Referring to the schematic layout of FIG. **13,** a pump **154** draws hydraulic fluid from a sump **156** and delivers it by means of a supply line or conduit **158** having branches **160** and **162.** The branches **160** supply fluid to a distributor valve **164** which supplies fluid to either side of a double-acting motor **70** by way of conduits **166** and **168.** The double-acting motor **70** is operatively connected for operating the movable stop **64** illustrated in FIG. **5.**

A second distributor valve **170** directs fluid alternately to either side of double-acting motor **60** by means of supply lines **172** and **174.** The motor **60** is operatively connected to arm **62** for operating the turning mechanism comprising members **54, 56,** illustrated in FIG. **5** for rotating the cartons 90°. A duplicate of this

circuit may be added to accomodate a second turning mechanism if such is desired in the system.

The supply line **162** is operatively connected to a distributor valve **176** which directs fluid by conduit **178** in parallel to motors **146–153** which are in turn connected for moving the platform **144.** These motors are each in turn connected in parallel to return lines **180, 182,** and **184,** each of which leads to a distributor valve **186** which is operative to direct fluid selectively from each of said lines to return line **188.** This arrangement is such that the motors, as shown in FIG. **11,** are each provided with three open return passages controlled by valve **186** such that when pressurized fluid is supplied to the inlet by supply conduit **178** such that the piston moves upward to the first return conduit **180** which, if open, permits the pressure to stabilize to maintain all pistons in that position. However, if the first conduit **180** is closed, all pistons continue to move upward to the next return conduit **182** and again if the valve **186** blocks this return, the pistons continue to move up past the communications with return line **184.** If valve **186** is positioned such that return line **184** is open, the pistons will stabilize in the top position and maintain the platform and pegs level in the uppermost position. Thus, the position of the support platform depends upon which of the return lines **180** through **184** is open.

Referring now to FIGS. **14–18,** there is illustrated an alternate embodiment of the present invention wherein the conveyor means itself is tiltable to stack the cartons. Referring particularly to FIG. **14,** there is illustrated an embodiment comprising a support frame **176** for supporting the conveyor or stacking apparatus and a support platform **178** for supporting a lift truck **180** at the height of the conveyor means and a transport vehicle **182.** The rollover mechanism comprises a support frame comprising side members **184** and **186** rotatably supported by shafts **188** and **190** and side members **192** and **194** of the support frame **176.** The frame **184-186** supports a first endless belt **196** movably supported on rotatable rollers **198** and **200** which are supported by frame members **202** and **204.** The frame members are provided with slides **202'** and **204'** and thereby are slideably mounted on support members **184** and **186** and powered by hydraulic motors **220** and **222** to move the belt **196** for pushing the stack from belt **206.** A second endless belt **206** is movably supported by rollers **208** and **210** in frames **184** and **186.** These two endless belts are disposed or mounted at right angles to each other and are adapted to pivot about the axis of shafts **188** and **190** for purposes to be described. The belt **196** is provided with suitable drive means such as an electric motor **212** connected by belt **214** for driving the roller **200.** The belt **206** is provided with suitable drive means such as a motor **216** connected such as by a drive belt **218** to drive roller **208.** Hydraulic rams **220** and **222** are provided for moving the support frame **202–204** with respect to the frames **184–186,** a conveyor **224** may be provided for delivering cartons to the rollover mechanism and a conveyor **226** for asembling and delivering the assembled stack to a position to be secured and loaded by a lift truck into the transport vehicle.

Suitable control circuits for the present apparatus are shown in FIGS. **17–18.** FIG. **17** discloses a suitable hydraulic control circuit comprising a pump **228** which draws fluid from a sump **230** and supplies it to a pair of control valves **232** and **234** for supplying fluid to double-acting hydraulic motors **220, 222** and **227.**

Illustrated in FIG. **18** is a suitable electrical control circuit comprising a source of electrical power operatively connected for supplying power to a pair of switches **238** and **240** which are operative to control the operation of motors **212** and **216.**

Referring now to FIGS. **19–22,** there is illustrated a sequence of operation of the present invention, particularly the embodiment of FIGS. **14–16,** together with a method of loading that is particularly suitable for facilitating unloading. Referring specifically to FIG. **19,** stacks of cartons resting on pallets **242–243** are supplied by conveyor **224** onto conveyor **196** of the turning apparatus. The stacks move up against conveyor **206** and the stacks are then turned over, as shown in FIG. **20,** with one stack resting atop the other on conveyor **206.** The resulting stack moves then onto conveyor **226,** as shown in FIGS. **20–21,** where it is assembled with other similar stacks against movable stop means **225.** These stacks have been thus formed to fit the height dimension of vehicle **182.** A lift truck then selects a stack of suitable width to fit the width dimension, which is then put into the waiting vehicle. The turnover mechanism then may be returned to its initial position, as shown in FIG. **22,** with conveyors **196** and **224** reversed to send the pallets **242–243** back to the storage area.

This embodiment may also be operated in reverse as discussed in the FIGS. **4–6** embodiment when it is necessary for the cartons to be presented in a top up position. Also, a pair of the turnover mechanisms may be employed in series or in sequence, as illustrated and described in FIGS. **7–8.**

As an example, consider loading a particular vehicle **182** (FIG. **16**) having an end opening that is the same width as the cargo receiving area. The cargo space is of a dimension to receive five unit stacks of eight cartons each disposed flatwise. Consider also that it is desirable to unload the cargo by suitable mechanical means such as a lift truck. In order to unload cargo by such mechanical means, it is generally necessary that the cargo rest on suitable pallets. A preferred form of pallet is disclosed in co-pending Application Ser. No. 33,795, mentioned above.

With the above considerations in mind, the cartons from the field are loaded onto the field truck on edge, as shown in FIG. **3.** The pallets on the field truck can be loaded in this manner, with two tiers, each tier containing four unit stacks of four cartons on edge. These pallet loads can still pass through the cooling chamber in the usual manner.

As shown in FIGS. **16–19,** two pallets **242** and **243,** loaded in the manner described, are delivered to the turning apparatus such as by conveyor belt **224.** Paperboard pallets **224** and **246** are inserted upright against belt **206** and between the pallet loads. When the stacks are then turned over, as in FIG. **20,** the stacks are then resting in their normal flatwise position, one atop another on thin paperboard pallets. When the entire truck load is provided with pallets in this manner, it can be easily unloaded with a lift truck. As shown in FIG. **16,** pallets **224'** are present under the entire load and pallets **246'** are present between the fourth and fifth layers. A lift truck, at the destination, can then select a stack of two tiers having any number of unit stacks up to five and having a height of either four or eight car-

tons. Thus, the entire load may be easily removed by a lift truck.

In a similar manner, the methods and apparatus of the present invention may be utilized to form stacks of any desired size. For example, different size stacks may be formed to fill a given cargo space like pieces of a puzzle. Any number of stacks may be fitted adjacent or atop each other to fill a cargo space.

From the above description, it can be seen that there is disclosed method and apparatus for assembling a plurality of cartons into stacks of a selected size to fit the opening to the cargo space of a vehicle.

What is claimed is:

1. Loading means for use in combination with a lift truck and including means for assembling layers of cartons into stacks to be fitted into a three-dimensional cargo space having a support surface, said means comprising:

a support platform having a support surface for supporting cartons at substantially the same height as the support surface of said cargo space;

said support platform including conveying means for conveying cartons to a position to be loaded into said cargo space;

turning means operatively associated with said platform to receive rows of cartons, convert said rows into stacks and deposit said stacks on said platform;

movable stop means operative to move along said conveying means to accumulate and position stacks of said cartons on said support platform; and,

first guide means disposed in laterally spaced vertical planes disposed transverse to and to one side of said conveyor means for alignment with an opening into said cargo space for guiding selected stacks into said cargo space; and,

support means including second guide means disposed on the opposite side of said conveying means from said first side means to support and guide a lift truck in alignment with said first guide means for guiding said lift truck for moving said stack into said cargo space.

2. The invention of claim **1** wherein said turning means comprises a pair of support surfaces disposed at a fixed right angle to one another and each of said surfaces operative to tilt to and from the surface of said conveying means.

3. The invention of claim **2** wherein said support surfaces each comprise endless belt means, and one of said belt means is movable when in its vertical position along the other of said belt means.

4. The invention of claim **2** wherein said conveying means comprise a plurality of endless belts disposed in parallel relation; and

said turning means comprise L-shaped arms which are pivotally disposed between said belts.

5. The invention of claim **4** comprising means extending between said belts and movable to support said stacks of cartons above said conveying means to permit removal therefrom by a lift truck.

6. The invention of claim **4** wherein said arms are adjustable in length to adjustably select a predetermined number of cartons.

7. The invention of claim **1** comprising adjustable support means to lift and support said cartons above said conveying means and for supporting said lift truck for traversing said conveying means.

* * * * *

UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,788,496 Dated January 29, 1974

Inventor(s) Wells A. Webb and Freling E. Baker

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

In claim 1, column 12, line 5, "side" is corrected to read:

guide

Signed and sealed this 10th day of September 1974.

(SEAL)
Attest:

McCOY M. GIBSON, JR.
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents

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