

[54] **APPARATUS FOR LOADING FRANGIBLE CONTAINERS**

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

[58] Field of Search ..... **53/61, 166, 247**

[56] **References Cited**

**UNITED STATES PATENTS**

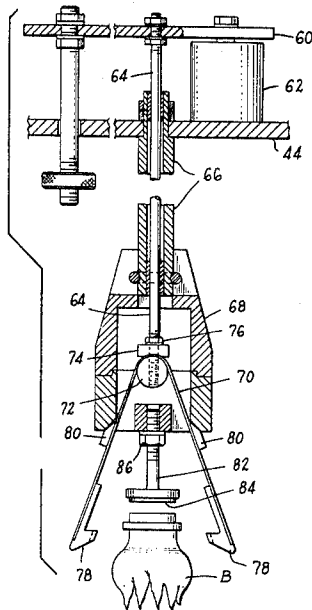
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[57] **ABSTRACT**

A machine is disclosed for loading frangible containers, such as relatively tall glass bottles of the thin walled-non-returnable-variety, into upwardly open packing cases. The bottles are conveyed in discrete side-by-side lanes into a grid structure where they are isolated by conventional brake means associated with each lane. A frame arranged over the grid structure carries a vertically reciprocable carriage having a plurality of individual container gripping units for holding a group of containers while a bottom portion of the grid is opened. Means is provided for retracting the frame and the grid structure slightly, away from those bottles being held by the brake means so that the carriage can be lowered and the bottles passed downwardly through the open grid structure into the case. Each gripper unit comprises a hollow tubular stem portion supported from the carriage, and a lower housing portion which contains a generally U-shaped spring member having depending leg portions with laterally opposed jaws at their respective ends for engaging the neck portion of a container. Each unit also includes a rod slidably mounted in the tubular stem, and connected to the apex of each spring member so that a vertically reciprocable plate in the carriage, to which the upper ends of these rods are connected, can be moved vertically to open and close the jaws on a container.

**8 Claims, 10 Drawing Figures**



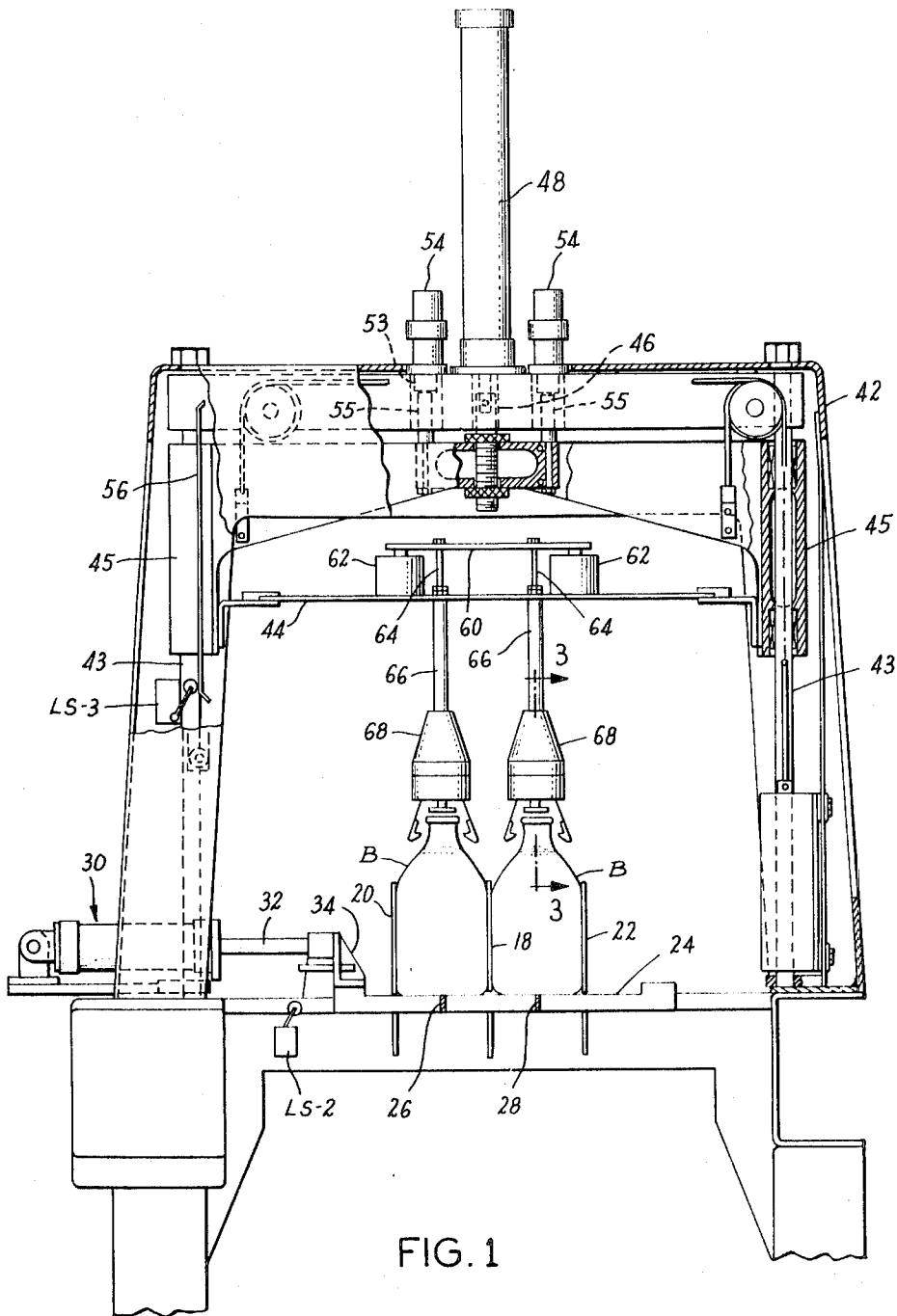


FIG. 1

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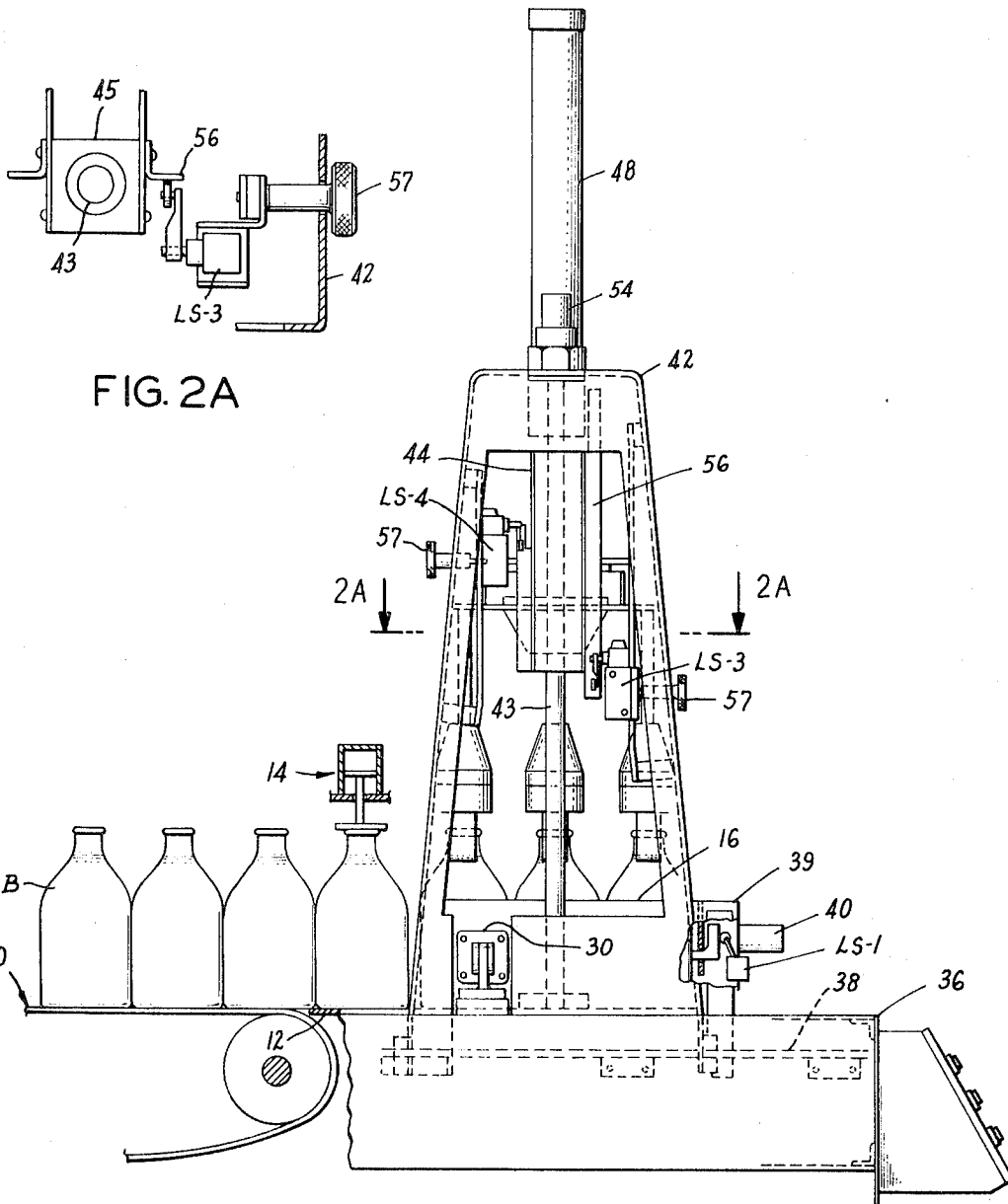
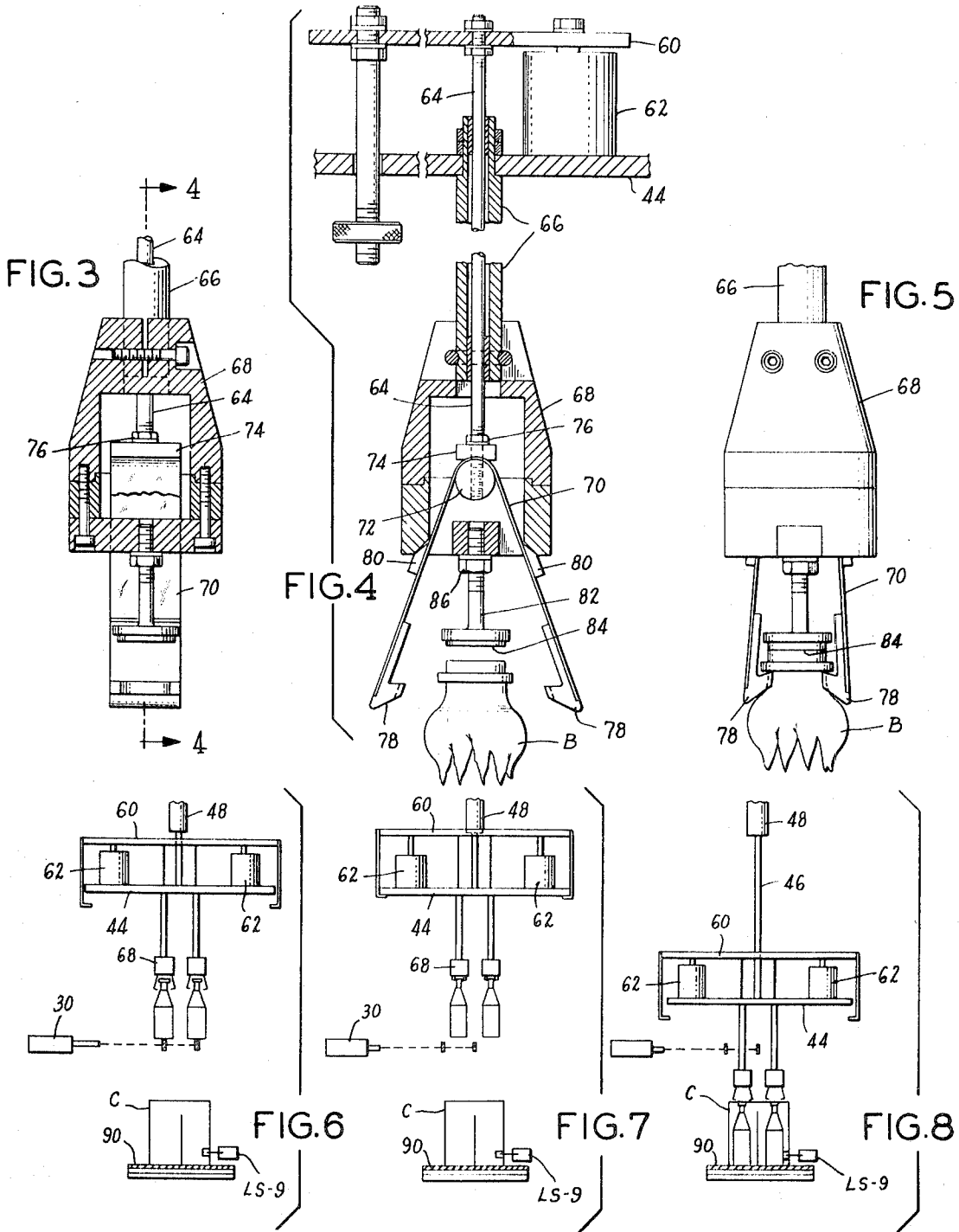


FIG. 2A

FIG. 2

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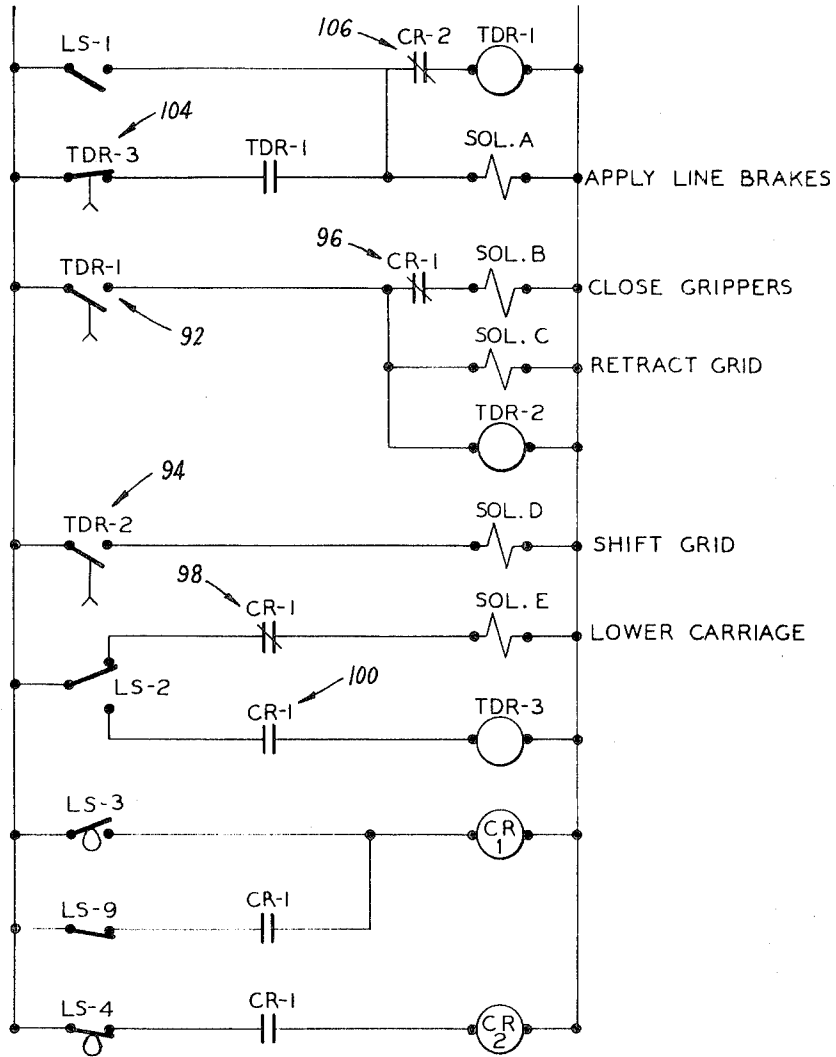
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FIG. 9



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## APPARATUS FOR LOADING FRANGIBLE CONTAINERS

## BACKGROUND OF INVENTION

This invention relates to machines for loading frangible containers into upwardly open packing cases such as those referred to in the trade as drop packers, wherein groups of containers are adapted to be dropped through a sequentially open grid structure. The conventional grid structure includes funnel means for lessening the impact between the container and the case, but such funnel means is not required in the machine to be described herein.

In drop packing tall frangible containers, such as quart and half-gallon bottles or larger, especially where these bottles are of the thin walled-non-returnable-type, it has been found that the conventional funnels used to lessen this impact do not adequately serve their intended purpose. A primary aim of the present invention, then, is to provide an attachment for a conventional drop packer of the foregoing type, which attachment will permit the drop packer to handle frangible containers without encountering the objectionable impact between the containers and the case.

In carrying out the foregoing aim of the present invention, a vertically reciprocable carriage is provided over the conventional grid structure, and individual container gripping units are provided in this carriage for lowering the containers at a controlled rate through the open grid structure into the packing case.

Carriages for handling bottles have been proposed heretofore, for example in U.S. Pat. No. 2,712,405 issued to Rockcastle in 1955 a case loading machine is shown having bottle gripping tongs mounted on a vertically movable carriage. However, this patent does not show or suggest the means for handling a group of containers fed to a grid structure in a plurality of lanes, which containers are then lowered downwardly without having to be transferred horizontally from one discrete station to another prior to being lowered into a packing case.

As mentioned above, Rockcastle utilizes gripping units of the tong type, but other gripping units have been used in machines of this general type. Examples of other prior art patents showing gripping units or heads designed to handle glass bottles are shown in U.S. Pat. No. 2,863,579 issued to Meyer in 1958, and U.S. Pat. No. 2,918,325 issued to Gibson in 1959. It will be apparent from an inspection of the gripping units shown in these patents that each such unit requires that the carriage move downwardly over the bottles to be gripped, and that the grippers be sequentially actuated after lowering of the carriage. The carriage must then be subsequently raised so that the articles can be transferred to a succeeding station in the machine.

In the present disclosure, the carriage need not be moved downwardly in order to grip the containers, and the containers, as a result, are free to move in lanes between the depending leg portions of a U-shaped spring in the gripping units disclosed herein. These leg portions are closed around the necks of the bottles without any necessity for lowering the carriage in order to so grip the bottles. The carriage is subsequently lowered to "drop" the gripped bottles through a sliding grid structure into the packing case without having to first move through a substantially horizontal displacement in a manner characteristic of the prior art machines discussed hereinabove.

## SUMMARY OF INVENTION

Means is provided for conveying frangible containers into a grid structure of the type used in a conventional drop packer, that is into a grid structure having a sliding bottom portion movable between open and closed positions. A frame over the grid structure supports a vertically movable carriage having a plurality of gripping units which can be closed over the tops of the containers to grip them in order to permit opening of the grid. The carriage then lowers the gripping units and containers to load the latter into a stationary packing case. The

gripping units then release the containers, and the carriage returns to its raised position prior to initiating a second cycle of operation. Each gripping unit comprises a housing having laterally spaced lower openings through which spaced spring fingers depend for gripping opposite sides of the upper portion of a container. A vertically reciprocable rod in each unit is adapted to move these fingers toward and away from one another so that jaws at the lower ends of the fingers grip the containers, preferably just beneath an annular bead formed on each container.

## BRIEF DESCRIPTION OF DRAWINGS

FIG. 1 is an elevational view of the downstream end of an apparatus incorporating the present invention, showing two side-by-side containers in two lanes just prior to actuation of the two gripping units located immediately thereabove.

FIG. 2 is a side elevational view of the apparatus shown in FIG. 1, with the lane defining grid structure containing three containers in each of the two side-by-side lanes, and with brake means for holding back containers on an infeed conveyor being shown schematically.

FIG. 2A is a sectional view taken on line 2A—2A of FIG. 2.

FIG. 3 is a vertical sectional view taken on line 3—3 of FIG. 1 through one of the six gripping units shown in FIGS. 1 and 2, with portions thereof being omitted to better show the configuration of the housing.

FIG. 4 is a vertical sectional view through the same gripping unit, but taken on the line 4—4 of FIG. 3, and showing in schematic fashion the mechanism for operating this unit.

FIG. 5 is a side view of the FIG. 4 gripping unit but taken at a slightly later instant of time to show the spring leg portions holding a container against the adjustable stop provided in a lower portion of the housing.

FIG. 6 is a schematic view of the carriage and its actuator together with the means for operating the gripping units, showing these components in their FIG. 1 position, and showing a packing case in position for loading.

FIG. 7 is a view similar to FIG. 6 but shows the containers gripped by the gripping units and the grid structure in its open configuration.

FIG. 8 is a view similar to FIGS. 6 and 7 but taken at a slightly later instant of time, the carriage being shown lowered and the gripping units after releasing the containers into the packing case.

FIG. 9 is an electrical schematic diagram showing a control means for operating the apparatus of FIGS. 1 thru 8 inclusively.

## DETAILED DESCRIPTION

Turning now to the drawings in greater detail, FIG. 2 shows a plurality of frangible containers in the form of large thin walled glass bottles, B, B being conveyed from left to right on an infeed conveyor 10 of the conventional construction and having a fixed dead plate 12 located at the downstream end thereof. A conventional line brake 14 is arranged above the dead plate so as to periodically interrupt the flow of containers on the infeed conveyor and to cause them to stop in the position shown whenever a lane defining grid structure 16 is filled with a predetermined number, or group of these containers. As shown three containers are provided in each row in the grid structure illustrated in the drawings, and two such lanes are provided in side-by-side relationship in the grid structure shown. These two lanes are defined by a center wall 18 and left and right hand lane defining walls 20 and 22.

The grid structure 16 further includes a bottom portion, indicated generally at 24, which comprises a horizontally slidable grid portion which is movable between a first position (not shown) wherein the grid structure is downwardly open, and a second position, best shown in FIG. 1, wherein longitudinally extending tails 26 and 28 are located in centered relationship beneath the containers B, B in each of the side-by-side lanes, preventing them from dropping downwardly through the grid

structure. A fluid motor 30 is provided with a fixed portion and a movable portion 32 connected by a bracket 34 to the sliding grid portion 24 so as to shift the grid portion 24 between its first and its second position.

It will be apparent that the portion of the mechanism just described can be used for drop packing articles into an upwardly open packing case at least where the articles are not so frangible as to be likely to break when so packed. The packing case is located immediately below the grid structure, and the articles fed into the grid structure on the tails 26 and 28 until lane detector switches LS-1 sense that the grid structure is fully loaded with containers at which time the cylinder 30 would shift the grid from the position shown to an open position whereupon the bottles would be allowed to drop downwardly into the packing cases (not shown). It has been found that with frangible containers such as 1 quart and ½-gallon non-deposit-non-returnable bottles that these containers are not adapted to be so packed. Even if a funnel device is adapted for use beneath the grid structure it has been found that such frangible containers are apt to become damaged when allowed to freefall in a distance in excess of their own height. In order to be able to handle containers of this type in a machine designed to package containers which can be drop packed in the manner described above, attachment means, to be described, is provided above the grid structure in conjunction with a control mechanism for operating the components of this attachment means, and these elements will now be described in detail.

As best shown in FIG. 2 the grid structure 16 is mounted on longitudinally extending horizontal ways 38, 38 which permit the grid structure to be retracted slightly, or moved in a downstream direction, so that bottles in the grid structure 16 are clear of the bottles being held by the line brake 14. Thus, the grid structure comprises a self-contained unit slidably mounted in a fixed frame 36, which frame defines fixed ways or rails 38, 38. A grid retract cylinder 40 is provided for moving the entire grid structure no more than a fraction of an inch in order to provide the above mentioned clearance between the last bottle in the grid structure and the bottle being clamped by the line brake 14. An upwardly extending bracket 39 is connected to the frame 36 and supports the actuator cylinder 40 for this purpose.

A generally U-shaped frame 42 extends upwardly from the grid structure 16, as shown in FIGS. 1 and 2, and this frame slidably supports a vertically reciprocable carriage 44. Laterally opposed end portions of the carriage 44 are slidably supported in the depending leg portions of the frame 42 on vertically extending guide rods 43, 43, preferably by the slide blocks 45, 45. A center portion of the carriage 44 is connected to the movable portion 46 of a conventional fluid motor or air cylinder 48. As so constructed the carriage 44 can be raised to the position shown in FIG. 1, and indicated schematically in FIGS. 6, or lowered to the position best indicated schematically in FIG. 8. As best shown in FIGS. 1 and 2 the frame 42 supports the carriage 44 by a system of chains and sprockets 50 and 52 which are connected to the carriage and to counter weights in the depending leg portions of the frame for balancing the weight of the frame. The air cylinder 48 is adapted to raise the carriage 44 from the FIG. 8 to the FIG. 6 position under the control of a valve (not shown) which is in turn controlled by solenoid E. The carriage is lowered by gravity when solenoid E is deenergized by venting the air cylinder to atmosphere. A pair of snubbers 54, 54 are provided in the frame of the machine and have depending plugs 53, 53 which are adapted to be engaged by pins 55, 55 provided for this purpose on the carriage in order to provide a cushioned stop for the carriage when it is raised from the FIG. 8 position to the FIG. 6 position. A vertically oriented cam 56 is provided on the carriage for tripping a limit switch LS-3 as the carriage reaches its raised position, and for also closing this switch when the carriage reaches its lowered position. As shown in FIG. 2 a second limit switch LS-4 is also provided to indicate when the carriage has reached its raised position. The function

of the limit switches LS-3 and LS-4 will be discussed in greater detail with reference to FIG. 9 in discussing the operation of the apparatus. Adjusting knobs 57, 57 are provided for these switches to permit setting up the machine to accommodate bottles of various size.

As best shown in FIG. 1, the carriage 44 includes a horizontally extending plate 60 which is adapted to be moved with respect to the carriage in response to actuation of a plurality of relatively short stroke air cylinders 62, 62. Actuation of these "pancake" cylinders 62, 62 causes corresponding movement of the rods 64, connected to the plate 60 as shown in FIG. 4. Each rod 64 is thus adapted to be reciprocally moved either upwardly or downwardly in a tubular stem portion 66 of each of the gripping units associated with each of the containers B,B.

Turning now to a more detailed description of each of these gripping units, FIG. 4 shows in vertical cross section the configuration of one such gripping unit. The outer tubular stem portion 66 comprising the upper portion of the gripping unit is connected to the carriage 44 and the inner actuating rod 64 slidably received in the tubular stem portion 66 is connected to the horizontally extending plate 60 associated with the four cylinders 62, 62. Each gripping unit includes a lower housing member 68 which is hollow and into the hollow portion of which the lower end of the actuating rod 64 extends. A generally inverted U-shaped spring member 70 is connected at its apex portion to the lower end of the actuating rod 64, preferably by means of a generally cylindrical mounting member 72 and a contoured spacer 74 both of these being clamped together by means of a locknut 76 so as to support the spring member with its leg portions in depending relationship. The leg portions of the spring member 70 extend downwardly through openings provided for this purpose in the lower wall of the housing 68 and are adapted to be cammed inwardly toward one another in response to upward movement of the rod 64. The housing itself comprises a generally frustoconical upper portion and a generally annular lower portion, which portions cooperate to define a suitable hollow receptacle for receiving the connection between the actuator rod 64 and the spring member 70. The lower end portion of each of the leg portions of the spring member carries a suitable container engaging jaw 78 and each of the leg portions shown has an intermediate portion for engaging the outer radial edges of the downwardly open holes in the lower wall of the housing 68. In the embodiment shown in FIG. 4 a small cam 80 is provided at the intermediate portion of each leg of the spring member 70 so as to achieve a predetermined path of movement of these jaws when the actuating rod 64 is raised upwardly in response to energizing of the cylinders 62, 62. Depending upon the configuration of the containers being gripped by the unit these cam members may or may not be required. The lower wall of the housing 68 further includes an adjustable stop member 82 against which the jaws 78, 78 can act so as to firmly grip a container at three discrete points prior to lowering of the container through the grid structure into a packing case positioned therebelow. This stop member 82 comprises a resilient lower portion which may be formed of rubber or the like, as indicated generally at 84, and has an upstanding threaded portion which is adapted to be threadably received in a socket provided for this purpose in the lower wall 69 of the housing. A locknut is provided, as indicated generally at 86, for anchoring this stop 82 in a predetermined position for handling containers of a predetermined configuration. It will also be apparent that the jaws 78, 78 may be chosen for gripping containers of predetermined configuration, and it is a feature of the present invention that the housing is fabricated in two parts, the lower portion or part being removable so as to permit removal and replacement of the spring member 70 and of the lower wall defining portion itself so as to accommodate containers of various sizes in a machine of the type described herein.

FIG. 4 shows a bottle prior to being gripped by the gripping unit, and FIG. 5 shows the unit after the actuating rod has

been raised and the U-shaped spring member 70 compressed as a result of being pulled upwardly within the fixed housing, thereby urging the leg portions toward one another and the jaws into engagement with the neck of the bottle just below the annular bead on the container so as to pull the bottle off the grid rails 26 and 28 a very slight distance upwardly against the fixed stop 82, and more particularly against the lower rubber portion 84 thereof, so as to support the container prior to shifting of the grid from its closed position, shown in FIGS. 1 and 6, to its open position, best shown in FIG. 7. As indicated schematically in FIG. 7 the air cylinder 30 is adapted to shift the grid so as to open the grid prior to lowering of the carriage 44 and lowering of the containers into the awaiting packing case C located on a conveyor or the like indicated generally at 90.

The operation of the above described apparatus can best be summarized with reference to FIG. 9 wherein a control diagram is shown capable of operating a machine incorporating the features described above. Limit switches LS-1 are provided adjacent the downstream end of each of the lanes in the grid structure 16 and these switches are closed when each of these lanes has been filled with a predetermined number of containers or bottles, as shown in FIGS. 1 and 2. Closing of this limit switch LS-1 energizes a relay TDR-1 causing its associated contacts, indicated generally at 92, to time close with the result that the miniature pancake cylinders 62, 62 are energized through solenoid B closing the spring members 70, 70 on the containers and raising them up off the sliding grid structure in the manner described hereinabove with reference to FIGS. 4 and 5. At substantially the same time, the retract cylinder 40 associated with moving the grid slightly so as to allow a clearance to be created between the bottle held by the line brake 14 and the last bottle to enter the grid structure. The line brake 14 will have been energized through solenoid A immediately upon energizing relay TDR-1 as can be seen from line 2 of the schematic diagram. A second relay TDR-2 will be energized simultaneously with solenoids B and C associated with closing the grippers and retracting the grid for the above-mentioned clearance. Relay TDR-2 has contacts, indicated generally at 94 in FIG. 9, which will then time close so as to energize solenoid D and shift the grid laterally from the FIG. 6 position to the FIG. 7 position. A limit switch LS-2 is actuated when the grid 24 has shifted to the FIG. 7 position indicating that the grid structure is open and that the containers can be lowered into the packing case C on the conveyor 90. Thus as shown in FIG. 9 limit switch LS-2 deenergizes solenoid E associated with a valve (not shown) venting the air cylinder 48 allowing the carriage 44 to be lowered by gravity from its raised position shown in FIG. 1 to the FIG. 8 position. Limit switch LS-3 is in engagement with the cam 56 provided for this purpose on the carriage, but when the carriage reaches its lowered position limit switch LS-3 will be allowed to close energizing relay CR-1 thereby opening the normally closed contacts indicated generally at 96 in FIG. 9 deenergizing solenoid B and allowing the pancake cylinders 62, 62 to return to their normal position opening the grippers and releasing the bottles so as to allow them to fall a short distance into the packing case C. At the same time, a second set of normally closed contacts, indicated generally at 98 in the same relay CR-1, will open deenergizing solenoid E allowing the valve mechanism associated with the air cylinder 48 to supply air under pressure for raising the carriage 44 from the FIG. 8 position back to the FIG. 6 position. In the FIG. 6 position LS-4 will be cammed closed when the carriage reaches the FIG. 6 position energizing relay CR-2. The normally closed contacts 106 of relay CR-2 will open dropping out relay TDR-1. Contacts 92 of TDR-1 reopen causing the grippers to reopen, the grid to move upstream slightly and relay TDR-2 to be deenergized. Contacts 94 of relay TDR-2 then reopen to allow the grid to close in order to receive another charge or group of containers, and as the grid shifts closed LS-2 will actuate TDR-3. When TDR-3 times out its contacts 104 release the line brake 14 recycling the apparatus for continuous operation.

#### We claim:

1. In a machine for packing frangible containers in a packing case and including means for conveying containers to a pick-up station and means for conveying cases to be packed to a loading station spaced below the pick-up station, the improvement comprising a lane defining grid structure for receiving groups of the containers in a predetermined pattern, said grid structure including a laterally shifting portion movable between a first position wherein it defines a downwardly open grid and a second position wherein the grid is adapted to slidably receive the containers, a frame above said grid structure, a vertically reciprocable carriage slidably supported in said frame for movement between raised and lowered positions, a plurality of container gripping units each of which has an upstanding tubular stem and a lower hollow housing portion, a rod slidably received in each of said tubular stems, a generally U-shaped spring member carried at the lower end of each rod, each spring member having its apex located in said housing portion and its leg portions depending from the housing, said leg portions having end portions which define container engaging jaws and intermediate portions for engaging the outer edges of downwardly open holes in the lower wall of said housing, means connecting the upper ends of said tubular stems to said carriage, means on said carriage for moving said rods between raised and lowered positions to close and open said jaws on containers located therebetween, and control means for timing movement of said carriage with said rod moving means and with said shifting grid to sequentially grip the containers at the pick-up station, open the grid, lower the carriage so that the containers are lowered into a packing case at the loading station, release the containers from the jaws, and raise the carriage to its raised position in position for receiving a subsequent container group.

2. In a machine of the type defined in claim 1 wherein said containers each have a neck portion characterized by an annular projection adjacent the upper end thereof, said combination recited in claim 1 being further characterized by each of said U-shaped spring members comprising a strip of resilient material having an apex portion and generally flat leg portions, each of said jaws comprising a projecting inwardly extending member adjacent the ends of said respective leg portions for engaging said container projection.

3. In a machine of the type defined in claim 2 further characterized by adjustable stop means on the lower wall of each of said housing portions for engaging the upper end of each container as it is gripped between said jaws, said jaws moving inwardly and upwardly in response to upward movement of said rod moving means to support the container at three points as it is lowered into the packing case.

4. The combination defined in claim 1 wherein said means on said carriage for so moving said rods comprises a plurality of fluid motors having first portions connected to a surface on said carriage, said connecting means comprising a plate spaced from said carriage surface, said fluid motors having second portions movable with respect to said first portions and connected to said plate, said rods being connected at their upper ends to said plate for movement in response to movement of said second fluid motor portions.

5. The combination defined in claim 1 further characterized by brake means for holding back the containers on said container conveying means, said control means including container detect switch means for generating a signal when a group of containers has moved into position in said grid structure, and said control means including means for energizing said brake means in response to said signal.

6. The combination defined in claim 5 further characterized by means for moving said frame and said grid structure clear of said container conveying means and said brake means, said control means including means for actuating said grid and frame moving means at substantially the same time during a machine cycle when the containers are gripped.

7. The combination defined in claim 2 wherein said jaws are spaced apart laterally in each of said gripping heads so that when said carriage is raised containers can be fed between

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each of said jaws during the formation of said subsequent container group, said carriage remaining in said raised position when said rods are raised to close said jaws on said containers.

8. The combination defined in claim 7 further characterized by means for snubbing movement of said carriage as it reaches its raised position, said means for moving said carriage comprising a single action fluid cylinder which is energized by said control means to raise the carriage and de-energize to allow

said carriage to be gravity biased downwardly, and counter weight means for preventing excessive inertial forces on said frame when said carriage reaches a predetermined stop position, said control means including limit switch means responsive to arrival of said carriage at said lower stop position to lower said rods and open said jaws to allow a slight free fall of said containers into the packing case.

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