Dec. 10, 1957 K. B. HOLSTEBROE ET AL 2,815,623

MACHINES FOR PACKING ARTICLES IN CASES

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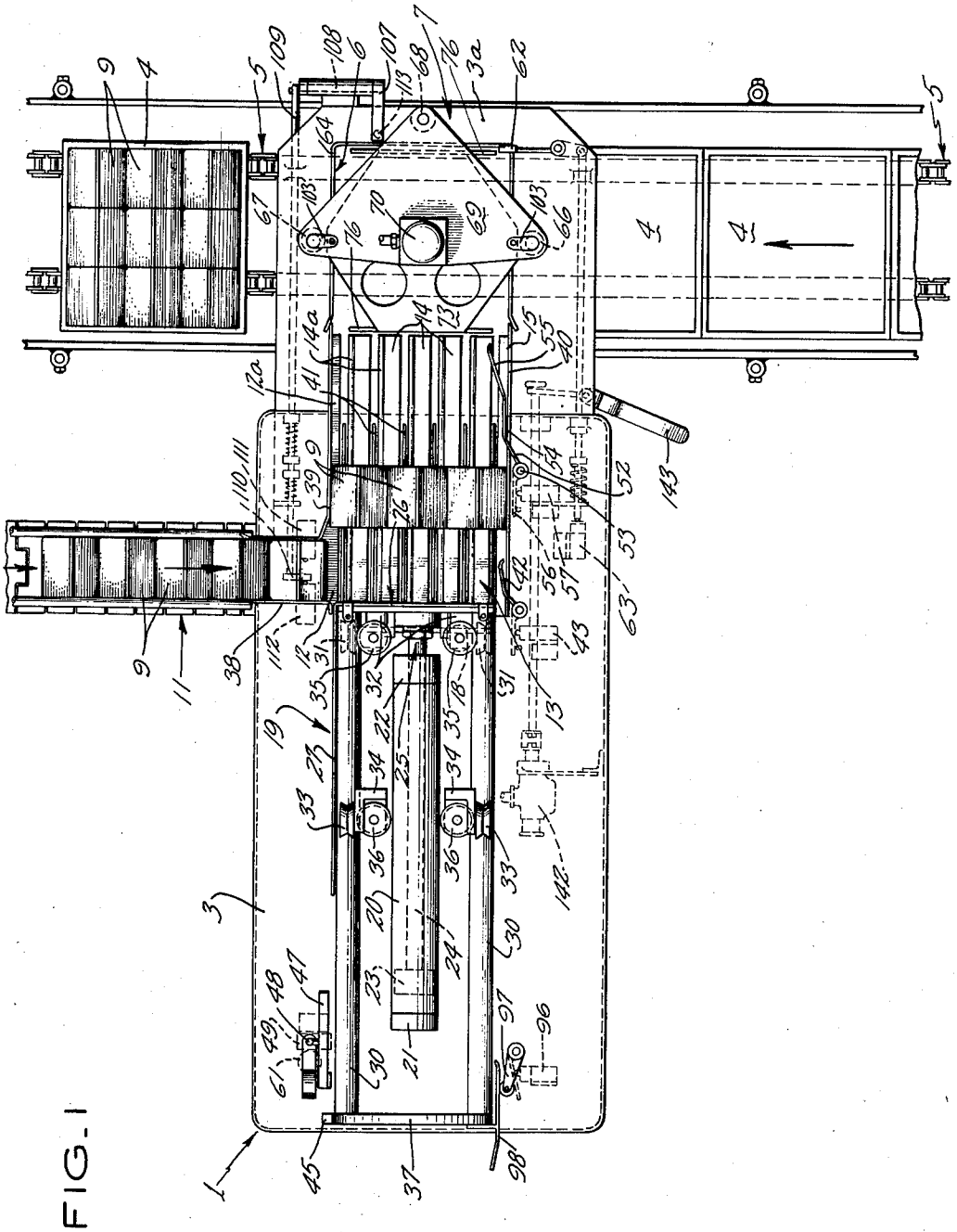


FIG. 1

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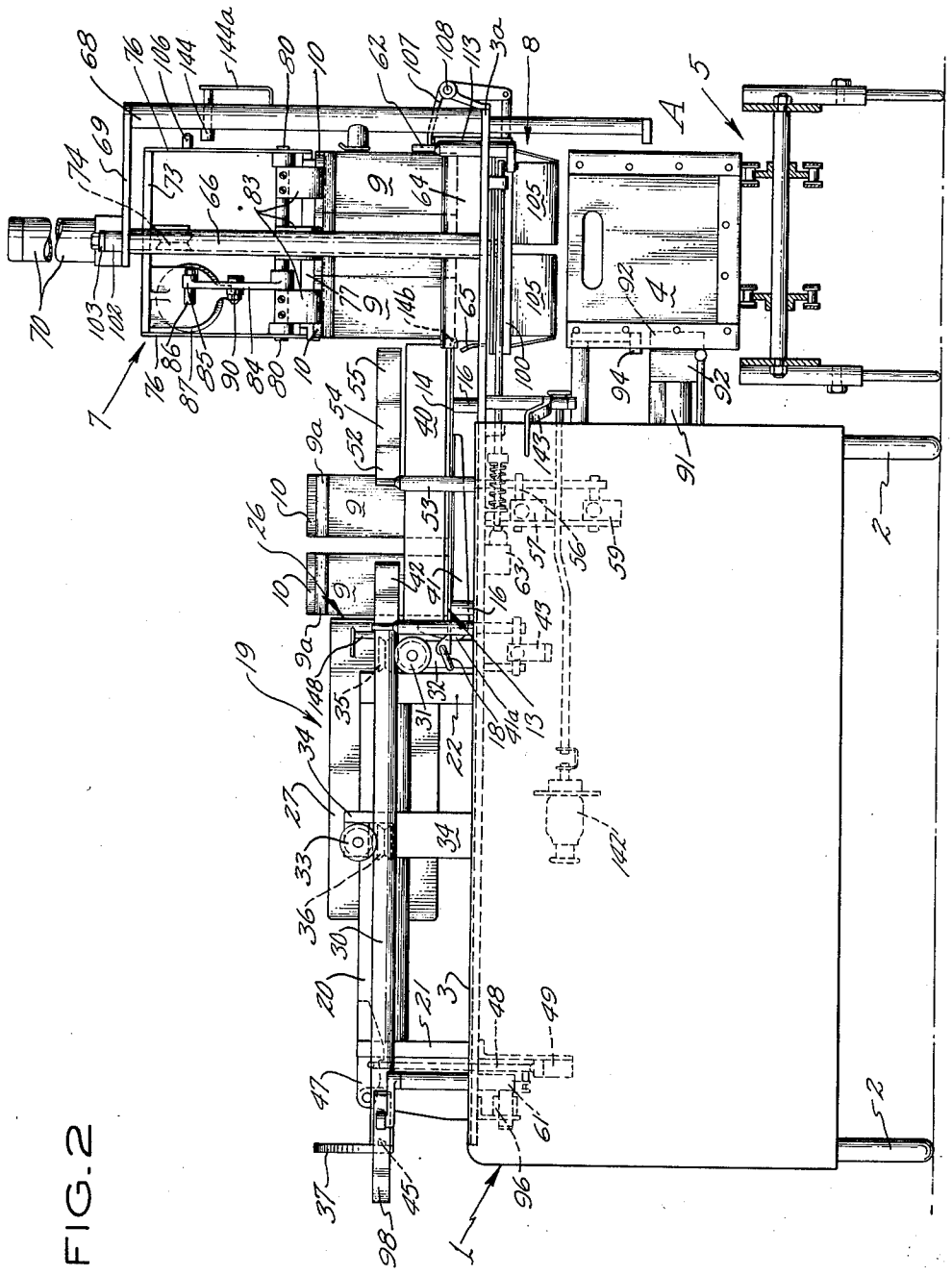


FIG. 2

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FIG. 3

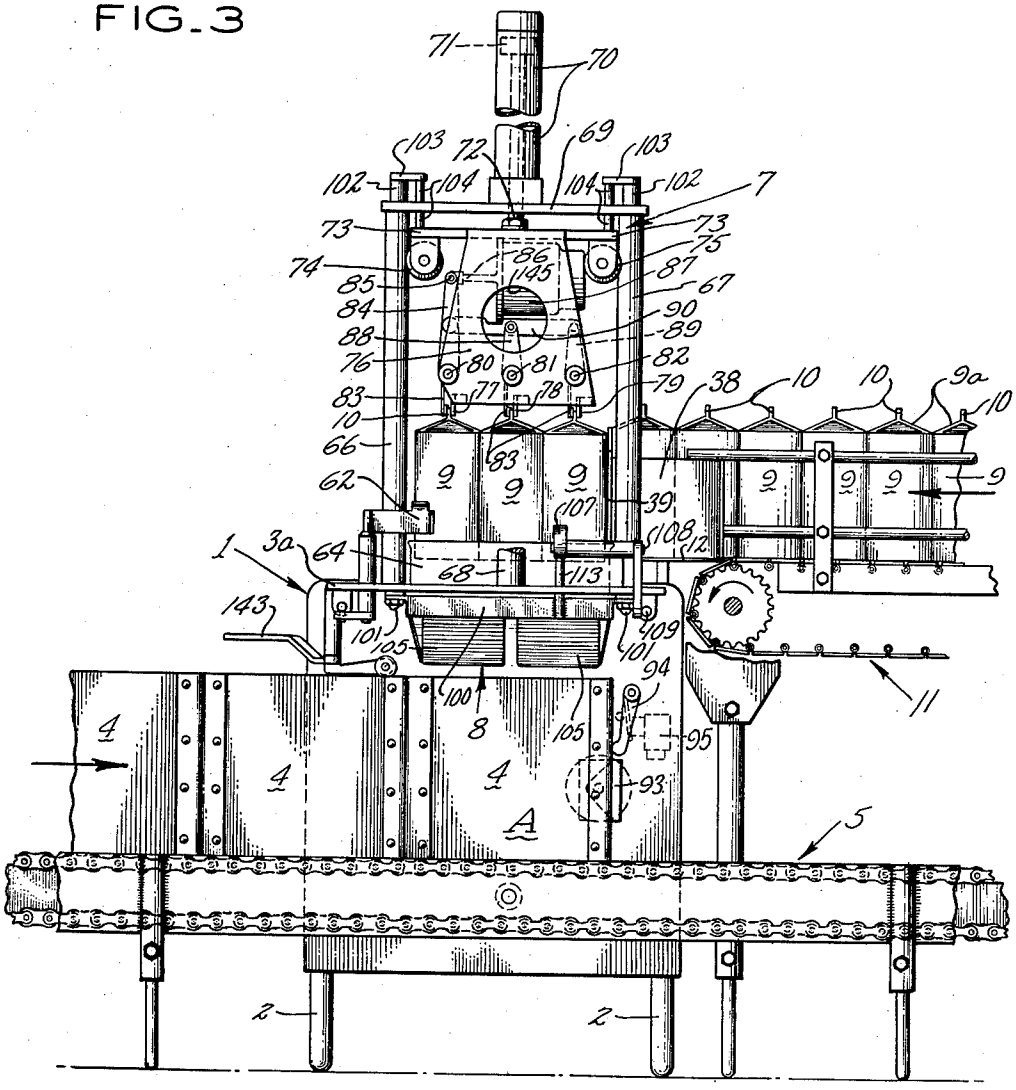
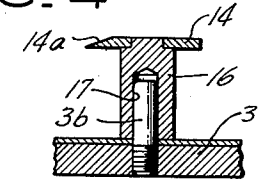


FIG. 4



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FIG. 5

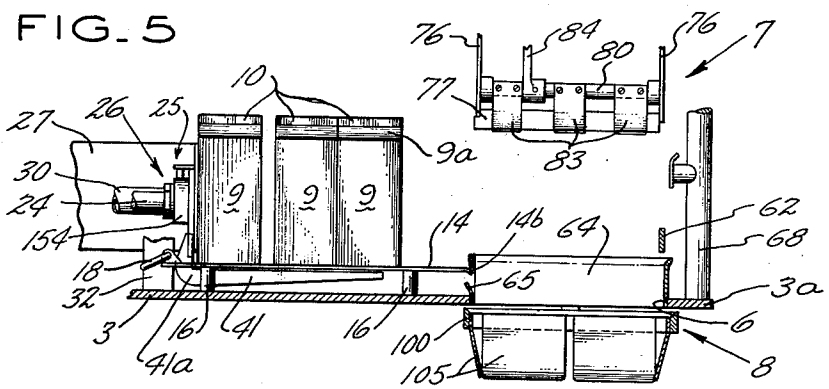


FIG. 6

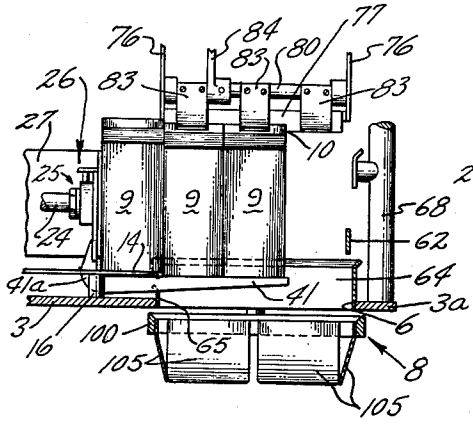


FIG. 7

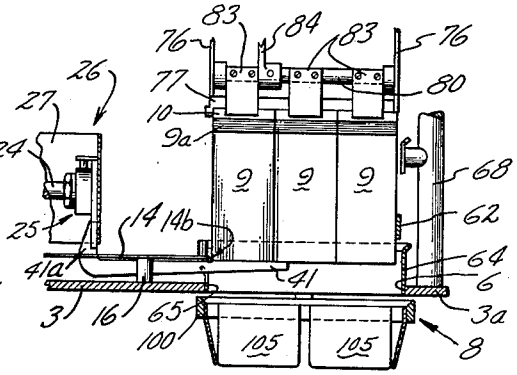
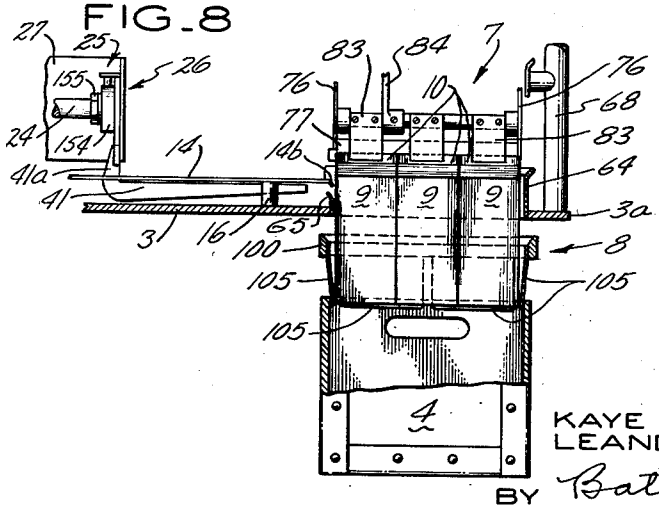


FIG. 8



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FIG_11

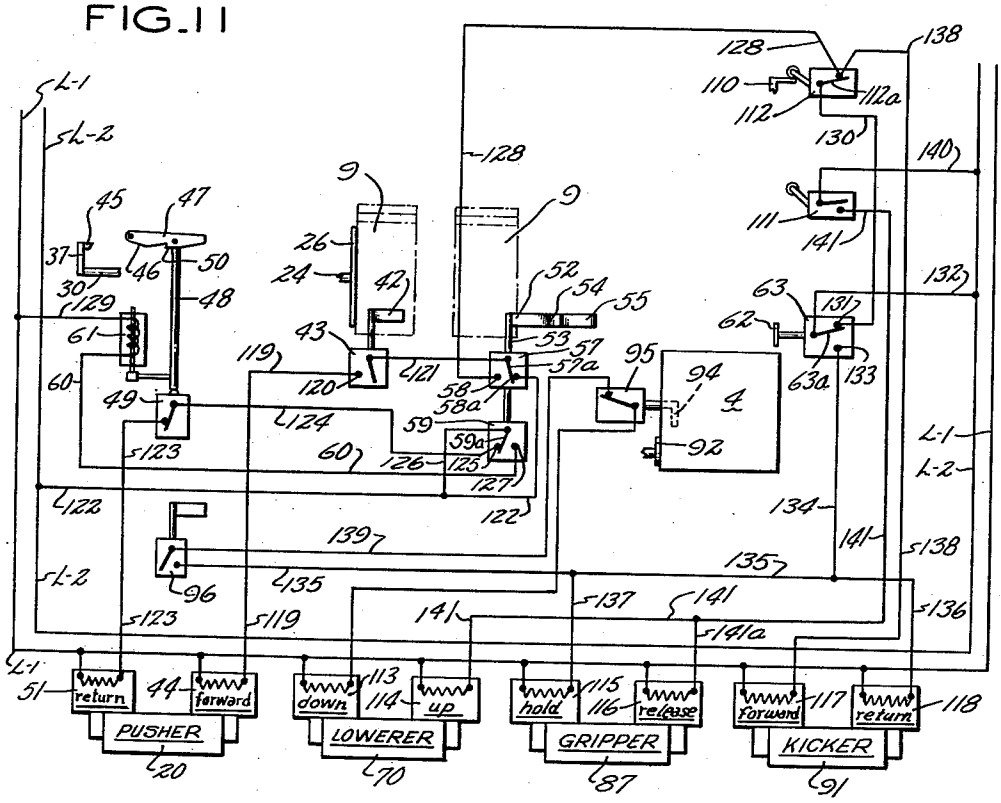


FIG_9

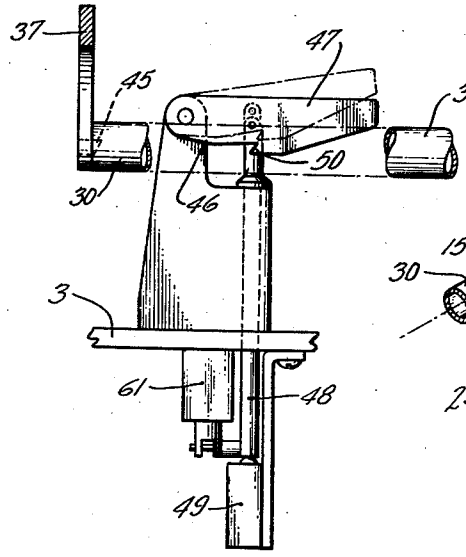
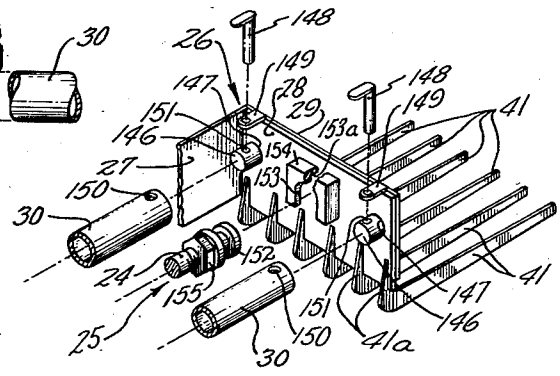


FIG_10



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2,815,623

MACHINES FOR PACKING ARTICLES IN CASES

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Application November 3, 1954, Serial No. 466,558

11 Claims. (Cl. 53—58)

This invention relates to improvements in machines for packing articles in cases and more particularly to a machine for packing gable-top milk containers or the like.

An object of the invention is to provide a fully automatic machine for grouping containers of the character described, so as to form a series of separate case-loads, each consisting of the required number of containers arranged in a suitable pattern for the case to be filled, positioning cases to be filled successively at a case-loading station of the machine, and packing successively formed load-groups of the containers into successively positioned cases at the case-loading station.

A further object of the invention is the provision of an automatic packing machine of the character described having reliable control means and safety provisions to assure smooth and efficient functioning of the machine without premature or untimely operation of any of the moving or operating parts thereof.

A further object of the invention is the provision in a machine of the character described of a novel means for transferring each load-group of containers from a load forming platform to a vertically reciprocable load lowering mechanism having grippers which grip the individual containers of the load by their tops and suspend them in their load pattern over a loading opening in the machine frame structure until the case for which such load is intended has been positioned beneath that opening, whereupon the load-lowering mechanism will lower the suspended containers through such opening and deposit them gently in the waiting case.

Other objects and advantages of the invention hereinafter will be pointed out or will become apparent from the following description of the construction and operation of a machine embodying the invention, as illustrated in the accompanying drawings, in which:

Fig. 1 is a plan view of the machine as it appears at one stage of its operation;

Fig. 2 is a side elevation of the machine;

Fig. 3 is a front elevation of the machine;

Fig. 4 is a fragmentary sectional detail view of a portion of a load forming platform included in the machine;

Fig. 5 is a fragmentary view, partly in section, showing cooperative features of a pusher head assembly, the load forming platform, container grippers, the loading opening and an associate funnel beneath the grippers, the view showing containers of three successive transverse rows on the load forming platform;

Fig. 6 is a view similar to Fig. 5 but showing the relative positions of the parts at a later stage in a cycle of operations of the machine, the containers of the first and second of the three transverse rows having been advanced onto and being supported by the projecting fingers of a transfer platform which now extends partly over the loading opening beneath the grippers, which are open;

Fig. 7 is a view like Figs. 5 and 6 to show the relative positions of the parts at a still later stage in the

operation of the machine, the containers of the three transverse rows now being gripped by the grippers and positioned over the loading opening and the temporary supporting fingers of the transfer platform and the pusher head having been partly retracted;

Fig. 8 is a view similar to Figs. 5 to 7, inclusive, to show the relative positions of the parts at a still later stage in the operation of the machine, the temporary supporting fingers of the transfer platform having been fully retracted by retraction of the pusher head, the load guiding funnel having been lowered and the closed grippers being in the process of lowering the containers supported thereby downwardly through the loading opening and the load guiding funnel into a waiting case;

Fig. 9 is a relatively enlarged detail of a switch actuating and latching mechanism component of the means for controlling the operations of the pusher head;

Fig. 10 is a fragmentary perspective view showing in separated positions the elements provided for detachably connecting the pusher head with its operating and guiding means; and

Fig. 11 is a schematic diagram of the electrical connections and certain operating and control parts of the machine.

The machine framework comprises a substantially rectangular box-like structure or housing generally designated 1, Figs. 2 and 3, having supporting legs 2, and a rectangular flat top or table 3, which is best seen in Fig. 1. The table 3 is provided at its forward end with a generally rectangular co-planar end extension 3*a*. The table end extension 3*a* overlies a case loading station indicated at A, Fig. 2, to which each of a series of open-topped cases 4 may be brought in its turn by a horizontal case feed conveyor system, generally designated 5, as indicated by the position of the leading case 4 in Fig. 3. The table end extension 3*a* is provided with a square loading opening 6 above the waiting case at the loading station A and a load packing mechanism, generally designated 7, is mounted on the table end extension 3*a* and includes vertically reciprocable container gripping mechanism presently to be described for lowering a load-group of the containers through the opening 6 and a funnel 8 positioned therebeneath into the waiting case.

The containers to be packed are indicated at 9 and are shown as being square in cross-sectional configuration throughout their body portions and as having gable-type tops 9*a*, the upper median portion of which is in the form of an upwardly projecting ridge 10. These containers may be brought from a filling machine or other place (not shown) to the machine by a horizontal supply conveyor 11. The discharge end of conveyor 11 is operatively associated with the table 3 at one side edge of the latter adjacent to the forward end of such table, as shown in Fig. 1, being at a slightly higher level than the table, as shown by Figs. 2 and 3. The conveyor 11 may operate continuously so as to bring a line of the containers in close order formation to the machine.

From the conveyor 11, containers 9 pass by line pressure in a direction transverse of the table 3 onto a scuff plate 12, Fig. 1, and thence onto and across a rearward end portion of a load forming platform generally designated 13, Figs. 1 and 2. This load forming platform may comprise a plurality of parallel spaced supporting strips 14, each of which is beveled at its side edge proximate to the conveyor 11 as indicated at 14*a* in Figs. 1 and 4. The width of the load forming platform is approximately the same as the width of the loading opening 6 in the table end extension 3*a*. An edge poriton of the scuff plate 12 at the side of the load forming platform nearest to the conveyor may be extended to the opening 6 as indicated at 12*a* in Fig. 1 and serve as a side strip of the loading platform. At the opposite side of the load forming plat-

form, a similar side strip, indicated at **15**, may be provided.

The platform strips **14** which, as aforesaid, are beveled at their edges nearest to the conveyor **11**, may be readily removed for cleaning or other purpose and as readily replaced. These strips are provided with short supporting legs as indicated at **16**, Figs. 2, 4, 5 and 6. As shown in Fig. 4, each leg has a socket indicated at **17**, open at its bottom end to fit over a fixed upstanding locating stud or pin **3***b* on the table **3**. The rearward ends of the strips **14** are tied together and to the machine framework, as to transversely spaced fixed blocks **32** on the table **3**, by a removable cross rod **18**, Figs. 1, 2 and 5.

A pusher mechanism, generally designated **19**, Figs. 1 and 2, is mounted on the table **3** at the rear of the load forming platform. It comprises a pneumatic cylinder **20** supported at its ends by longitudinally spaced supporting blocks **21** and **22**, respectively, on the table **3**. A piston **23** in the cylinder **20** has a rod **24** projecting from the front end of the cylinder, as through the upper part of supporting block **22**. Rod **24** is coupled at its forward end by coupling mechanism **25**, Fig. 1, to a pusher head **26**. Pusher head **26** is of suitable transverse and vertical dimensions to press flatly against the rearward sides of all the containers **9** of a transverse row of such containers on the rearward portion of the load-forming platform. A forward movement of the pusher head from its retracted position will move these containers forward on the load forming platform sufficiently to make room for a second similar transverse row of containers, as to the position of the three containers **9** on platform **13** in Fig. 1. A gate **27** extends rearwardly from the side edge of the pusher head next to the discharge end of the container supply conveyor **11**. This gate is moved across the discharge end of the conveyor **11** on each forward stroke of the pusher head from its retracted position so as to block movement of further containers onto the loading platform until the pusher head has completed its forward stroke and has been returned to its retracted position.

As shown, see Fig. 10, the pusher head **26** comprises a main plate **28** covered at its forward face by a face plate **29**. Gate **27** may be an integral rearward extension of face plate **29** at the side edge of the latter next to the discharge end of conveyor **11**.

The pusher head **26** is provided with a pair of transversely spaced rearwardly extending rods **30** which at their forward ends are rigidly coupled thereto by means presently to be described. These rods **30**, Figs. 1 and 2, rest on peripherally grooved supporting rollers **31** carried by the fixed blocks **32** on the table **3** and at more rearwardly located places pass under peripherally grooved guide rollers **33** mounted on blocks **34** on the table **3**. The respective rods **30** also are in bearing contact with horizontal peripherally grooved guide rollers **35**, mounted on portions of the blocks **32** and also with more rearwardly located peripherally grooved guide rollers **36**, mounted on portions of the blocks **34**. Any suitable known means may be employed to guide the rods **30** as they are moved longitudinally above table **3** by the reciprocating pusher head. At their rearward ends, which are located rearwardly of the pusher cylinder **20**, the rods **30** are connected by a cross bar **37**.

The group forming platform **13** is sufficiently wide to accommodate a transverse row of three of the containers **9**. These containers may be guided across the dead plate **12** by guide rails **38** so that they will be pushed by line pressure from oncoming containers across the rearward portion of platform **13** directly in front of the fully retracted pusher head. Guide rails **39** and **40**, respectively, may be provided at the remote side edges of the side edge strips **12***a* and **15** of the load forming platform. The gate **27** moves past the discharge end of the conveyor **11** along the guide rail **39** when the pusher head **26** is projected to push a transverse row or rows of the containers forward on the load forming platform, as hereinafter will be explained.

The length of the load forming platform, in the example shown, is not substantially less and may be somewhat greater than the combined width of three of the transverse rows of containers on the load forming platform. Three such rows, each containing three of the containers, provide a group-load for one of the cases **4** in this example.

Such a group-load of containers is moved to a position over and then lowered through the opening **6** in the table end extension and into a waiting case therebeneath. This is accomplished by a novel arrangement of coacting elements, including for the first step thereof a novel means to shift the containers of the group-load forward from the load forming platform to a position over the opening **6** and such that the ridge portions of the tops of such containers are in positions to be gripped by grippers of a cooperative group-load lowering mecahnism which the invention also provides and which will presently be described.

The means for shifting the group-load to a position over the opening **6** comprises a transfer platform comprising a series of spaced parallel substantially horizontal elongate fingers **41** rigidly joined at their rearward ends to the pusher head **26** so as to project forwardly from the lower edge of the latter in the spaces between adjacent strips of the load-forming platform, the upper surfaces of these fingers being level and slightly below the level of the upper surface of the load-forming platform. The transfer platform fingers **41** have upturned rear end portions **41***a* welded or otherwise rigidly secured to the plate **28** of the pusher head, as shown by Fig. 10. The length of these fingers is as great or not substantially less than the combined width of the three transverse rows of containers forming a group-load. In the example shown, the fingers **41** are considerably shorter than the load-forming platform strips and thus will be disposed in inactive positions in the spaces between such strips until projected beyond the forward ends of the latter by a relatively long, transfer stroke of the pusher head as presently will be described.

Containers brought to the machine by the supply conveyor **11** will be pushed by line pressure of the oncoming containers across the scuff plate **12** onto and across the rear end portion of the loading platform next to the retracted pusher head **26**. The leading container of this transverse row on the load forming platform will contact and actuate a pivoted actuator or so-called flag **42** for a switch **43**, Figs. 1 and 11. Switch **43** is an element of an electrically operated control system which is shown diagrammatically and somewhat schematically by Fig. 11 and which will be more particularly described later in this specification. It will suffice at this point to state that the actuation of the switch **43** referred to will effect operation of a solenoid operated air valve indicated diagrammatically at **44** in the lower left hand portion of Fig. 11 so as to supply air under pressure to the rear end of cylinder **20** and thereby cause a forward stroke of the pusher head to move the transverse row of three containers forward on the load forming platform. The cross bar **37** will likewise be moved forward with the pusher guide rods **30**, Fig. 1. An upstanding lug **45** on one end of cross bar **37** will be moved under and in lifting contact with a cam surface **46** on the bottom edge of a vertically swingable pivoted bar **47**, Fig. 11, to raise the latter and a rod **48** depending therefrom to the extent required to cause operation of a switch **49** with which rod **48** is cooperatively associated. This occurs when the pusher head has moved the transverse row of containers forward sufficiently to clear the portion of the load forming platform onto which further containers from conveyor **11** will pass when gate **27** has been withdrawn from its then blocking position across the delivery end of such conveyor. The transverse row of containers may be in the position on the load forming platform shown in Fig. 1. The pusher head has now completed its first "short" stroke. Overtravel is prevented by the provision

of a rearwardly facing stop shoulder **50** on the lower edge of lifter bar **47** in position to be engaged by lug **45** on bar **37** of the pusher assembly.

Operation of the switch **49** as described at the end of the first short stroke of the pusher head will effect operation of a solenoid operated air valve which is indicated diagrammatically at **51** in the lower left hand corner of Fig. 11. Operation of valve **51** will admit air under pressure to front end of cylinder **20** and cause a return of the pusher head to its retracted position. Gate **27** will be retracted to clear the delivery end of supply conveyor **11**.

Containers **9** will be moved by line pressure from conveyor **11** until a second transverse row of three of the containers is disposed on the load forming platform back of the first row and in front of the pusher head. This will cause a second forward stroke of the pusher head against the second transverse row of containers and the forward movement thereof will cause the first row to be correspondingly advanced on the load forming platform. Switch **49** will be operated in the manner described to cause a return of the pusher head at the end of a "short" stroke thereof.

A relatively long horizontally swingable switch actuator or "flag" **52** is mounted on a vertical rock shaft **53** at the same side of the load forming platform as flag **42** and in advance of the latter. Flag **52** has a laterally bent contact portion **54** relatively near its supporting rock shaft **53** and a more forwardly located second laterally turned contact portion **55** nearer the free end of the flag. Contact portion **54** of the flag will be struck by the container **9** at the adjacent end of the first transverse row on the load-forming platform as that row is being pushed forward by the second short stroke of the pusher head. The flag will be biased laterally outward by such contact sufficiently to turn rock shaft **53** clockwise as viewed in Fig. 1 to the extent required to swing a switch control rocker arm **56** on the rock shaft relative to a fixed switch **57**, Switch **57** has a switch arm **57***a*, Fig. 11, normally bearing against switch contact element **58***a*. Actuation of the switch as just described will result in throw of switch arm **57***a* from contact element **58***a* to a second contact element **58**. This operation of switch **57** is to set the electrical control system, presently to be described, so as to preclude any possible continuation of the forward movement of the pusher head beyond its second short stroke should the load-lowering mechanism or lowerer not be in its fully raised position.

To complete the load, three more of the containers enter the load forming station and actuate the switch **43** to initiate a third forward stroke of the pusher head in the manner and as described for the previous strokes. This forward movement of the pusher head will move a block of three transverse rows of containers forward on the load forming platform. An end container of the leading row will actuate free end portion **55** of the flag **52** so as to operate a switch **59** to close a circuit through wire **60**, Fig. 11, to a solenoid **61**. This will energize solenoid **61** which will act through its connection with rod **48**, Fig. 11, to lift the pivoted latch member **47** sufficiently to clear the lug **45** at the end of a short stroke of the pusher assembly, thereby permitting continued forward movement of the pusher to make the long stroke required to push the load group from the load forming platform onto the then projecting fingers **41** of the transfer platform. In passing from the load forming platform to the transfer platform, the containers will drop slightly as indicated in Fig. 6.

At the end of the long stroke, a switch actuating trip element **62**, Figs. 1, 3 and 11, will be actuated to operate a switch **63** to effect closing of grippers on the ridges of the individual containers of the load so as to take over the support of the load from the transfer platform. The containers of this load will have passed the flag **52** so that switch **59** will return to the position shown in Fig. **11** and the solenoid **61** thus will be de-energized. This will permit the raised latching member **47** to drop to its active position. The switch **49** will be returned to its normally closed position and a return stroke of the pusher will be initiated. The transfer platform fingers will be retracted with the pusher. Contact of the forward ends **14***b* of the load forming platform bars with the containers of the rearmost row above the loading opening as shown in Fig. 7 will strip the containers from the transfer platform bars as the latter are retracted. The return movement of the pusher will actuate other operating parts of the machine as presently will be described.

An upstanding curb **64** of substantial height may be provided along the side and front edges of the loading opening **6** in table plate end extension **3***a*, Figs. 1, 3 and 5 to 8, inclusive. A lower curb **65** may be provided at the rear margin of this opening with its upper edge below the level of the load forming platform strips **14**, this curb **65** being apertured to accommodate the transfer platform fingers **41** when the latter are projected forwardly across the space above the opening **6**.

The load lowering mechanism has supporting structure comprising three upright posts or standards **66**, **67** and **68**, respectively, uprising from the supporting table end extension **3***a*. The standards **66** and **67**, respectively, are located at opposite sides of the opening **6** while the standard **68** is located at the front thereof. See Figs. 1 and 3. The upper ends of these standards support a triangular top plate **69**. Mounted on this top late **69** is a vertically disposed air cylinder **70**. A piston **71**, reciprocable therein, has a rod **72** depending through the plate and carrying a gripper mechanism head plate **73**. Head plate **73** carries guide rollers **74** and **75** in contact with the standards **66** and **67**, respectively. Depending from opposite side edges of plate **73** are hanger plates **76**. These are connected at intervals at their lower edges by three spaced transverse gripper bars **77**, **78** and **79**, respectively. Three transverse rock shafts **80**, **81** and **82**, respectively, extend across the space between these hanger plates and are supported by the hanger plates in positions above and slightly out of line with the respective gripper bars **77**, **78** and **79**, respectively. Each of the rock shafts carries three depending gripper fingers **83** spaced along the length of such shaft and disposed in cooperative relation to the adjacent gripper bar.

A rocker arm **84** for operating rock shaft **80** extends upwardly between the hanger plates and is operatively connected at its upper end at **85** with a piston rod **86** projecting from a horizontal air motor **87** which hangs from the plate **73**. The rock shafts **81** and **82** are provided with upwardly extending shorter rocker arms **88** and **89**, respectively. A tie-bar **90** operatively connects all the rocker arms **89**, **88** and **84** together so that operation of rocker arm **84** by the air motor **87** will turn the rock shafts **80**, **81** and **82** in unison to effect closing or opening movements of the gripper fingers **83** with respect to the fixed cooperative gripper bars **77**, **78** and **79**, respectively, according to the direction of movement of the air motor piston rod **86**.

When the load group of containers **9** has been moved to a position over the loading opening **6** in the manner hereinbefore described, the actuation of the switch **63** will effect closing movements of the gripper fingers and gripping of the ridge portions **10** of the tops of the containers forming the load group between the stationary gripper bars and then closed gripper fingers, substantially as shown by Figs. 3 and 7. This actuation of switch **63** also will cause an operation of air motor **91**, Fig. 2, to retract a case kicker head **92** from its projected position, indicated by dotted lines, where it would block movement of an oncoming case **4** to the loading station directly beneath loading opening **6** to the full line position which permits the leading case to be moved by line pressure of the oncoming cases on case feed conveyor **5** to the loading station. The leading case is spotted at that station

by the contact of its forward wall with a fixed stop **93**, Fig. 3, which projects from the fixed frame structure **1** into the path of movement of the case arriving at the loading station. Just before the leading case is moved against stop **93**, such case will strike and actuate a pivoted switch control arm **94** and the resultant operation by that arm of a switch **95**, Figs. 3 and 11, will clear the operating circuit, as later will be explained, so that the gripper head, carrying the load group of containers may start its downward movement when a switch **96**, Figs. 1 and 11, which also is in that circuit, has been operated. Operation of switch **96** is by a pivoted actuator **97**. A cam element **98** is fixed to the pusher assembly cross bar **37** in position to strike and operate element **97** when the pusher assembly has been retracted far enough to carry the transfer platform fingers **41** clear of the loading opening **6**.

A funnel **8**, Figs. 2 and 3, for guiding each load group of containers lowered through opening **6** into a case **4** at the loading station therebelow is movably supported below and in line with that opening. Such funnel has a rectangular funnel rim member **100** fastened at **101** to the lower ends of vertical rods **102** which extend through and are slidable in the vertical posts **66** and **67**, respectively, such posts being tubular for that purpose. The rods **102** project from the upper ends of posts **66** and **67** to a short distance thereabove when the funnel is in a relatively raised position as shown in Figs. 2, 3 and 5 to 7, inclusive. Projecting laterally from the upper ends of these rods are short rigid arms **103** to which are fixed rigid depending pins **104**. These pins extend downwardly through suitably provided aperatures in frame plate **69** so as to bear against the upper surface of movable gripper assembly head plate **73** when the gripper assembly is in its raised position. This will maintain the funnel **8** in its raised position. When, however, the gripper assembly is lowered, this being effected as hereinbefore explained, the funnel supporting rods **102** will move downwardly as the member **73** descends ahead of pins **104** until arms **103** rest on head plate **69**. The funnel **8** includes depending, slightly convergent spring funnel body strips **105** carried by the rim member **100** and the downward movement of the funnel with its supporting rods **102** will be sufficient to dispose the lower ends of these strips in the upper part of the case **4** at the underneath loading station as shown in Fig. 8.

The descending load-group of containers will be guided in its descent by curb **64**, **65** and funnel **8** into the waiting case. When the bottoms of the containers are near the bottom of the case, a rigid outwardly projecting lug **106** on one of the gripper assembly side plates **76** will have been moved downwardly sufficiently far to strike a vertically swingable rocker arm **107** on a rock shaft **108**, Figs. 1, 2 and 3, and will swing that arm downwardly as the gripper assembly completes its downward stroke. Rock shaft **108** is operatively connected to one end of a pull-and-push rod **109**, Fig. 1, the opposite end of which carries a rigid switch actuator **110** which is movable by the rod to-and-fro between two switches **111** and **112**, respectively, so as to operate one or the other of such switches according to whether the rod is pulled or pushed from an intermediate position. Switch **111** will be operated when rocker arm **107** is depressed and will be effective through control and operating mechanisms of the machine to open the grippers to deposit the load-group of containers gently in the case at the loading station and also to initiate a return, upward movement of the gripper assembly.

Near the end of the upward movement of the gripper assembly, the upwardly moving plate **73** will strike the lower ends of pins **104** and thereafter raise the rods **102** and funnel **8** to the positions shown in Fig. 3. A rigid upwardly projecting striker element **113** on the rim of the funnel **8** will be raised against depressed rocker arm **107** and return it upwardly to its raised position as shown in Fig. 2. This will cause rod **109** to be pushed as required to effect operation of switch **112**, Fig. 1. Such operation of switch **112** will cause the air motor **91**, Fig. 2, to be operated so as to project the kicker head **92** outward against the adjacent side of the filled case at the loading station. The filled case will be pushed laterally on its supporting conveyor **5** beyond the projecting end of fixed stop **93**, Fig. 3. Conveyor **5** then will carry the filled case away from the loading station so that the next case in line may be advanced to that station when kicker head **91** has been retracted as hereinbefore has been explained.

When the gripper assembly has been returned to its fully raised position, a cycle of case loading operations will have been completed. Another load-group of containers will have been formed on the load-forming platform in the meantime. This load-group cannot be advanced by a long stroke of the pusher head to a position over the loading opening until the switch **112** has been operated as the final portion of the upstroke of the gripper assembly is completed.

The machine is air operated. Its operating cylinders may be controlled by solenoid pilot operated valves which are supplied with air under pressure and are controlled by a suitable electric system, including the switches to which attention hereinbefore has been directed. The control system may be substantially as diagrammatically and schematically illustrated in Fig. 11 in which the several operating air cylinders are represented by rectangles bearing appropriate legends.

The cylinder **20** for operating the pusher has its opposite ends operatively connected to a pair of solenoid operated valves which are represented by the rectangular diagrams **44** and **51**, respectively, such diagrams being marked "forward" and "return," respectively. The cylinder **70** for lowering and raising the load gripping assembly is equipped with a "down" solenoid operated valve **113** and an "up" solenoid operated valve **114**. The cylinder **87** for releasing and opening the grippers is equipped with a solenoid operated valve **115**, marked "hold" and a solenoid operated valve **116**, marked "release." A cylinder **91** for operating the kicker head for thrusting each filled case laterally on its conveyor at the proper time is equipped with a solenoid operated valve **117**, marked "forward," for projecting the kicker head outward against the case and with a "return" solenoid operated valve **118**.

One side of each of these solenoid operated valves is electrically connected to a main designated L–1. The opposite side of each such solenoid operated valve is electrically connected at times to a second main which is designated L–2 by a suitable arrangement of wiring and one or more of the aforesaid switches. The arrangement is such as hereinbefore has been explained to assure operation of the several operating parts of the machine in proper sequence and to preclude premature or untimely operation of any of these parts. The electric connections by which these results are accomplished will now be explained with reference to a cycle of load forming and packing operations of the machine.

The solenoid operated valve **44** for use in effecting a forward movement of the pusher head **26** is connected by a wire **119** to a contact element **120** of the switch **43**. This switch is normally open and is connected by a wire **121** with the switch arm **57***a* of double-throw switch **57**. The contact element **58***a* thereof is operatively connected by a wire **122** to main L–2 and the switch arm **57***a* normally is in contact with this element.

Thus, when the carton **9** hits the flag **42**, switch **43** will be closed and this will close a circuit to one part of switch **57** for operating the solenoid valve **44** to cause a forward stroke of the pusher **26**. This will move a transverse row of the containers **9** one push forward on the load forming platform of the machine, as hereinbefore has been explained. Near the end of this stroke,

switch 49, which is normally closed, will be opened by a slight lifting of pivoted member 47 by travelling lug 45. The "return" solenoid operated valve 51 is normally in a closed circuit comprising a wire 123 connecting such solenoid operated valve with the normally closed switch 49, a wire 124 connecting switch 49 with a contact element 125 of switch 59, and a wire 126 connecting switch arm 59a of switch 59 with wire 122 which leads to element L–2, the switch arm 59a normally being disposed against contact element 125. When the switch 49 is opened at the end of a short forward stroke of the pusher, the circuit will be broken and the solenoid valve 51 will be rendered effective to cause a return stroke of the pusher to its retracted position.

The switch 59 has a second contact element, designated 127, which is operatively connected by a wire 60 to the solenoid 61, this solenoid has a wire 129 leading to the main L–1.

The contact element 58 of switch 57 is connected by the wire 128 to normally closed switch 112. That switch has a switch arm 112a connected by a wire 130 to an element 131 of switch 63, which is a double-throw switch. Switch arm 63a of switch 63 normally bears against contact element 131 and is connected by a wire 132 to main L–2. A second contact element, designated 133 of switch 63, is connected by a wire 134 to a wire 135 which leads to the switch 96 and also has branch connections, indicated at 136 and 137, with the solenoid operated valves 118 for the case kicker and 115 for the gripper mechanism, respectively. Switch 112 also has a second wire, indicated at 138, leading from its contact to the solenoid operated valve 117 of the case kicker mechanism.

At the end of the second short stroke of the pusher 26, a carton 9 of the first tranverse row will strike the portion 54 of flag 52 and will operate switch 57 so as to move its switch arm 57a from contact 58a to contact 58. This will bring switch 112 and switch 63 into series with switch 43 and eliminate a possible long stroke of the pusher if the load group lowering mechanism is not fully in its up position.

At the beginning of the pusher long stroke, which is the third stroke of a series, the containers of the first transverse row will continue to move the flag 52 so as to operate switch 59 before the lug 45, carried by the pusher mechanism, reaches the pivoted latching bar 47. This will energize solenoid 61, causing the rod 48 to be raised sufficiently to raise the pivoted latching bar above the path of movement of the lug 45, allowing a long stroke of the pusher.

At the end of the long pusher stroke, switch 63 is operated and its switch arm 63a is moved against contact 133. This will actuate the solenoid operated valve 115 to cause closing of the grippers and also will actuate solenoid operated valve 118 to cause a return or retractive stroke of the case kicker head 92.

When the containers clear the second portion 55 of the flag 55, at the end of the long stroke, the switch 57 is released and returns to its normal position and the pusher is returned to its retracted position.

Switch 96 is connected by a wire 139 with switch 95 and is normally open. When the pusher returns to its retracted position, switch 96 will be closed, as hereinbefore has been pointed out, and the load group lowering assembly will be moved on its down stroke provided switch 95 is being maintained closed by an empty case at the loading station. At the end of the down stroke of the lowerer, normally open switch 111 will be closed. This switch is connected by a wire 140 with main L–2, by a wire 141 with the "up" solenoid valve 114 of the load lowering mechanism and by a branch wire 141a with the "release" solenoid valve 116 of the gripper operating mechanism. Consequently, when switch 111 is closed, the grippers will be opened to deposit the lowered containers in the case and the lowerer mechanism will be started on its return upward stroke.

At the end of the up stroke of the lowerer, switch 112 will be opened and this will cause operation of the "forward" solenoid valve 117 of the kicker mechanism so that the filled case will be thrust laterally from the position at which it was loaded, allowing it to be carried away by the case feed conveyor.

It will be apparent that adequate safety provisions thus are included in the machine to maintain proper sequence of operations of the several operating parts.

An air pressure release valve, indicated at 142, in Figs. 1 and 2, may be opened by a manually operable handle 143, if desired, so as to permit any work on parts of the machine or repair thereof while air pressure is off. Should this be done, a normally retracted latch 144, Fig. 2, should be manipulated by its handle 144a so as to be projected inwardly into an opening 145, Fig. 3, in the adjacent side plate 76 of the load lowering mechanism so as to prevent such mechanism from dropping out of control when the air pressure is released.

The piston rod 24 of the pusher air motor and the guide rods 30 preferably are connected with the pusher head so that the pusher head assembly can be quickly detached for cleaning or other purpose and readily reconnected.

As shown in Fig. 10, the rods 30 may be hollow so as to fit over short studs 146 which project from the pusher head face plate 29 through holes 147 in the main pusher plate 28. Pins 148 are adapted to be projected downward through apertured lugs 149 on the pusher plate through registering transverse holes 150 and 151, respectively, in the telescopically associated tubular guide rods 30 and fastening studs 146.

The piston rod 24 has an enlarged or disc-shaped terminal portion 152 adapted to fit in an enlarged inner portion 153a of an open-bottomed recess 153 formed in a fixed fastening block 154 on the rear face of pusher plate 28. When the relatively large terminal end portion 152 of piston rod 24 has been placed in the recess in the block 154, a jam nut 155 on a threaded portion of the piston rod may be tightened against the block 154 to maintain the connection between the piston rod and the pusher plate.

In order to remove the pusher head assembly and the load forming platform strips 14, if desired, it is only necessary to displace pins 148, loosen nut 155, and detach the pusher head from the piston rod 24 and guide rods 30. The piston head assembly then is removable as a unit and this will provide access to the load forming platform strips 14, which, as previously has been explained, are retained in place by a single transverse pin 18, Fig. 2. Removal of this pin will permit displacement of the load forming platform strips. Reassembly of the parts just mentioned can be effected quickly and easily in the manner described.

The invention has been described in detail in connection with one particular embodiment thereof. It will be understood that other embodiments which include various changes in the construction and arrangement of the various parts of the apparatus may be made without departing from the spirit of the invention or exceeding its scope as set forth in the appended claims.

We claim:

1. In a machine for packing containers into cases, a framework structure, including a table having a projecting end extension provided wtih a loading opening through which a load-group of containers appropriate for a case may be lowered, a stationary platform comprising a plurality of transversely spaced strips mounted on said table so as to extend longitudinally of a portion thereof adjacent to said loading opening with said strips terminating at one end approximately flush with the adjacent edge of said loading opening, a movable platform comprising a plurality of strips respectively disposed in spaces between the strips of the stationary platform so as to be movable between a retracted position within the stationary platform and a projected position extending beyond said

end of the stationary platform strips and across said loading opening, a horizontally reciprocable pusher mounted on said table for movements longitudinally thereof from a retracted position at the second named end of the stationary platform strips and slightly above the level thereof toward the loading opening and back to said retracted position, and means operatively connecting said movable platform strips to said pusher.

2. In a machine for packing containers in cases, the combination specified by claim 1 and, in addition, means to feed containers onto the stationary platform in a row extending transversely across such platform directly in front of the retracted pusher, and means for operating said pusher to cause a short forward stroke thereof to push each such transverse row of containers forward on the stationary platform sufficiently to clear a space for a new such transverse row when the pusher has been retracted until sufficient such transverse rows have been fed onto the stationary platform to form a load-group for a case to be packed and for then causing a relatively long forward stroke of the pusher to project the movable platform strips across the loading opening and to push the load-group from the stationary platform onto the projected movable platform strips.

3. In a machine for packing containers into cases, the combination specified by claim 2 wherein said pusher is provided with a gate movable therewith to block feed of containers onto the stationary platform at all positions of the pusher other than its retracted position.

4. In a machine for packing containers into cases, the combination specified by claim 2 and, in addition, means to advance an empty case to a position spaced below and in alignment with said loading opening, and means for gripping the containers of the load-group on the projected movable platform, for lowering said load-group through the loading opening into the case therebeneath when the movable platform has been retracted from said loading opening, and for releasing the containers when they have been lowered into said case.

5. In a machine for packing containers into cases, the combination specified by claim 2 wherein the means for operating said pusher comprises an air motor mounted on said table and operatively connected to the pusher, a lug connected to the pusher to travel therewith, a pivoted latching bar normally in the path of movement of the lug in position to engage said lug when the pusher has completed a short stroke thereof to prevent further forward travel of the pusher, and means actuated by a container component of the load-group when such load-group has been formed and is being moved forward on the stationary platform to swing the latching bar out of the path of travel of the lug to permit said relatively long forward stroke of the pusher.

6. In a machine for packing containers into cases, a table having a projecting end portion overhanging a case loading station and provided with a loading opening directly above that station, means to position an empty case at that station below and in line with said opening, a retractile movable platform temporarily to support a load-group of containers appropriate for said case in a position directly over said loading opening, a vertically movable load-group funnel beneath and in line with said loading opening, a load-group lowering mechanism comprising vertically movable means for gripping the upper portions of the containers of a load-group temporarily supported on said movable platform, for lowering the load-group through the loading opening and the funnel into the waiting case at the loading station when the movable platform has been retracted and for releasing said containers to said case, and means interconnecting said load-group lowering mechanism and said funnel to cause said funnel to be lowered to position to extend into the upper part of the case during an initial part only of a downward movement of the gripping means and to be raised out of the case to a position adjacent to the plane of the loading opening during the final part only of a return upward movement of the gripping means.

7. In a machine for packing containers into cases, a table having a projecting end portion overhanging a case loading station and provided with a loading opening directly above that station, a platform movable in its plane between a retracted position that leaves the loading opening unobstructed and a projected position covering said loading opening, means to reciprocate said platform between said two positions thereof, said platform being adapted to support a load-group of containers when the platform is in its projected position, a load-group lowering mechanism comprising a gripper head movable vertically through the loading opening when the movable platform is retracted between a raised position above the plane of the platform and a lowered position below the plane of the loading opening, a plurality of parallel rows of openable and closable grippers carried by said gripper head in position to be closed to grip upper end portions of the component containers of a load-group on the movable platform over the loading opening and to be opened to release the containers to deposit them in a case at the loading station when the gripper head has been lowered to its lowered position, an air motor carried by the gripper head and connected operatively to said grippers to close and open them, and an air motor in said lowering mechanism connected operatively to the gripper head to lower and raise it.

8. In a machine for packing containers into cases, the combination specified by claim 7 wherein said rows of grippers comprise a plurality of parallel relatively stationary horizontal gripper bars and a plurality of horizontally swingable spaced aligned gripper members operatively associated with each of said bars and cooperative therewith to grip between themselves and the bar upwardly projecting transverse ridge portions of the tops of a row of gable-top milk cartons or like containers temporarily supported on the underneath positioned movable platform when the grippers are closed.

9. In a machine for packing containers into cases, the combination specified by claim 7 and, in addition, means to deliver a load-group of gable-top type milk cartons or like containers onto the movable platform when the latter is in its projected position, and means to guide the load-group of containers during downward movement thereof when the grippers have been operated to grip the upper portions of the tops of said containers, the movable platform has been retracted, and the load-group mechanism has been actuated to lower the gripped load-group of containers through the loading opening to the waiting case therebelow.

10. In a machine for packing containers into cases, a framework structure arranged to provide an elevated loading opening through which a load-group of containers appropriate for a case may be lowered, a stationary platform comprising a plurality of transversely spaced strips adjacent to said loading opening with said strips terminating at one end approximately flush with the adjacent edge of said loading opening, a movable platform comprising a plurality of strips respectively disposed in spaces between the strips of the stationary platform so as to be movable between a retracted position within the stationary platform and a projected position extending beyond said end of the stationary platform strips and across said loading opening, and means to reciprocate the strips of said movable platform between their said retracted and projected positions.

11. In a machine for packing containers into cases, a framework structure arranged to provide an elevated loading opening directly above a case loading station, means to position an empty case at the loading station below and in line with said loading opening, removable means temporarily to support a load-group of containers appropriate for said case in a position directly over said opening, a vertically movable load-group funnel below and in line with

said loading opening, a vertically reciprocable load-group lowering means for lowering the containers of a load-group through the loading opening and the funnel into the waiting case at the loading station when the removable means for temporarily supporting the load-group directly over the loading opening has been withdrawn, and means interconnecting said load-group lowering means and said funnel to cause said funnel to be lowered to a position to extend into the upper part of the case during an initial part only of a downward movement of the vertically reciprocable lowering means and to be raised out of the case to a position adjacent to the plane of the loading opening during the final part only of a return upward movement of said lowering means.

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