Feb. 27, 1973 K. E. MEISSNER 3,718,223

METHOD OF PALLETIZING CANS

Original Filed Dec. 4, 1969 10 Sheets-Sheet 1

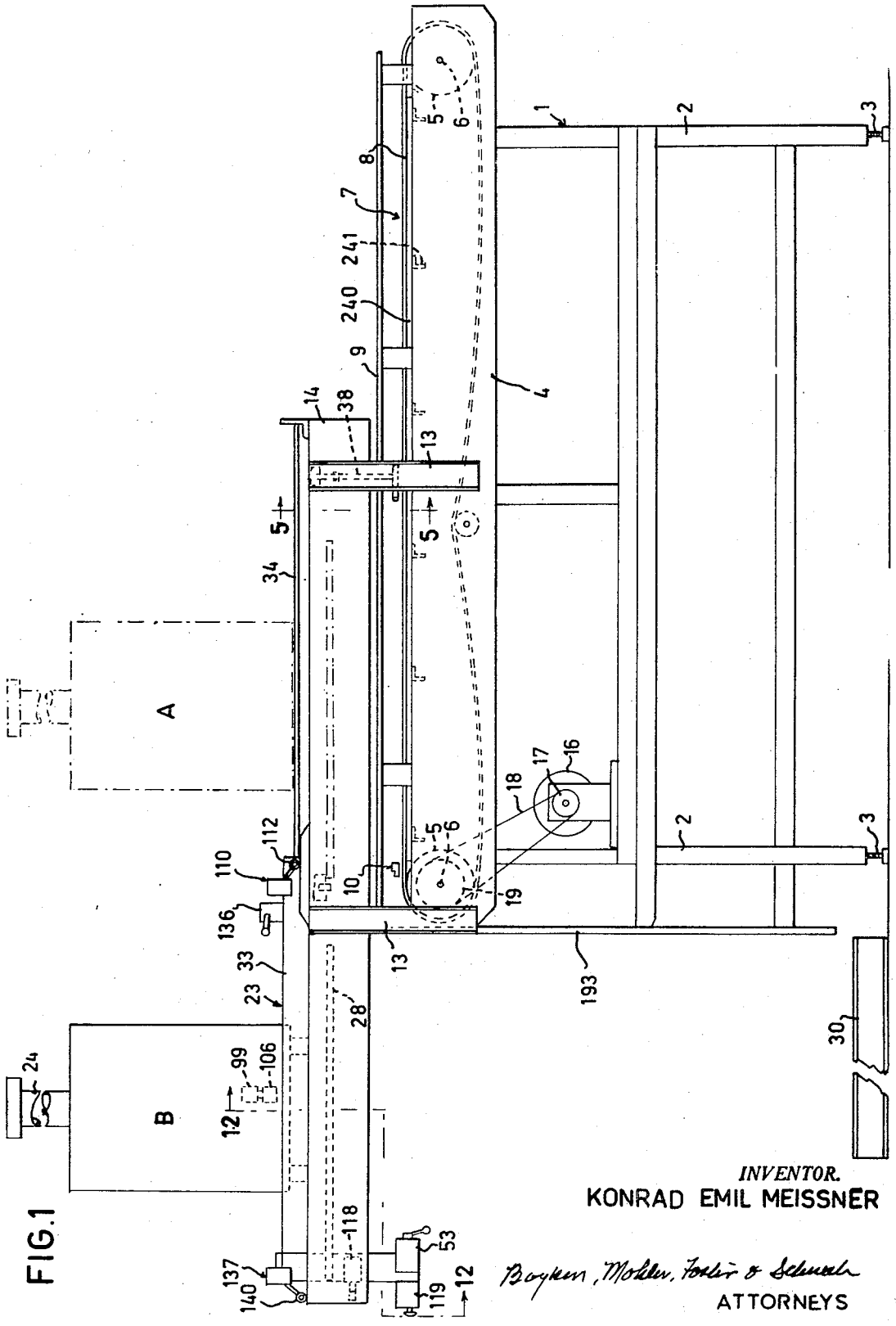

FIG.1

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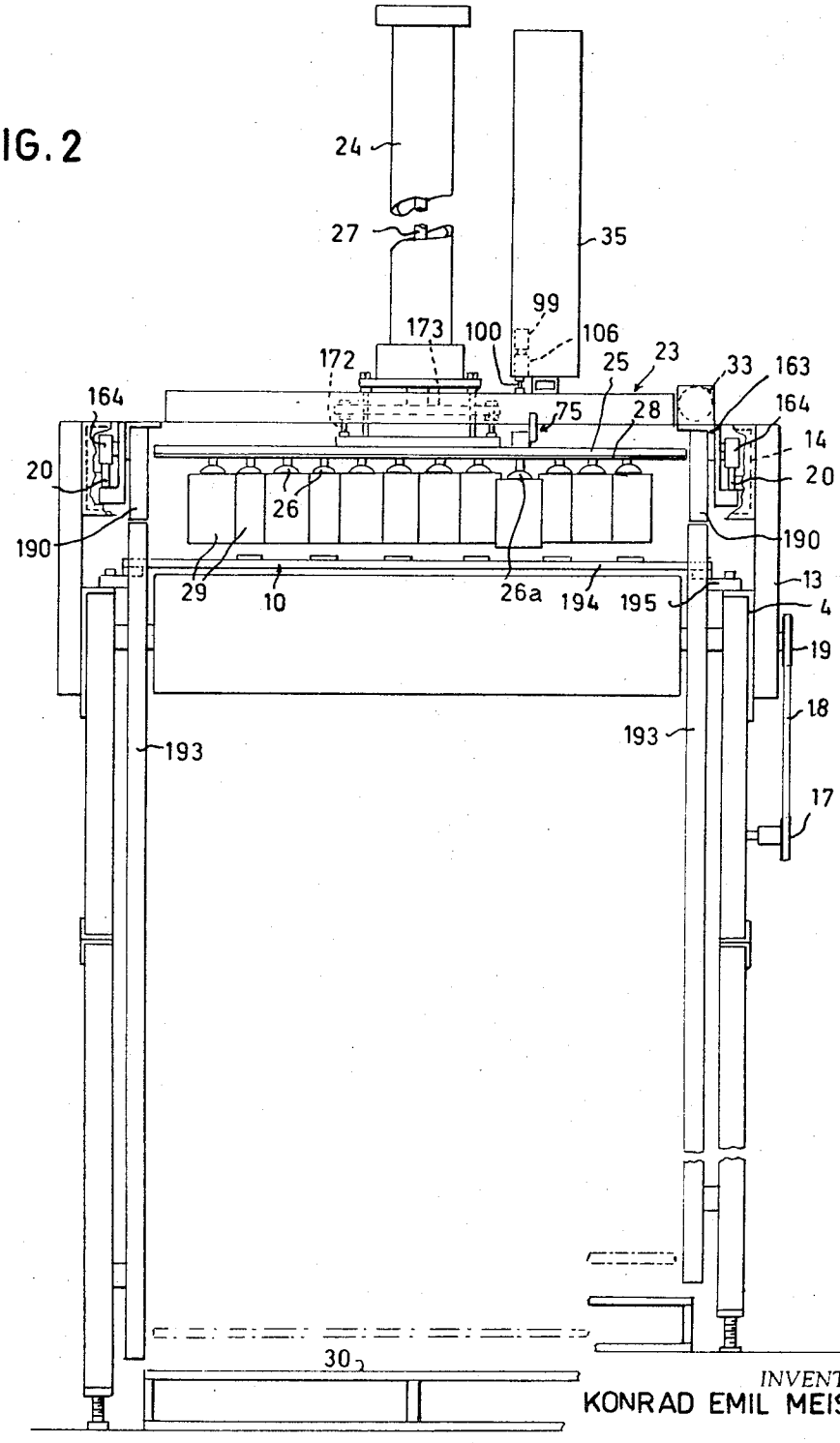
FIG. 2



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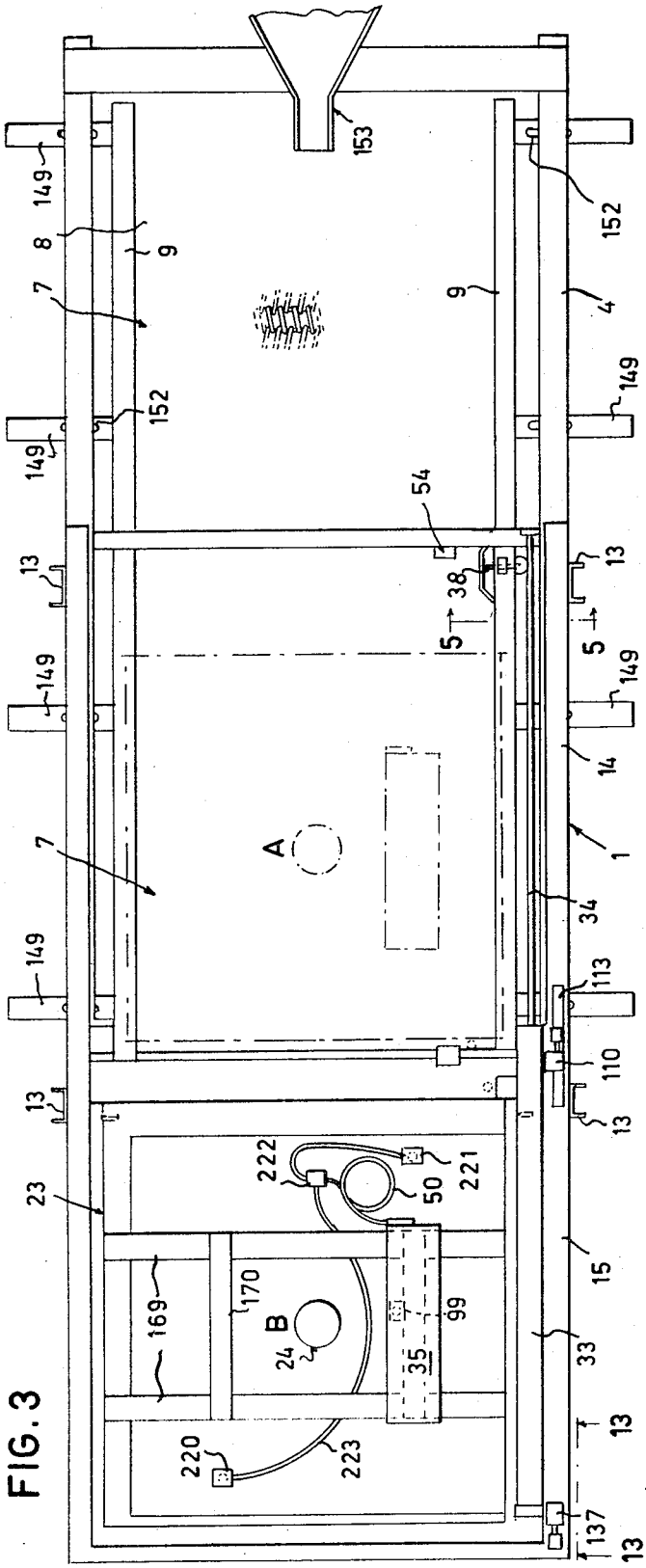

FIG. 3

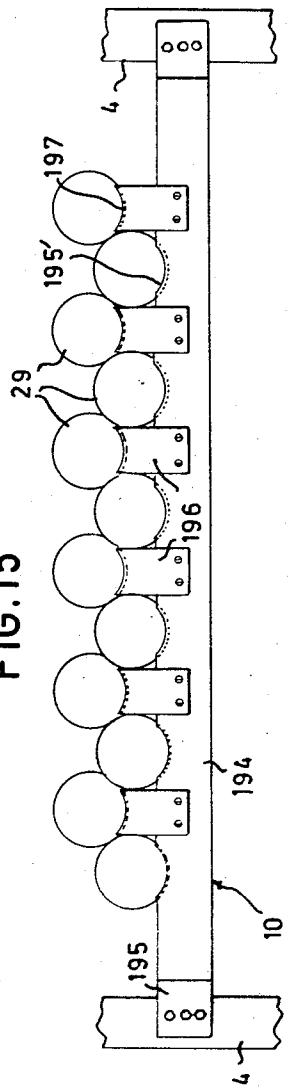

FIG. 15

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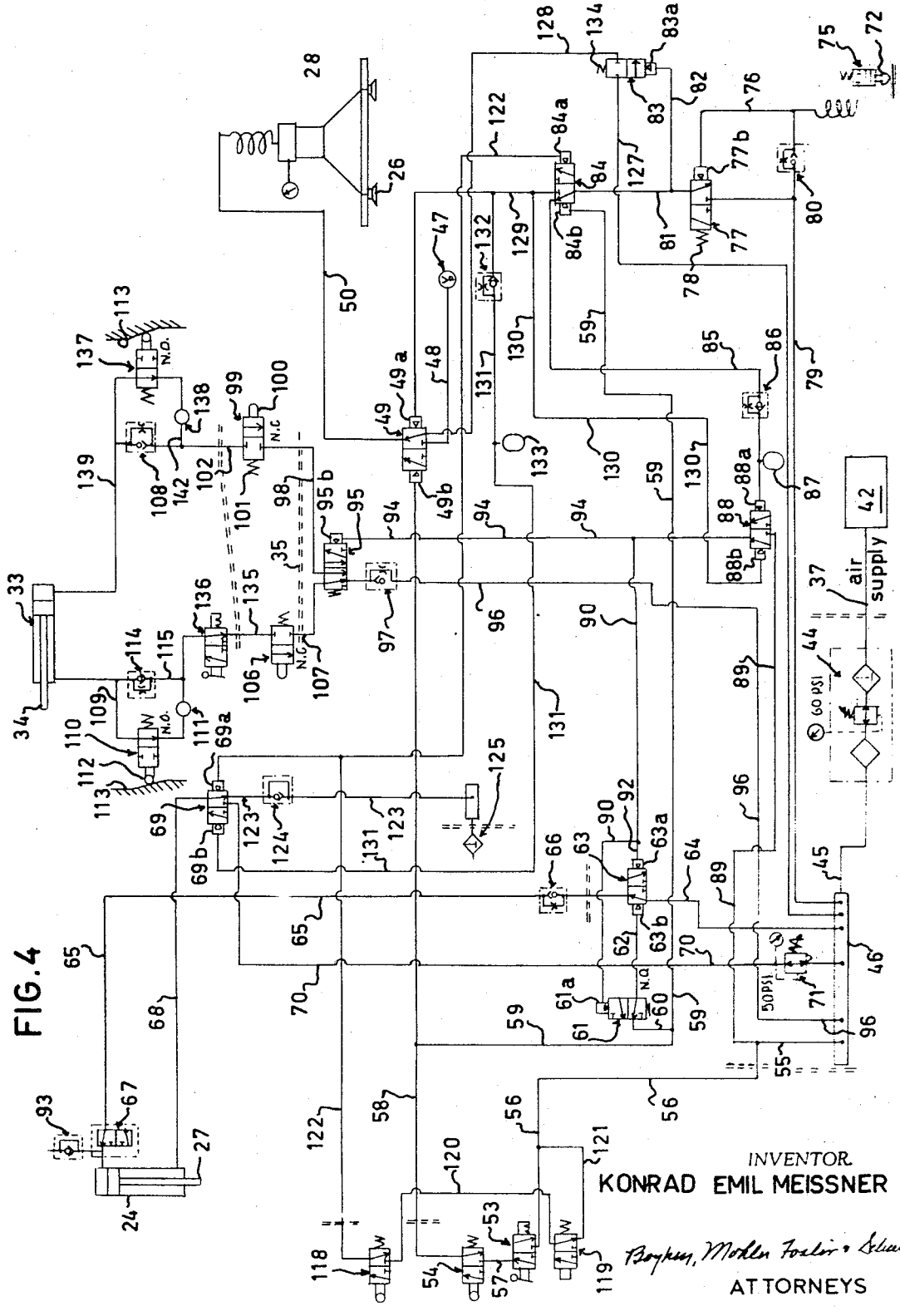

FIG. 4

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FIG. 5

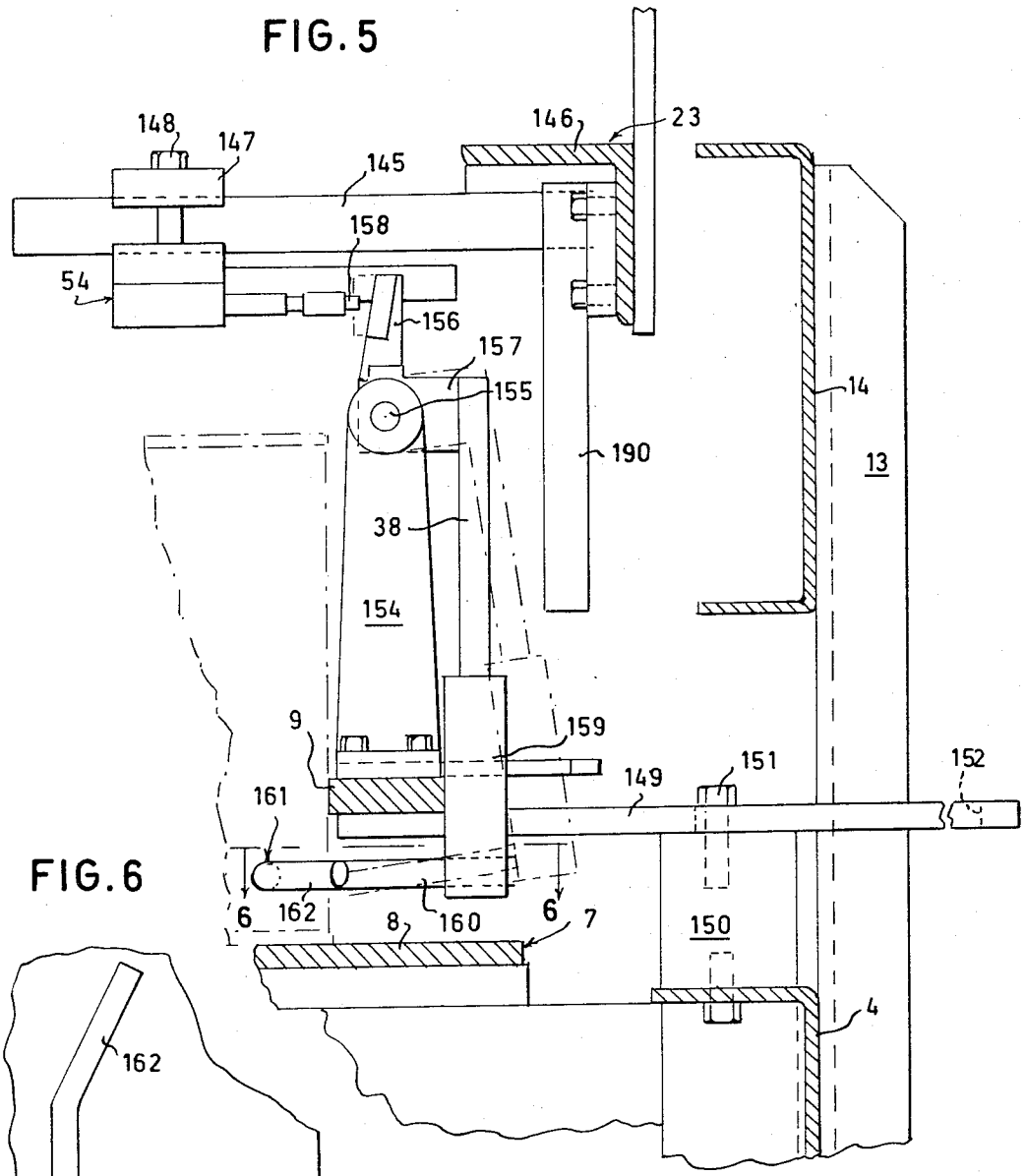

FIG. 6

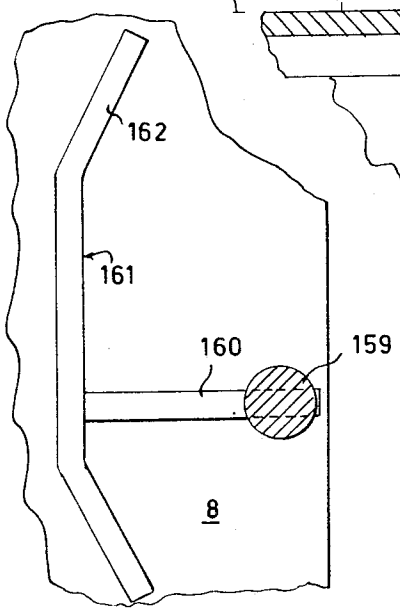

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FIG. 7

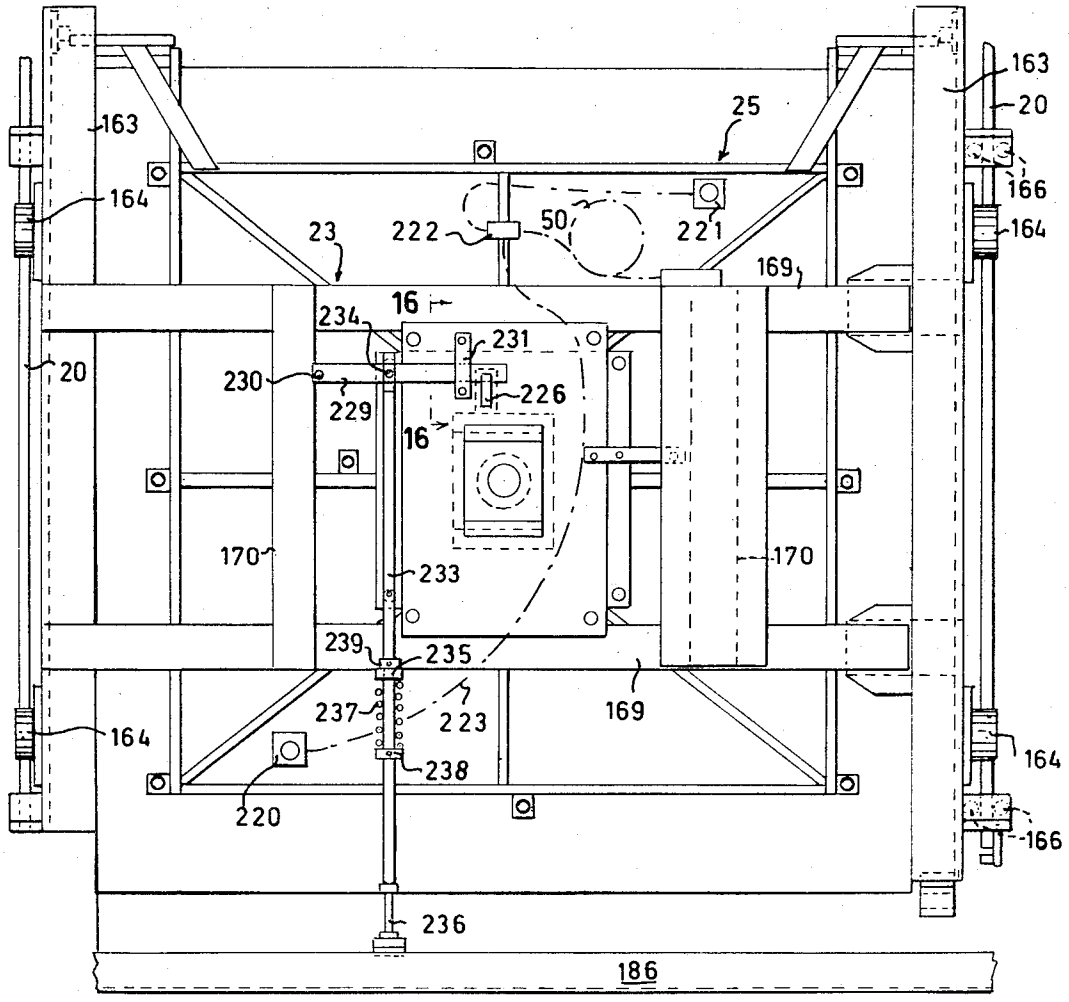

FIG. 8

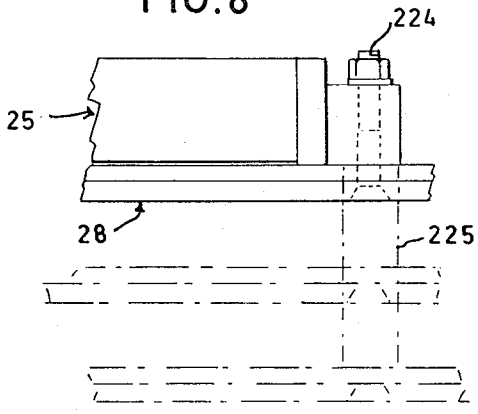

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FIG.9

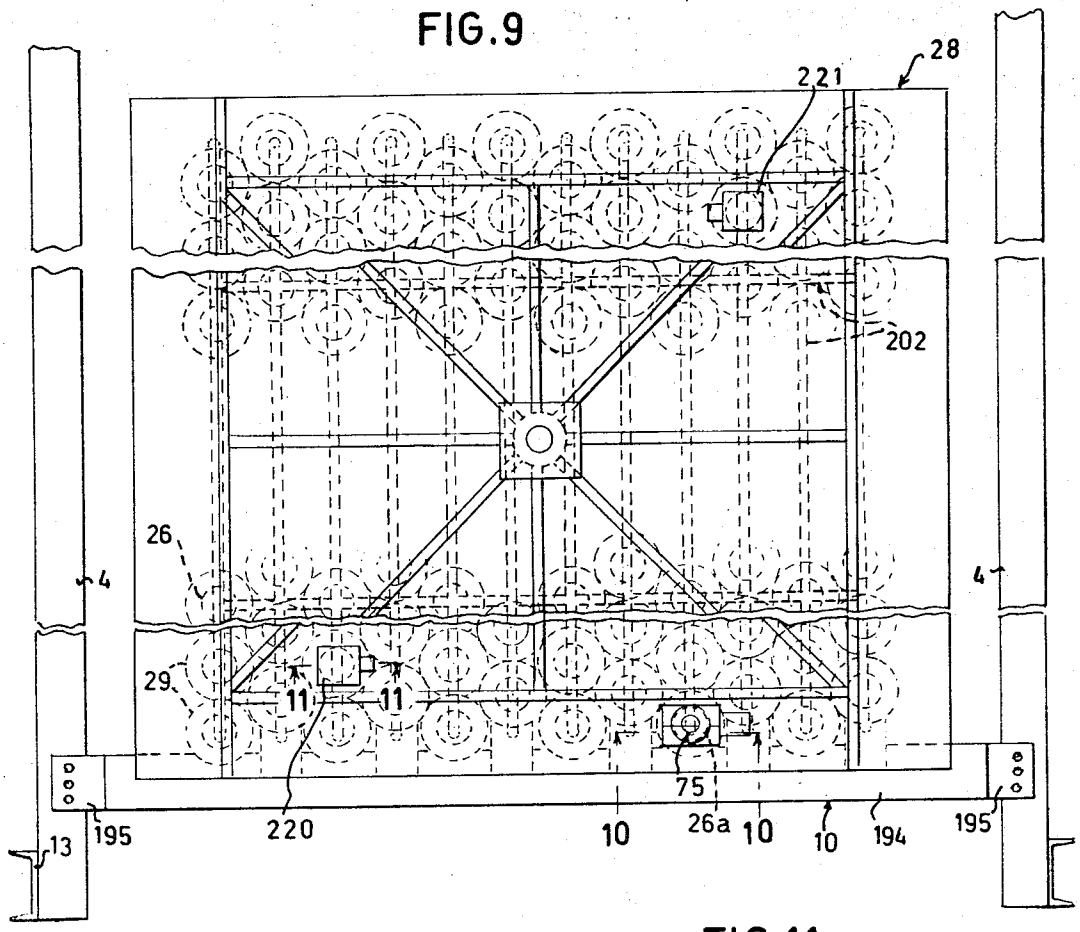


FIG.10

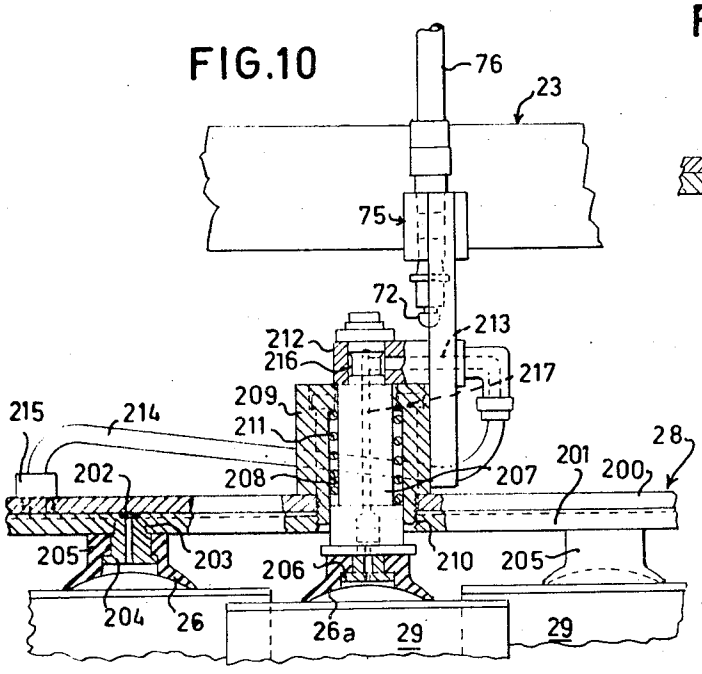
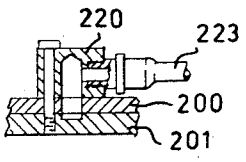


FIG.11



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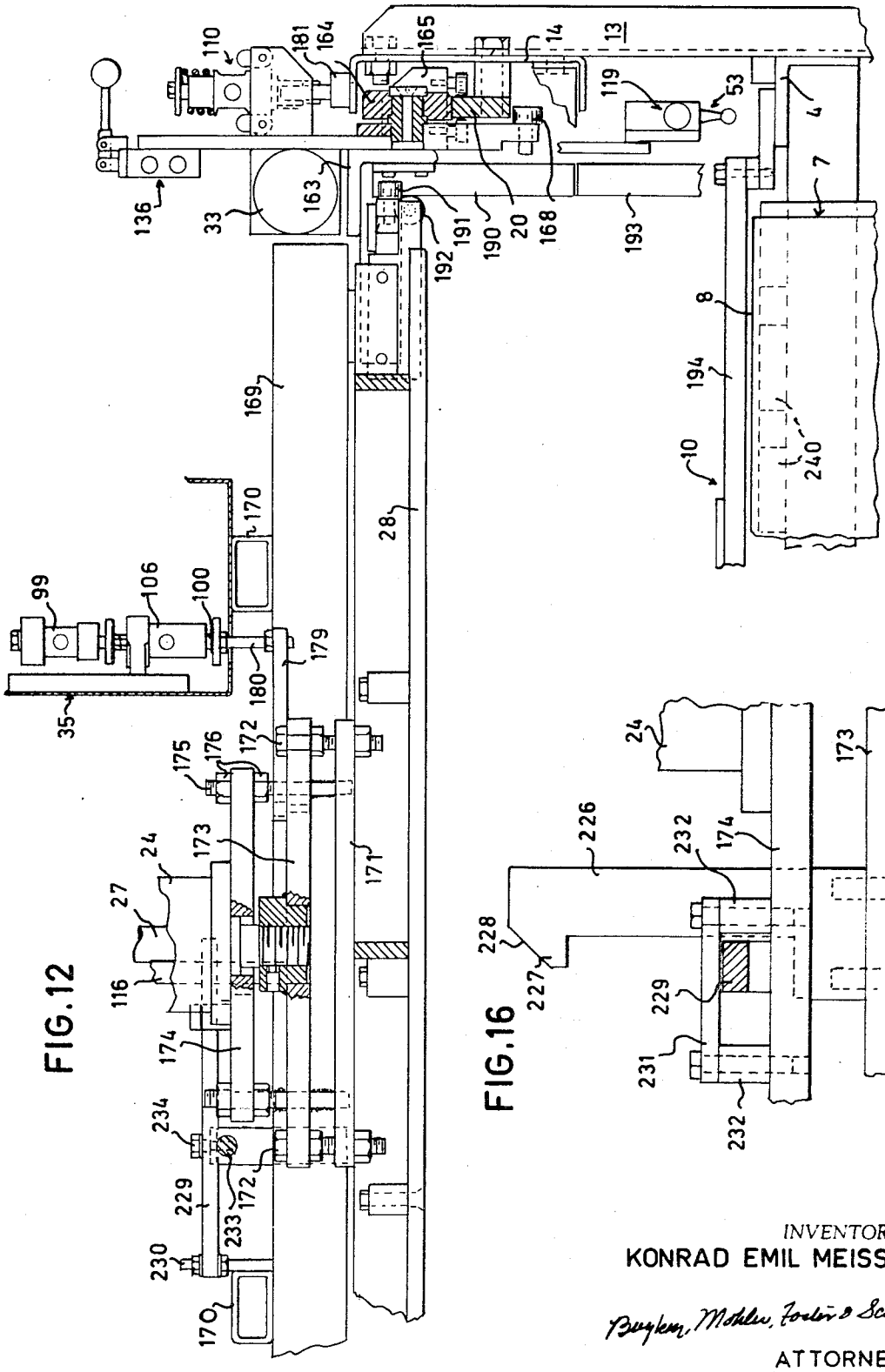

FIG. 12

FIG. 16

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FIG.13

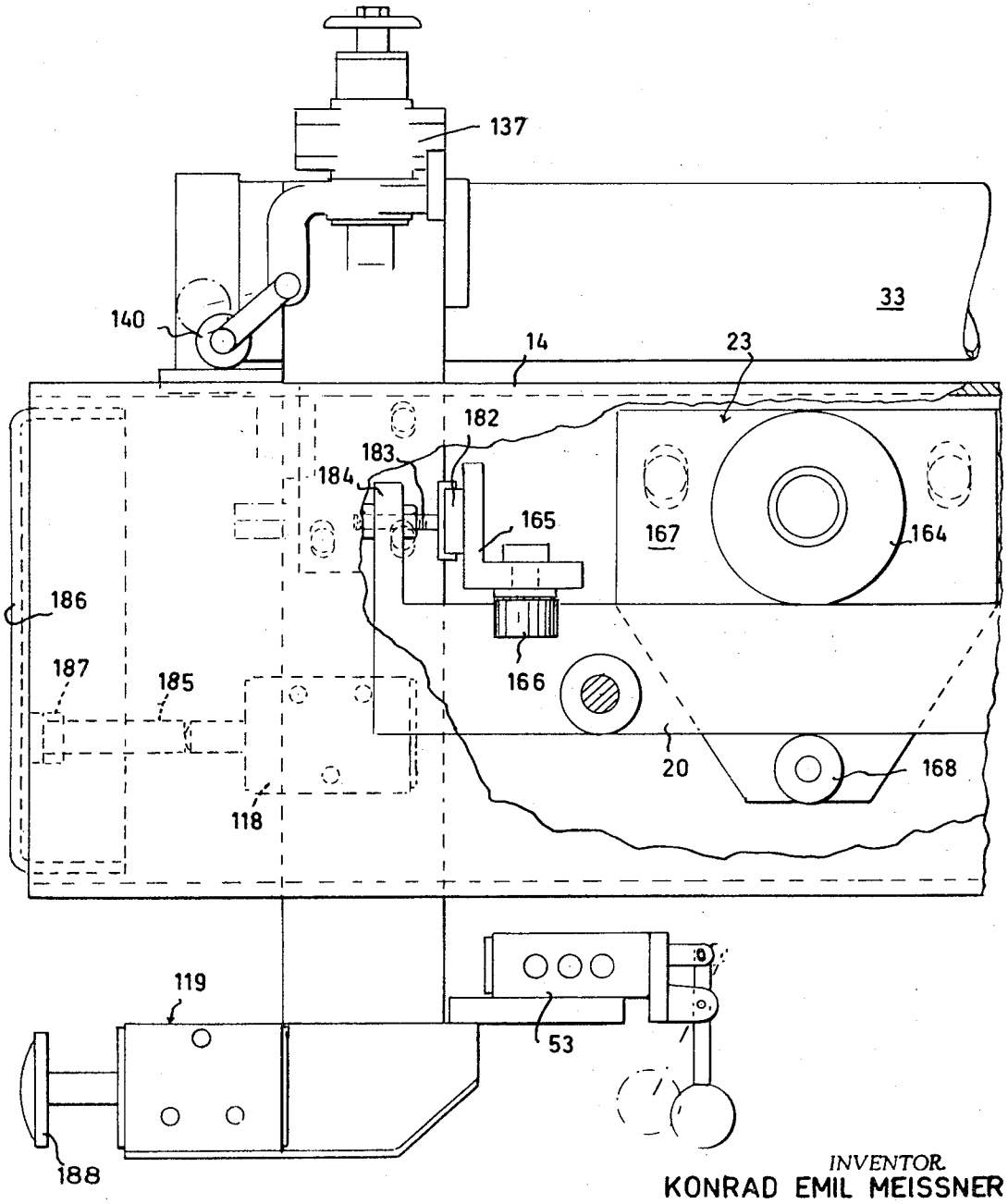

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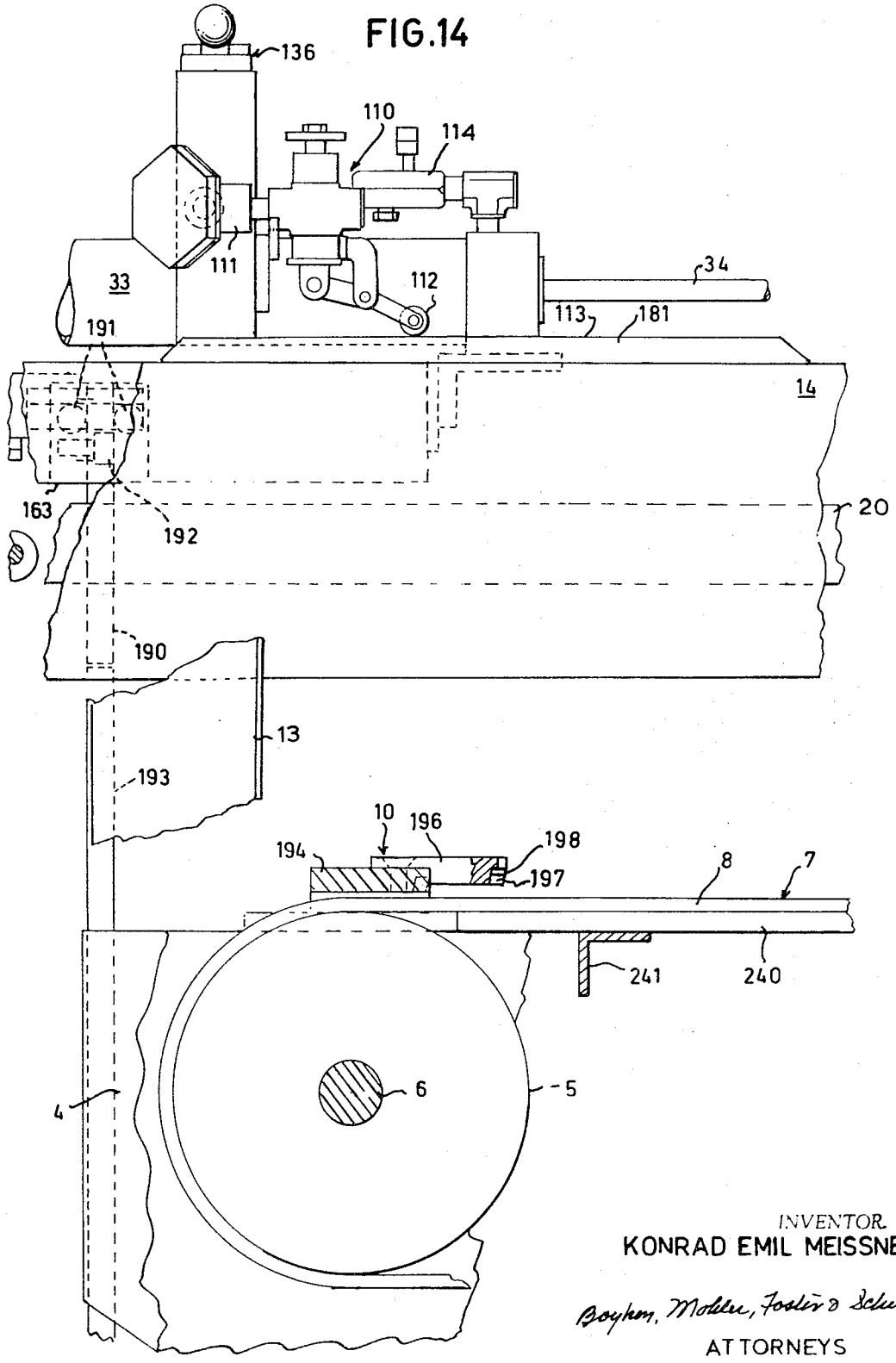
FIG.14



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United States Patent Office 3,718,223 Patented Feb. 27, 1973

3,718,223

METHOD OF PALLETIZING CANS

Konrad Emil Meissner, Lafayette, Calif., assignor to Filper Corporation, San Ramon, Calif.

Original application Dec. 4, 1969, Ser. No. 881,978, now Patent No. 3,662,902, dated May 16, 1972. Divided and this application Mar. 30, 1971, Ser. No. 117,923
Int. Cl. B65g 57/04
U.S. Cl. 214—152 3 Claims

ABSTRACT OF THE DISCLOSURE

An air-actuated palletizer for cans having a vertically reciprocable platen with vacuum cup for connection with cans on a conveyor carried against a pattern forming bar over which the cans are elevated by said cups and moved to a loading position for lowering said cans onto a pallet supported stack. A system of air-actuated valves controls the movements, including a valve actuated by movement of one of the cans releasably connected with and suspended from one of said cups.

SUMMARY

This application is a division of Ser. No. 881,978, filed Dec. 4, 1969, now Pat. No. 3,662,902 issued May 16, 1972.

The employment of vacuum cups for carrying and releasing cans in a palletizing system is old, as is the forming of cans in a predetermined pattern on a conveyor connecting the vacuum cups to the cans of such pattern.

One of the objects of the present invention is the provision of a substantially fully automatic air-actuated system in which vacuum cups are included, and in which system the different movements are approximately all air activated.

Another object of the invention is an improved arrangement of the components of the palletizer for providing a more positive and reliable palletizer.

A still further object of the invention is the provision of a can activated control means for releasing a layer of cans delivered onto a pallet or onto a layer previously deposited on such pallet.

Added objects are the provision of improved means in a palletizer for insuring against faulty operation of the palletizer, and against premature release and injury to cans, and also providing means for readily adapting the palletizer to handle different sizes of cans.

Other objects and advantages will appear in the description and drawings.

FIG. 1 is a simplified side-elevational view of the palletizer in loading position preparatory to lowering a load of cans carried thereby onto a pallet, with certain parts semi-diagrammatically illustrated. The position of the can-carrying carriage is indicated in dot-dash lines over the can conveyor on which a full layer of cans is adapted to be formed.

FIG. 2 is an end view of FIG. 1 from the left end as viewed in FIG. 1 with certain parts simplified, omitted, and broken away for clarity.

FIG. 3 is a top plan view of FIG. 1 with certain parts semi-diagrammatically indicated.

FIG. 4 is a schematic view of the system.

FIG. 5 is an enlarged, fragmentary, cross-sectional view taken along line 5—5 of FIG. 1.

FIG. 6 is an enlarged, fragmentary, cross-sectional view taken along line 6—6 of FIG. 5.

FIG. 7 is an enlarged, somewhat simplified, top plan view of the carriage and the platen-carrying frame, with air lines that would show indicated in dot-dash lines.

FIG. 8 is an enlarged, fragmentary, elevational view of one corner of the platen and platen-carrying frame.

FIG. 9 is a top plan view of the platen separate from the platen-carrying frame, with cans and suction cups indicated in broken lines and with the platen in a position for picking up a layer of cans for carrying it to a pallet.

FIG. 10 is an enlarged fragmentary part sectional and part elevational view along line 10—10 of FIG. 9.

FIG. 11 is an enlarged fragmentary cross-sectional view taken along line 11—11 of FIG. 9.

FIG. 12 is an enlarged, fragmentary, part sectional and part elevational view taken generally along line 12—12 of FIG. 1.

FIG. 13 is an enlarged fragmentary side-elevational view of the left end of the palletizer, partly broken away and in section, when the carriage is in the pallet loading position.

FIG. 14 is a fragmentary side-elevational view of a portion of the palletizer intermediate its ends, with one end of the platen indicated in dot-dash lines when the carriage is in the can pick-up position.

FIG. 15 is a top plan view of the pattern forming bar separate from the palletizer.

FIG. 16 is an enlarged fragmentary, part elevational and part sectional view taken along line 16—16 of FIG. 7.

DETAILED DESCRIPTION

A rigid, horizontally-elongated frame, generally designated 1 (FIG. 1), is supported on legs 2 that, in turn, may have height-adjusting screws 3 on their lower ends for levelling the frame or adjusting its height.

Frame 1 includes a lower portion comprising a pair of horizontally-elongated side frame members 4 supported on the upper ends of said legs. Horizontal, parallel pulleys 5, extending between the forward and rear ends of said side frame members are on shafts 6, which shafts are rotatably supported in bearings carried by said side frame members, and a horizontally-extending endless conveyor 7 extends over said pulleys.

The words "forward," "forwardly," "rear" and "rearwardly" and words of similar connotation are used with reference to the direction of movement of the upper run 8 of belt 7. Said upper run moves from right to left as viewed in FIG. 1, the forward end being the left end.

Belt 7 is preferably of the woven wire mesh type on which upright filled and closed cans will readily slide in any horizontal direction to adjust themselves to a predetermined pattern in a position between side rails 9 (FIGS. 1, 3), that are above and parallel with the opposite longitudinally-extending marginal portions of the upper run 8 of the conveyor 7, and against a pattern-forming bar 10. The bar 10, FIGS. 1, 2 and 15 extends over and adjacent to the forward end of conveyor 7 and at a right angle to rails 9.

Vertical side frame members 13 (FIGS. 1–3) secured to lower side-frame members 4 project upwardly from the latter and carry a pair of upper side frame members 14 (FIG. 1) that are spaced above and parallel with lower side frame members 13. Said upper side frame members extend from positions adjacent the forward half of conveyor 7, but spaced thereabove, to forwardly offset positions projecting forwardly relative to the forward end of conveyor 7 and the main frame 1 as indicated at 15 (FIG. 1).

A motor 16 (FIG. 1) supported on frame 1, drives a sprocket wheel 17 that, in turn, is connected by a chain 18 with a sprocket wheel 19 secured on forward shaft 6 for driving conveyor 7.

Said upper side frame members 14 have tracks 20 (FIG. 2) for supporting a horizontally-disposed rectangular carriage 23 for horizontal reciprocable movement from a pick-up station A spaced over the forward portion of the

upper run 8 of conveyor 7 to a loading position B on forward extensions of tracks 20 that are on the forwardly offset portions 15 of the upper side frame members 14, and vice versa.

A vertically-disposed air cylinder 24 (FIGS. 1, 2 is rigidly secured at its lower end to carriage 23 centrally of the latter, and below said carriage and carried thereby, is a rectangular platen frame 25 (FIG. 2) that, in turn, carries vacuum cups 26 depending therefrom in a predetermined pattern with their open sides facing downwardly.

A vertical piston rod 27 (FIG. 2), secured at its lower end to the platen frame 25, as will later be described more in detail, extends upwardly into the lower end of cylinder 24, and carries a piston at its upper end within said cylinder.

Said platen frame supports a platen 28 to which said cups are attached, and which platen is formed with intercommunicating ducts respectively ported for communicating with the interiors of said cups 26 to provide for exhaust and admission of air into said cups according to whether the cups are carrying cans or are releasing cans. The lower circular ends of said cups being adapted to engage the heads of cans that are on the forward portion of conveyor 7 to carry said cans under the influence of vacuum therein, from said pick-up position A to loading position B.

The air cylinder 24 and its piston provide means for lowering the platen frame 25 and platen 28 with a load of cans 29 suspended from cups 26 from an upper position adjacent and between the offset portions 15 of upper side frame members, onto a horizontal pallet 30 (FIG. 1) or onto a previously unloaded tier of cans on said pallet, and for returning said platen and cups to an elevated position for movement back to a pick-up position A after the cans have been released from the cups and loaded onto the pallet 30.

In the present invention, all of the cups 26, with the exception of cup 26*a* (FIG. 2) are directly connected with the platen 28. Cup 26*a* is in communication with the ducts in the platen, but is suspended for vertical reciprocation to actuate a trigger valve, as will later be described more in detail, for controlling the exhaust of air from the cups 26, 26*a* to release the cans from the cups when the cups are loaded onto the pallet 30, as will later be explained more in detail.

A horizontal traverse cylinder 33 is carried by and connected with carriage 23 and a plunger rod 34 extending out of its rear end is connected with the rear end of frame 1 for effecting horizontal reciprocable movement of the carriage between the pick-up station A and the loading station B.

A housing 35 is supported on the carriage 23 for movement therewith. A vacuum air line 36 and a pressure air line 37 lead to said housing, and the latter contains a plurality of air control valves, as will later be explained, that are automatically operative for controlling the air and the operation of the palletizer including the platen.

Other valves outside the housing are in the air system that is within the housing, including a manually-actuatable valve and valves actuated by the movement of the carriage 23, and by the cup 26*a*, as will later be explained in detail.

The foregoing description is adequate for generally explaining the operating cycle of the palletizer, which is as follows.

When the platen is in the dot-dash line position in FIG. 1 at the pick-up station A at the beginning of a cycle, the platen 28 will be held on carriage 23 in a position elevated over the forward end portion of the upper run 8 of conveyor 7 and over cans 29 on said portion.

Conveyor 7 is continuously actuated, and the cans 29 will be moved against pattern forming bar 10, and will be held by said bar until a complete pattern of cans is formed that corresponds with the pattern of the vacuum cups thereover. Until such complete pattern of cups is formed, the platen 28 will not be lowered. The movement of the conveyor will crowd the cans 29 against the pattern forming bar 10 and against the side rails 9 and when the pattern is complete, one of the cans on the conveyor that is sufficiently rearwardly of the completed pattern to insure a full pattern of cans being below the platen, will move a valve-actuating arm 38 (FIGS. 1 and 5) which will actuate a valve to admit air into the upper air cylinder 24 for lowering the platen for engagement of cups 26, 26*a* with the cans allowing the cups to grip the cans, after which the platen is automatically elevated (with the cans attached to the cups) a sufficient distance to clear the pattern-forming bar 10. One of the cans 26, designated 26*a* (FIG. 2) will depend from the platen slightly below the rest of the cans due to the influence of gravity aided by a spring, as will later be described more in detail.

After the platen is elevated, as above described, the transverse cylinder 33 is actuated to move the carriage 23 and the platen 28 with the load of cans suspended below the latter to the loading station B.

At station B, further movement of the cans ceases to enable an operator to place a cardboard or paper separator onto one or more tiers of cans previously deposited on the pallet 30, after which the operator manually actuates a push button to actuate a valve in the air system, for causing the platen 28 to be lowered. The platen then moves down under the control of air in cylinder 24 until the can 26*a* engages the pallet, or a can of a previously deposited layer of cans on said pallet, effecting actuation of a valve for releasing the load of cans.

After the cans have been released, the platen automatically moves back to its elevated position and from thence to the pick-up station A. If a full pattern of cans is on conveyor 7 by the time the platen returns to the pick-up station, the cycle will automatically commence immediately.

Referring to the diagrammatic chart of FIG. 4, the symbols used are those adopted by the United States of America Standards Institute (USASI) in December 1966. The valves outside the housing 35 will be indicated by the same numerals in other views.

As shown in the diagram, any suitable source 42, of air under pressure, is connected by pressure line 37 with a filter-pressure-regulator-lubricating unit 44 for maintaining a uniform pressure of say approximately 60 p.s.i. in a manifold 46 that, in turn, is connected with said unit 44.

A vacuum pump 47 is connected by a vacuum line 48 with a two-position air pilot actuated valve 49 in housing 35, and another line 50 connects valve 49 with the ducts in platen 28, and consequently with vacuum cups 26, 26*a*.

It is to be understood that the diagram is illustrative of the system in one position in which the manually-actuatable starting valve 53, which is on the forward end of the carriage 23, is in a closed position, and when moved to closed position the various other valves are automatically actuated or actuatable, as described hereafter.

When the platen 28 is in position A, a manually-actuatable starting valve 53 outside housing 35 in any suitable location on carriage 23 is detent-held in either an "on" position or an "off" position. It is shown in FIG. 4 in an "off" position.

For operation of the machine, the conveyor motor 16, vacuum pump 47 and the air supply to the manifold 46 must be operating, and the valve 53 must be in the "on" position. The conveyor motor and vacuum pump and air supply to the manifold are continuously operating but when valve 53 is closed, the cycle will not start.

Upon completion of the full layer at station A the lever arm 38 (FIGS. 1, 3 and 5) will be actuated by engagement with a can on conveyor 7 to move a valve 54 (FIGS. 3 and 5) from closed to open position, thereby

connecting air under pressure from manifold **46** through lines **55**, **56**, valve **53**, line **57** and valve **54** with a line **58** that, in turn, leads to three places, as follows:

(1) Through a line **58** to the air pilot **49***b* of vacuum valve **49**, activate valve **49** to connect line **48** from vacuum pump **47** with line **50** that connects with the platen **28** and vacuum cups **26**, **26***a*.

(2) Through line **59**, which is connected with line **58**, to a branch line **60** that leads to a normally open air and spring controlled pilot valve **61**, and through said valve **61** to line **62** that connects with the air pilot **63***b* of an air pilot controlled valve **63**. Valve **63** will now be moved to the position shown in FIG. 4, in which it connects an air line **64** from manifold **46** with a line **65**. Line **65** has a flow control valve **66** therein, and from said valve the air in line **65** passes through a quick exhaust valve **67** into the upper end of the air cylinder **24** from the depending rod **27** of which cylinder **24**, the platen **28** is carried.

A line **68** connects the lower end of cylinder **24** with an air pilot controlled valve **69**. When air under 60 p.s.i. is introduced into the upper end of cylinder **24**, air at 50 p.s.i. is in the lower end of said cylinder, said lower end being in communication with manifold **46** through a line **70** having a pressure regulator **71** therein. The pressure differential in the cylinder effects downward movement of the piston rod **27** and the platen **28** until the cups on the platen are fully seated on the cans **29**. The flow control valve **66** is set to obtain a slow descent of the platen.

(3) Through line **59** to pilot **84***b* of an air pilot controlled valve **84** to set the valve **84** for the next cycle.

The vacuum cup **26***a* on platen **28**, as already mentioned, depends a short distance below the other cups **26** (FIG. 10) which may be about ¼ inch, when the cups **26***a* and **26** are spaced above the cans **29**, and in this position a vertically reciprocable stem **207** will be moved upwardly upon cup **26***a* being fully seated on a can **29** to actuate a valve **75** (FIG. 10) for moving the latter from a normally closed position to an open position for exhausting air from line **76** that connects valve **75** with air pilot **77***b* of a spring-pilot controlled valve **77**.

A line **79** connects with line **76** at a point between valve **75** and valve **77**, which line **79** extends to manifold **46**, and a flow control valve **80** in line **79** regulates the flow of air from manifold **46** to the pilot line **76**. As long as the trigger **72** is depressed by the pressure of cup **26***a* on a can, air will bleed out of pilot line **76** and the spring **78** of valve **77** will keep valve **77** in its end position. The small amount of air that passes through flow control valve **80**, exhausts through valve **75**.

When valve **77** is moved to its end position under the influence of spring **78** and by the bleeding of air out of air pilot **77***b*, air from the manifold **46** will pass through valve **77** and from valve **77** through lines **81**, **82** to the pilot **83***a* of spring-air pilot controlled normally closed valve **83**, and through line **81** to an air pilot controlled valve **84**, which valve **84** was previously set to allow air to pass from line **81** and valve **84** to a line **85** having a flow control valve **86** therein.

Air passes through flow control valve **86** into an accumulator **87** and to pilot **88***a* of an air pilot control valve **88**, opening the latter. The control valve **86** and the accumulator **87** serve as a time delay to slow down signal to pilot **88***a* of valve **88**. This is required to allow the vacuum cups to get a good grip on the cans before they are lifted by the platen. As valve **88** must open before the platen can rise, as will hereinafter appear, the time delay on pilot **88***a* of valve **88** will also delay lifting of the cans, as desired. The right amount of delay is obtained by adjusting the air flow through valve **86**.

When valve **88** is opened, air from manifold **46** will pass through line **89** that connects valve **88** with said manifold, to and through valve **88** to three places, as follows:

(1) Through line **90** to the air pilot **61***a* of a normally open spring-pilot controlled valve **61**, closing the latter to passage of air therethrough to pilot **63***b*, permitting exhaust of air from the latter,

(2) To pilot **63***a* of valve **63** through a line **92** connected with line **90** actuating valve **63** to exhaust line **65** to the upper end of the platen-lifting cylinder **24**, thereby permitting the exhaust of air from the upper end of the lift cylinder **24** through quick exhaust valve **67** and flow control valve **93**.

The air at 50 p.s.i. in the lower end of cylinder **24** now lifts platen **28** and the full layer of cans to the upper end of its movement at which end the lower ends of the cans are sufficiently elevated (approximately two inches) to clear the pattern forming bar **10** when the load of cans is moved from station A to station B.

(3) Through line **94** to the air pilot **95***b* of a spring-pilot controlled valve **95**.

The actuation of valve **95** by air to pilot **95***b* permits air from manifold **46** to pass through a line **96** and a flow control valve **97** therein, to and through valve **95** to a line **98** that connects with a normally closed mechanically actuatable valve **99** (FIG. 2).

As soon as the platen **28** reaches the upper end of its upward movement it engages the valve stem **100** of said valve **99** opening the valve against the resistance of spring **101**. When valve **99** is so opened the air from the manifold will pass from line **98** through valve **99** to line **102** and into the rear end of the traverse cylinder **33**, but until the platen **28** reaches the upper end of its upward movement, valve **99** will remain closed.

When the cans are lifted from the conveyor **7** by elevation of the platen, the can **29***a* will hang at a level below that of the other cans, whereby the stem **207** will be moved downward away from the trigger stem **72** of valve **75**, with the result that valve **75** will close automatically. The pressure of air in line **76** and against air pilot **77***b* will then build up through flow control valve **80** until valve **77** is moved against the resistance of spring **78** to close valve **77** to passage of air therethrough from the manifold **46** and air from pilot **83***a* of valve **83** as well as from pilot **88***a* of valve **88** will exhaust through valve **77**.

At the same time normally closed valve **99** is opened and as soon as platen **28** reaches the upper end of its movement with the full load of cans depending therefrom, normally closed mechanically-actuated valve **106** (FIG. 2) will also be opened by said platen. Valve **106** is connected by line **107** with valve **95**.

A flow control valve **108** is in line **102** leading to the rear end of the traverse cylinder from valve **99** and when valve **99** is opened at the upper end of its movement, air passing through line **102** from valve **99** will pass freely through said control valve **108** and into the rear end of the traverse cylinder **33** to move its rod **34** and the platen from station A to the loading position at station B.

The air in the forward end of traverse cylinder **33** will exhaust through line **109** and a normally open cushion valve **110** and then through a quick exhaust valve **11** to the atmosphere as the platen is being moved by the traverse rod **34** to station B.

Approximately six inches before platen **28** reaches station B, the valve **110** will be closed by a cam follower **112** connected with valve **110** moving onto an elevated cam track **113** (FIG. 1) carried by one of the upper side frame members **8**, thereby compelling the exhaust air to pass through a flow control valve **114** that is set to restrict the rate of exhaust, and to slow down the movement of the platen just prior to it reaching station B.

It is important that the traverse motion of the platen cannot occur under the influence of air from the manifold **46** until both of the platen actuated valves **99**, **106** are actuated by the platen at the upper end of its movement.

To insure against downward movement of the platen until it reaches station B a normally closed stop valve **118** is provided, which valve is connected by a line **120** with a manually-actuated valve **119** positioned on the platen carriage **23** (FIGS. 1 and 13).

Valve **118** is actuated by the platen upon the latter reaching station B at the end of its traverse movement (FIG. 1).

Manually-actuatable valve **119** is connected by line **121** with air pressure line **56** that, in turn, is connected with manifold **46**. Until valve **119** is manually actuated, no air from the manifold **46** will pass to valve **118**, and valve **118** will remain closed until the platen is at the end of its movement to position B; hence, the platen will remain elevated until valve **119** is manually actuated.

The period of time between the arrival of the platen **28** and its load of cans at station B and the manual actuation of valve **119** to effect lowering of the cans, is employed by the operator in placing a sheet of cardboard over a layer of cans previously loaded onto a pallet, or in removing a loaded pallet and replacing it with an empty one.

Upon manual actuation of valve **119**, as by pressing a button on the latter, the air from manifold **46** will pass through valve **119**, line **120** and valve **118** to line **122**, and to pilot **84***a* of valve **84** and to pilot **69***a* of valve **69**.

Air in the portion of line **122** connecting with pilot **84***a* functions to reset valve **84***b* for the next part of the cycle. During the previous part of the cycle air through valve **84** shifted valve **88** that has heretofore been open to permit passage of air from manifold **46** to pilot **95***b* in turn opening valve **95** to passage of air to the rear end of traverse cylinder **33**.

The air in the portion of line **122** connecting; with pilot **69***a* of valve **69** actuates the latter to connect line **68**, which leads to the lower end of the lifting cylinder **24**, with exhaust line **123** in which a flow control valve **124** is positioned to control the rate of exhaust, and said exhaust air then passes through an exhaust filter **125** to the atmosphere.

The weight of the cans and platen forces the exhaust of air from within the lower end of cylinder **24**, and the rate of descent of the platen and the cans carried thereby must be controlled very closely to prevent hard impact when the cans engage the pallet or the cardboard sheet on a layer of cans previously deposited on the pallet. This control is accomplished by proper adjustment of control valves **93** and **124**. Valve **124** restricts the flow of the exhausting air and valve **93** restricts the flow of incoming air into the upper end of cylinder **24**, with these two control valves, the desired speed of descent of the platen **28** and its load of cans may be obtained for heavy or light cans.

During the traverse and descent of the platen **28** and its load, the control can **29***a* carried by the vertically reciprocably supported cup **26***a* will be suspended in a position slightly lower than the remaining cans **26**, which may be approximately the lower end of its downward movement, can **29***a* will be the first to engage the separator sheet on a previously deposited layer of cans, or the pallet, and cup **26***a* from which can **29***a* is suspended includes stem **207**, which stem will move upwardly, while the remaining cans **26** are lowered to seat themselves to engage valve trigger **72** of valve **75** to open said valve to air from manifold **46** as air bleeds out of the pilot **77***b* of valve **77** through valve **75**.

Upon the exhausting of air from air pilot **77***b* of valve **77**, spring **78** shifts valve **77**, and air from the manifold **46** may pass through valve **77** to the following four places:

(1) Through line **82** to pilot **83***a* of valve **83** thereby permitting air from manifold **46** to pass through line **127** to and through valve **83** to line **128** that is connected with vacuum valve **49**, but this air will not, as yet, pass through valve **49**;

(2) Through line **81** to and through valve **84** and from valve **84** through line **129** to pilot **49***a* of valve **49**, with the result of closing valve **49** to the vacuum pump **47** and opening valve **49** to passage of air under pressure through line **50** to the vacuum cups **26**, **26***a*, thereby providing a blast of air into the cups to prevent the cans from clinging to the cups when the platen is lifted to its elevated position at station B;

(3) Through line **81** to and through valve **84** to line **130**, which line **130** is connected with line **129**, and through line **130** to pilot **88***b* of valve **88**. This will exhaust the air in pilot line **94** from pilot **95***b* of valve **95**. Also, air will be exhausted from pilot **63***a* of valve **63** through line **90** and from pilot **61***a*. Valve **95** is now reversed to allow air from manifold **46** to pass from line **96** to the normally closed valve **106**. Valve **61**, in turn, is now in its normally open position for passing of air to pilot **63***b* of valve **63** for the next cycle, although there is no such passage of air at this time. Thus, valve **61** is set for picking up cans during the next cycle;

(4) Through valve **84** and line **129** to line **131** that connects with pilots **69***b* of valve **69**. A control valve **132** and an accumulator **133** in line **131** function to slow down the signal to pilot **69***b*. This delayed action of valve **69**, through which valve air is now passing from manifold **46** through lines **70** and **68** into the lower end of cylinder **24**, allows the cups **26**, **26***a* to loosen their grip on cans **27**, **27***a* before the platen starts its upward movement.

The valve **69**, when fully open to passage of air through line **68** into the lower end of cylinder **24**, lifts the platen **28** and the cups **26**, **26***a* to the upper end of its travel under pressure of approximately 50 p.s.i., leaving the layer of cans on the cardboard separator positioned on a previously deposited layer or cans on pallet **30**, or on the pallet.

Upon the upward movement of the platen after the cans carried thereby have been loaded on pallet **30**, the stem **72** of valve **75** that is carried by the platen **28** or its frame will drop, closing valve **75** and allowing air to accumulate in pilot lines **82**, **129**, **130**, **131**, respectively connected with pilots **83***a*, **49***a*, **88***b*, and **69***b* of valves **83**, **49**, **88** and **69** will exhaust through valve **77**, and at this point the air blast through valves **83** and **49** is shut off by movement of valve **83** under the influence of spring **134** of the latter.

When the platen **28** reaches the upper end of its movement, the normally closed valves **99**, **106** are actuated by the platen to open them to allow air from manifold **46** to pass air from line **96** through flow control valve **97**, valves **95**, **106**, line **135**, through a normally open manually actuated valve **136** and through line **115** to flow control valve **114** and into the forward end of the traverse cylinder **33** for moving the platen back to station A.

Air in the rear end of cylinder **33** will be exhausted to the atmosphere through a normally open, mechanically actuatable valve **137** and a quick exhaust valve **138**. A line **139** connects the rear of cylinder **33** with valve **137**, bypassing the flow control valve **108** through which air had been admitted into the rear end of cylinder **33** to move platen **28** from station A to station B. Valve **137** is similar to valve **110**, being carried by carriage **23** and having a cam follower **140** that rides on a stationary cam track **113** that in turn is on one of the upper side frame members **14** of the machine.

Toward the end of movement of the carriage **23** from station B to station A, the valve **137** is closed under the influence of movement of follower **140** on track **113** to force the air in the rear end of cylinder **33** to exhaust through flow control valve **108** and line **142** that connects with the exhaust valve **138**.

When the carriage **23** and platen **28** reach station A, the next cycle will be automatically repeated with the exception of the actuation of manually-actuatable valve **119**, but only if a sufficient number of cans has accumu-

lated on conveyor 7 against the pattern forming bar 10 to form a complete layer for moving actuating arm 38. Valve 54 is located on platen carriage 23 and will be opened by valve actuating bar arm as soon as carriage 23 reaches the end of its return motion at station A.

If a full layer of cans has not been accumulated against the pattern forming bar 10, the carriage 23 and platen 28 will remain elevated at station A until valve 54 is actuated by the cans of a full layer, and then the cycle will commence.

It should be noted that the carriage 23 and platen 28 will be held stationary against the forward and rear end stops by air pressure in cylinder 33 at all times, except during traverse movement of the carriage, and during the up and down movements of the platen at the pick-up station A and the loading station B, the valves 106 and 99 are closed. Thus the air in the traverse cylinder 33 is closed in to prevent accidental traverse movement of the platen carriage during the up and down movements of the platen.

The valve 136 is adapted to be manually actuated, which valve is provided in line 135 between normally closed valve 106 and the lines leading to the rear end of cylinder 33 to enable an operator to manually move the carriage 23 between stations A and B for inspecting the can pattern or to check the vacuum cups. When manually actuated for movement to close line 135 it will open the line 109 to exhaust air in the forward end of the cylinder for permitting said manual movement.

The foregoing arrangement provides for an air-actuated system independent of electric solenoids, relays, etc. Also, means is provided for varying the rate of movement of the platen at the ends of its traverse movement and its movement when engaging the cans and releasing them to preclude injury to the cans or their disarrangement and when connected with the cups. This control of the platen during its vertical movement at the loading station to enable accurate control of the rate of descent so as to gently load the cans onto the pallet or the caps on the pallet is important.

The feature of all steps being automatic only when the pattern of cans for a full platen is complete at the can pick-up station, except the lowering of the platen at the loading station, is highly desirable, as is the feature of enabling manual control of movement between the pick-up and loading station, and other features appearing in the description and drawings.

Referring to FIG. 5, the valve 54 that is actuated by the cans upon a full load or layer being formed on the belt 8 at station A (FIG. 1) is adjustably supported on a horizontal bar 145, which bar is bolted to one of the side frame members 146 of the carriage 23. This valve, in itself, is conventional and is adapted to be secured on bar 145 at different positions therealong by a clamp jaw 147 and bolt 148.

Spaced below the bar 145 is one of a horizontal row of spaced, parallel, horizontally-extending arms 149, each of which is bolted to a block 150 that, in turn, is bolted against the upper flange of side frame member 4 (FIG. 5) of the stationary frame. A row of said arms is at each of the longitudinally-extending sides of the palletizer (FIG. 3). A bolt 151 extends through a slot 152 in each arm to enable positioning the arms in different degrees of extension of their inner ends over belt 8, said arms extending in directions at right angles to the length of said belt.

The inner ends of the row of arms 149 along each side of the palletizer support a horizontal side rail 9 (FIGS. 3, 5) providing a pair of horizontally-extending parallel rails between which the cans on the belt 8 are confined and which define two of the opposite lateral sides of the group of cans to be lifted by the suction cups. The third side of the group formed on belt 8 is against the pattern forming bar 10, and the fourth side will automatically be formed as the cans from a chute or conveyor 153 (FIG. 3) are fed onto the read end of the belt 8.

Secured on the side rail 9 that is below valve 54 and bar 145, is an upstanding standard 154 (FIG. 5) having a horizontal pivot 155 at its upper end on which is secured an upwardly-extending arm 156 and a laterally outwardly-projecting arm 157. The arm 38 that is actuated by engagement with one of the cans on the belt 8 is rigid with and depends from the outer end of arm 157.

The upper end of the upwardly-extending arm 156 is opposite valve stem 158 that is adapted to actuate valve 54 when the arm 38 is swung outwardly.

The lower end of arm 38 may be weighted by an enlargement 159 and when no cans are on the belt 8 is in a position to actuate the arm 38, this enlargement may rest against the rail 9 adjacent thereto, so that the latter functions as a stop.

Rigid with arm 38 at its lower end is a horizontally-extending stem 160 that carries a horizontally-elongated bar 161 (FIG. 6) at its inner end positioned over, and extending longitudinally of belt 8.

The opposite end portions 162 of said bar are inclined outwardly toward the adjacent side of the palletizer.

After a complete pattern or layer of cans is formed on belt 8, one of the cans 29, indicated in dot-dash line in FIG. 5 will, under the pressure of oncoming cans, engage the element 159 and swing arm 38 outwardly causing arm 156 to move to the dot-dash position to actuate valve 54, as has hereinbefore been described, so that the cup carrying platen when at station A will move downwardly for connecting the vacuum cups with the upper closed ends of a full layer of cans that are on belt 8 ahead of the can that actuates arm 8 and valve 54.

The cup-carrying platen 28, is shown in FIG. 2 with the cups 26, 26*a* thereon. The carriage 23 comprises a frame having a pair of parallel, horizontally-elongated side frame member 163 (FIGS. 2, 7) that, in turn, have rollers 164 for supporting the carriage 23 on tracks 20 for horizontal reciprocable movement between the can pick-up station A and the can loading position B (FIGS. 1, 3). Tracks 20 are carried by the upper side frame members 14 of the palletizer frame (FIG. 12) and brackets 165 (FIGS. 7, 12) secured to each of the side frame members carry pairs of rollers 166 at each of the corners of the carriage for engaging opposite lateral sides of the tracks 20 to maintain the carriage against lateral movement and to accurately position the carriage and can engaging suction cups over the cans at the stations A and B.

Hangers or plates 167 respectively support rollers 164 (FIG. 13) and a lower roller 168 is supported for rotation on the lower portion of each hanger, each roller 168 being below track 20 for retaining the carriage on the tracks against tipping.

By the foregoing arrangement, the carriage is held during its movement on tracks 20, and at stations A, B, against lateral, and vertical movement relative to the tracks.

The platen frame 25 includes cross frame members 169 (FIG. 7) that are rigidly secured at their ends to the side frame members 163 and which cross frame members, in turn, are connected by box beams 170, on one of which the housing 35 that encloses many of the control valves is secured.

The platen 28 is shown in FIG. 12, without the suction cups, and is carried by a central rectangular plate 171 (FIGS. 2, 12) that, in turn, is connected by adjustable levelling bolts 172 with a similar plate 173 spaced thereabove, and plate 173 is centrally secured to the lower end of the rod 27 that extends onto the vertical cylinder 24.

Cylinder 24, in turn, is secured at its lower end on an upper horizontal rectangular plate 174, which plate 174 is secured adjacent its corners on levelling bolts 175 between adjusting nuts 176 on said bolts to enable adjusting the cylinder to insure vertical movement of the platen for making a vertical stack of layers of the cans when the palletizer is in operation.

The platen levelling bolts provide means for levelling the platen so that the cups for engaging the cans will be in a plane parallel with the plane of the upper ends of the cans.

Secured to the plate **173** is a laterally projecting arm **179** that extends below the housing (FIG. 12) at its outer end, and a vertical valve actuating rod **180** is adjustably secured to said outer end and projects upwardly therefrom. The valves **99, 106** are supported inside housing **35** in superposed relation and are connected for simultaneous operation by means of a stem projecting from the lower valve **106**. This stem is in vertical alignment with the rod **180**, hence when the platen is at its maximum elevated position, the rod **180** will have passed through an opening in the bottom of housing **35** and have actuated valves **99, 106** as has hereinbefore has been described, for admitting air into the traversing cylinder **33** for moving the carriage between the stations A and B.

Until the platen and its frame are in their uppermost position, the valves **99, 106** will be closed, hence it will be impossible to move the carriage on tracks **20** in either direction, unless the platen is at its maximum elevated position.

It is important that the platen **28**, in moving from station A to station B with a layer of cans suspended from the cups **26, 26*a***, should stop at station B without loosening the cans from their connections with the cups, and this is accomplished by actuation of the valve **110** (FIG. 14) which valve is on the carriage **23**. The cam track **113** is on the upper side of a horizontally-elongated cam **181** (FIG. 14) on one of the side frame members **163** and the cam follower **112** that is on the trailing end of the carriage during movement form station A to station B. The cam follower **112** will ride onto cam **181** when the platen is about six inches from reaching station *b*, thus actuating the valve **110** to slow down the movement of the carriage, and rubber bumpers **182** (FIG. 13) will be engaged by brackets **165** that carry rollers **166** when the carriage reaches loading position to further minimize any shock. Each bumper is carried on an adjustable bolt **183** that in turn is adjustably secured to an upstanding member **184** rigid with the end of each track **20**. Thus the bumpers provide an accurate stop for the carriage.

The carriage **23** also carries valve **118** (FIG. 13) that is adapted to be actuated upon the carriage **23** reaching the loading position at station B. An adjustable stop **185** in the form of a horizontally disposed member adjustably secured to the forward cross frame member **186** of the stationary frame. This member may be threaded into an opening in said forward cross frame member for securement by a lock nut **187** at the desired degree of projection toward the carriage **23**, and when the carriage reaches its forward position at station B the adjustable stop **185** will engage the stem of valve **118** to actuate the latter.

As has previously been noted, valve **119** (FIG. 13) is a manually actuatable valve carried by the carriage, and when the carriage **23** is at station B it is readily accessible to an operator for pressing the button **188** to actuate the valve, and when this is done the platen will be gently lowered at a controlled rate of speed by reason of air being admitted under pressure through valve **119** for passage to and through valve **118** to the control means hereinbefore described for opening the lower end of the elevating cylinder **24** to relatively slow exhaust. Until valve **118** is actuated, this exhaust of air from the lower end of cylinder **24** cannot be effected, hence accidental lowering of the platen during movement from station A to station B is avoided.

It is quite important that the rate of descent of the platen carrying a layer of cans at the loading station should be carefully controlled so there is no shock when the layer of cans is seated on the pallet **30** or on a layer previously deposited on the pallet, and it is also important that the pallet should be accurately guided during its descent.

A pair of vertical guide strips **190** (FIGS. 2, 12 and 14) are secured to the side frame members **163** of the carriage **23** adjacent to the rear ends of said members and the platen frame itself carries a pair of horizontal rollers **191** (FIG. 14) between which each of the guide strips is positioned, said rollers being at the forward and rear sides of said strips. A third inner roller **192**, carried by the carriage frame (FIGS. 12, 14) engages each of the oppositely facing sides of the pair of guide strips **190**.

When the carriage is in position B preparatory to lowering a layer of cans onto a pallet, the guide strips **193** are above and in vertical alignment with a longer vertically-extending pair of lower guide strips respectively below and adjacent to guide strips **190**. Said guide strips **193** (FIGS. 1, 12 and 14) are rigidly secured to the stationary frame of the palletizer.

By the above structure, the platen and its platen frame are accurately guided during the lowering and elevating of the platen.

The pattern forming bar **10** (FIGS. 2, 14 and 15) comprises a flat strip **194** (FIGS. 9, 15) supported on and secured to members **195** (FIG. 2) that, in turn, are bolted onto the stationary side frame members. The strip **194** is spaced a small distance above the forward end of the upper run **8** of the conveyor **7** (FIG. 14) and at equally spaced points along its rearwardly facing edge it is formed with shallow arcuate recesses **195'** (FIG. 15) that conform to the horizontal cross-sectional cylindrical contours of the cans **29** that are supported on belt **7**.

Blocks **196**, equally spaced apart in a horizontal row, are secured on the strip **194** with the blocks between the end blocks of the row equally spaced between recesses **195**, one end block being outwardly of one of the end recesses **195'**. Blocks **196** equally project rearwardly from the rear edge of the strip **194** and the rearwardly facing end of each block is formed with a recess **197** that corresponds in contour to each recess **195'**.

The spacing between recesses **195'** in strip **194** and between the recesses **197**, and the positions of recesses **197** relative to recesses **195'** are such that when the cans **29** on belt **7** below station A are in adjoining relation and crowded against the pattern-forming bar with the cans along and against the side rails **9** in adjoining relation in a straight row of cans along each rail, a can will be positioned in each of the recesses **195'** and **197** and between each adjacent pair of blocks **196**.

In FIG. 9 the pattern of cans is illustrated when the pallet is at station A, the pattern-forming bar **10** being indicated.

The lower edges of the strip **194** and blocks **196** along recesses **195', 197** are bevelled or chamfered at **198** to preclude the chimes at the lower ends of cans **29** catching thereon upon the layer of cans on belt **7** being elevated.

In FIG. 9 the position of the platen at the pick-up station is indicated in dot-dash lines.

The platen, itself, comprises a pair of rectangular, flat horizontal plates **200, 201** (FIGS. 10, 11) tightly secured together in face-to-face relation with their outlines in register with each other. Plate **200** is uppermost and the upper surface of the lower plate **201** is formed with upwardly opening grooves **202** providing parallel ducts extending in one direction connected by cross ducts extending in the other direction (FIG. 9).

Plate **201** is formed with passageways **203** (FIG. 10) for threaded fittings **204** for securing the bases **205** of the downwardly opening rubber-like cups **26** tightly against the underside of plate **201**. Each fitting **204** is centrally apertured to provide a passageway communicating between a duct **202** and the interior of each cup **26**.

Cup **26*a*** corresponds to cups **26**, but it is secured by a fitting **206** to the lower end of a vertically-disposed cylindrical member **207** that is vertically reciprocable within a vertical bore **208** of an outer body **209**. The lower end of the body **209** is formed with an externally-threaded

nipple 210 that, in turn, is threadedly secured in an opening extending through the platen at a position midway between a pair of cups 26.

The member 207 slidably fits within bore 208 at its lower end and is formed with a shoulder within bore 208 against which the lower end of a coil spring 211 is seated, while the upper end of the spring is seated against a restricted portion of bore 208 that also slidably fits the outside of member 207. A fitting 212 is secured to the upper end of member 207 and acts as a stop to limit downward movement of the member and cup 26*a* under the influence of spring 211.

Fitting 212 is formed with a passageway 213 that is connected by a flexible tube 214 with another fitting 215 that, in turn, is secured on the upper plate 200 of the platen and which fitting is apertured to provide a communication between one of the ducts 202 and passageway 213 through tube 214.

Passageway 213 communicates within fitting 212 with one side of an annular chamber 216 around the upper end of member 207 within fitting 212, and which upper end of sleeve 207 is ported to provide for communication between the chamber 216 and a central passageway 217 in member 207 that opens at its lower end into cup 26*a*.

The valve 75 is secured on a frame member of the carriage 23, and air line 76 connects with said valve. When the member 207 is elevated by upward movement of a can 29 carried by cup 26*a*, upon a load of cans being deposited on pallet 30, the valve stem 72 will be engaged and actuated by fitting 212 to break the vacuum in the cups 26, 26*a* to release the cans.

Adjacent to diagonally opposite corners of the platen are fittings 220 and 221 that are respectively connected with a manifold 222 (FIGS. 3, 7). Each fitting 220, 221 communicates with one of the air ducts 202 in platen 28 (FIG. 11) and a flexible air line 223 connects fitting 220 with manifold 222, while a similar hose connects fitting 221 with said manifold (FIGS. 3, 7).

Air line 50 (FIGS. 3, 4 and 7) connects the manifold 222 with the vacuum valve 49 that is within the housing 35 (FIG. 4).

Vertical movement of the platen at station A must be adequate to lift the cans to clear the layer forming bar 10, and this distance will be the same irrespective of the vertical dimensions of the cans.

As seen in FIG. 8, the platen 28 is secured directly to the platen frame 25 by bolts 224 where the largest cans are to be handled, and spacers 225, indicated in dot-dash lines, which may be of different lengths according to the lengths of the cans to be handled, support the platen different distances below the platen frame. The vertical travel of the platen frame will remain the same for the different sized cans.

Rigidly secured to plate 173 of the platen frame is an upstanding latch-engaging post 226 (FIGS. 7, 12 and 16) having a laterally projecting tooth 227 (FIG. 16) at its upper end. The upper side of said tooth is bevelled at 228.

One end of a horizontally elongated latch bar 229 is pivotally connected at one end to a vertical pivot 230, which pivot is secured to one of the horizontal box beams 170 that is rigid on the carriage 23. The end of the latch bar 229 that is opposite pivot 130 is adapted to extend below the tooth 227 of the latch-engaging post 226 when the platen frame has moved to the upper end of upward movement.

A bridge piece 231 (FIG. 16) supported at its ends on posts 232 that, in turn, are secured on the plate 174, extend over the outer end portion of said latch bar and said outer end is oscillatable below said bridge piece and between posts 232.

Latch bar 229 is pivotally connected with one end of a horizontally-elongated latch actuating rod 233 (FIG. 7) by a pivot 234 at a point intermediate the ends of said latch bar. The opposite end of rod 233 slidably passes through a guide 235 that is secured to one of the cross frame members 169 of the carriage, and the terminal outer end of rod 233 is adjacent to, but spaced from, the forward cross frame member 186 of the stationary main frame 1. A horizontally-adjustable elongated rod engageable element 236, secured on said main forward cross frame member 186, is in longitudinal alignment with the rod 232.

An expansion coil spring 237 (FIG. 7) around rod 233 reacts between the guide 235 on the cross frame member 169 and a collar 238 secured on said rod 233. The spring 237 reacts between guide 235 and collar 238 fixed on rod 233 to hold rod 233 forward, and the end stop is provided by a second collar 239 (FIG. 7) fixed on rod 233. Collar 229 is held against guide 235, and in this position the latch bar 229 is located below tooth 227 on latch post 226 until the rod 233 is actuated by engagement between rod 233 and element 236.

The height of the tooth 227, relative to the upper run 8 of belt 7, is such that the latch bar 229 will stay below the tooth during descent of the platen to pick up the layer of cans formed against the pattern-forming bar 10 to clear said bar for movement of the platen and cans from station A to station B. Thus the platen with the layer of cans carried thereby cannot accidentally drop below the limit defined by the tooth 227 on the latch post during transit to station B.

Upon reaching station B, the latch bar 229 will be swung from below tooth 227 by the engagement between rod 233 and element 236 to permit the platen and the layer of cans carried thereby to be lowered. As long as the carriage with the platen is at station B, the element 236, by pushing against rod 233, will hold latch bar 229 swung to a position from below tooth 227. This allows the platen to move downwardly to unload the cans, and up again without obstruction from latch bar 229. The latch bar will move under tooth 227 as soon as the carriage starts its return movement from station B to station A. The platen as shown in FIG. 7 is in a position just before the latch bar has been swung to a position from below tooth 227.

The upper run 8 of belt 7 is supported between pulleys 5 on hardwood strips 240 (FIGS. 1, 12) or other suitable rigid supports, on cross members 241 that, in turn, are secured at their ends to stationary side frame members 4.

In operation, the cans to be palletized are fed upright onto the upper run 8 of outer or rear end of belt 7 by any suitable feed means, such as an inclined feed chute 153 or a conveyor. As already mentioned, the belt 7 may be of the well-known woven wire mesh type providing a planar upper surface on which the cans are readily slidable.

The cans fed onto said belt are carried against the pattern-forming bar 10 where a horizontal layer of cans is automatically formed in a pattern that conforms exactly to the pattern of a horizontal layer of vacuum cups carried by a horizontal platen 28, that in turn is supported on a horizontally-reciprocable carriage 23 for horizontal movement on rollers between a station or position A, and a loading station or position 13 (FIG. 1).

The platen carry the vacuum cups will remain at station A, elevated above the cans, until a full layer of cans of the completed pattern has been formed against the pattern-forming bar 10.

Upon a full layer of cans being formed against bar 10, the platen automatically moves down until the vacuum cups engage the heads of the cans and the latter are gripped by the cups. Means is provided in the system, as has been described, to control the rate of descent of the platen, and to provide sufficient delay of the vacuum cups on the cans to insure the cups having a secure grip on the cans before the platen is raised.

Immediately after the cans are securely gripped by the vacuum cups, the platen is automatically elevated at a controlled rate, and upon reaching a predetermined height sufficient for the cans to clear the pattern-forming bar 10, a valve in the air system is mechanically actuated by the

movement of the platen to said elevated position for effecting actuation of an air cylinder to move the platen carriage from station A to station B.

The movement of the platen carriage **23**, including the platen from station A to station B is controlled to slow down the movement before the carriage reaches station B and engages a rubber bumper, and accidental dropping of the platen and its load of cans before it reaches station B is mechanically prevented.

Upon reaching station B the platen is released for lowering but is held elevated by air in the air cylinder that elevated it, and said platen is not lowered until a manual release means is actuated by the operator. This provides time for the operator to place a separator sheet on a layer of cans previously deposited on a pallet, or time for removing a loaded pallet and replacing it, or for any other reason.

Upon actuating the manual release, the platen and its load of cans is gently lowered under the weight of the cans and accurate control of the release of air from the platen lifting cylinder.

The control can **26***a* that is suspended a fraction of an inch below the main body of cans will be the first can to reach the support for the layer and upward movement of said can will actuate a valve in the air system to close the vacuum lines to the cups and to open the lines to a blast of air to free the cups from any tendency to cling to the cans, and to effect a slight delay in elevating the platen and cups from the cans, after which the platen is elevated to its upper position at station B.

The one cup **26***a* will automatically be lowered by gravity and spring force as the platen moves away from the layer of cans deposited on the pallet, and the actuation of the valve effected by said lowering of the cup **26***a* will close the blast of air to the cups.

When the platen is at the upper end of its movement, valves will be mechanically actuated by said movement to actuate the air cylinder for returning the carriage **23**, and platen **28** back to station A under control by the air. This return movement of the platen is accurately controlled, and at the ends of said movement, the platen is held by air pressure in the horizontal cylinder at either one or the other of said ends, and the air cylinder for raising and lowering the platen cannot be actuated until the platen is in either station A or B.

In the event, however, that the operator may wish to examine the platen and cans between stations A and B, a manually-actuated valve is in the air system that enables this to be done.

In the event a full layer of cans is at station A when the platen returns to station A, the cycle will automatically recommence immediately.

I claim:

1. The method of palletizing upright, cylindrical cans of uniform shape and size having horizontal heads at their upper ends that includes the steps of:

(a) continuously feeding cans in upright positions onto a planar horizontal surface at a feeding point for movement of said cans with said surface along a horizontal path of travel in a direction away from said point;

(b) continuously moving said surface in said one direction with said cans supported upright thereon;

(c) obstructing the movement of the cans on said surface in said one direction along a fixed, stationary line extending transversely across said path above said surface at a right angle to said direction of movement of said surface and cans thereon, whereby a plurality of cans will accumulate on said surface between said line and said feeding point during said movement of said surface;

(d) simultaneously releasably engaging heads of a predetermined plurality of the cans so accumulated under the influence of suction for suspending said cans from said heads upon applying a lifting force to the heads so engaged;

(e) simultaneously lifting all of said predetermined number of cans, with the exception of one can adjacent said line, by applying a lifting force thereto, and then applying said lifting power to said one can upon upward movement of the others a fractional distance of the height of said one can and continuing said upward movement of said entire plurality of cans until said plurality including said one can are at a sufficient height to enable free movement of the cans on said continuously moving surface to said line;

(f) then moving the said plurality of cans so suspended horizontally across and beyond said line in said one direction and effecting upward movement of said one can to the same position as the others by lowering said plurality of cans onto a horizontal stationary surface while so engaged;

(g) responsive to said upward movement of said one can, releasing the heads from engagement under the influence of suction.

2. In the method as defined in claim **1**:

(h) applying a blast of air under pressure at the points of engagement with said heads during and responsive to said upward movement of said one can relative to the others and thereafter discontinuing said blast of air.

3. In the method as defined in claim **2**:

(i) said lifting force and upward movement of said plurality of cans being under the influence of air under pressure; and

(j) during movement of said suspended plurality of cans horizontally across said line and during said application of said suction, said plurality of cans being positively but releasably supported against downward movement independently of said lifting force.

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