

March 17, 1953

I. H. POLK

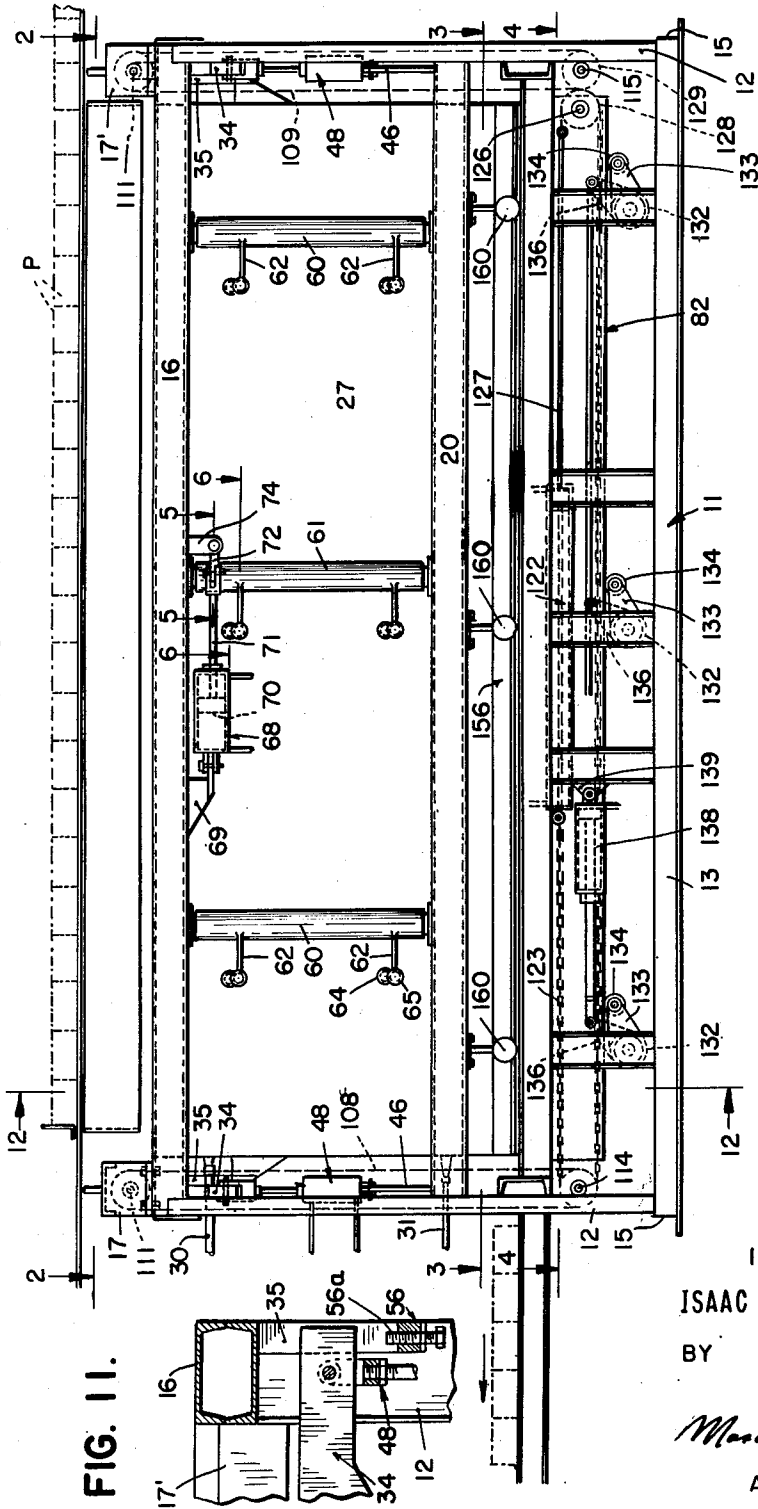
2,631,440

MACHINE FOR FREEZING PACKAGED PRODUCTS

Filed Dec. 18, 1948

6 Sheets-Sheet 1

FIG. I.



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FIG. 2.

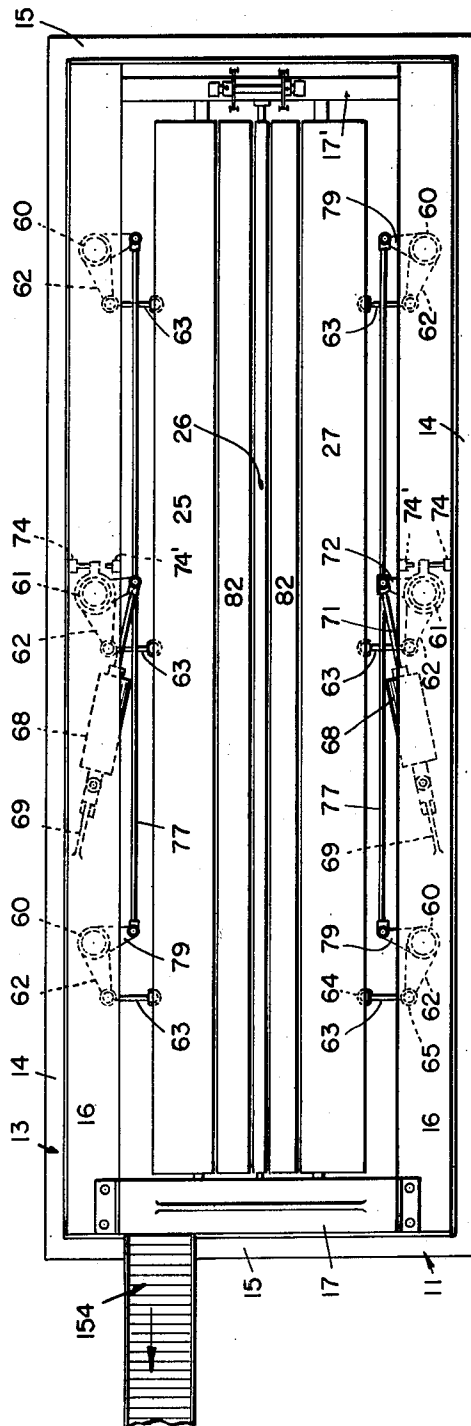
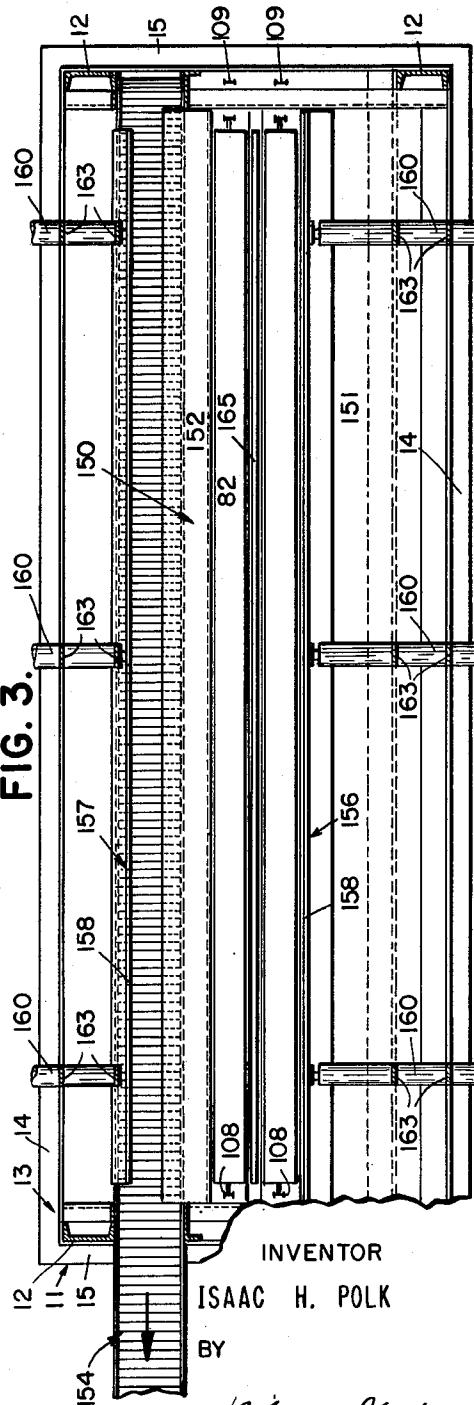


FIG. 3.



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FIG. 4.

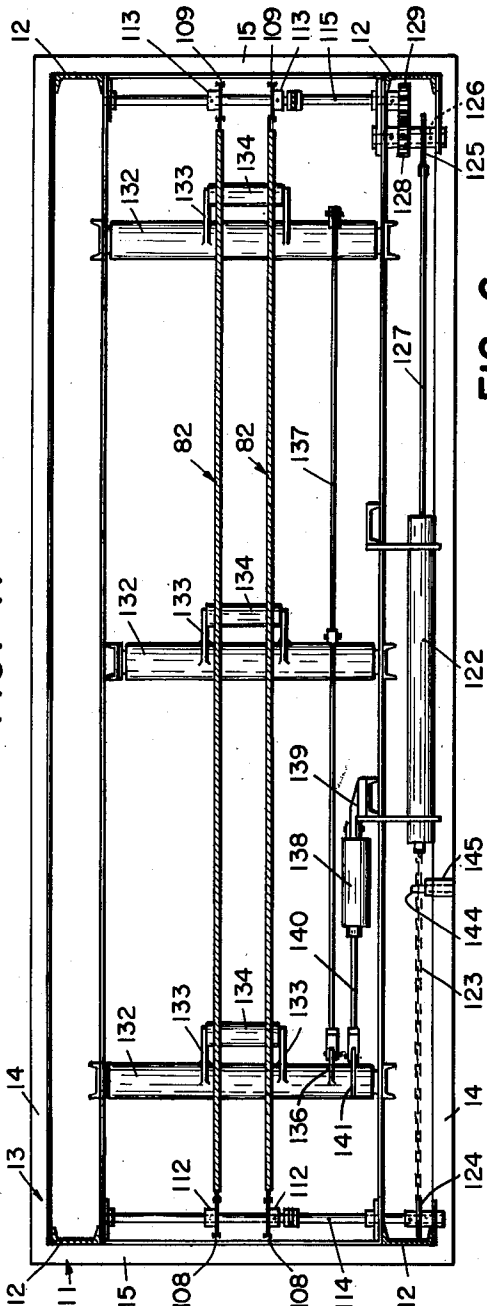


FIG. 6.

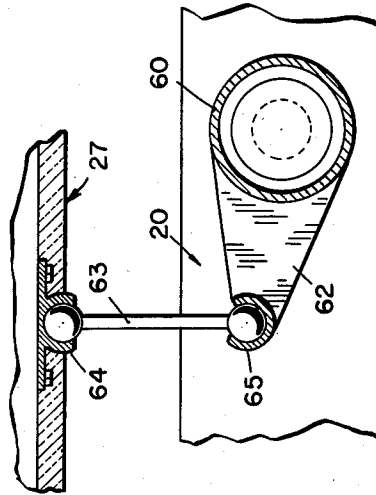
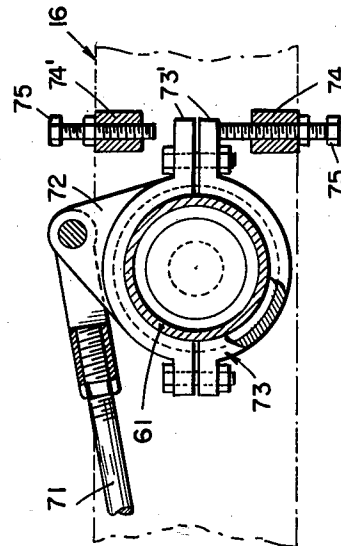


FIG. 5.



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FIG. 14.

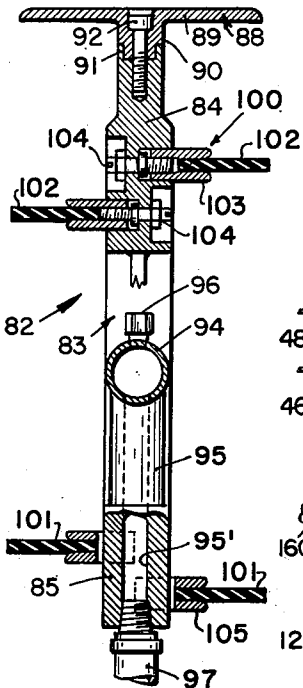


FIG. 7.

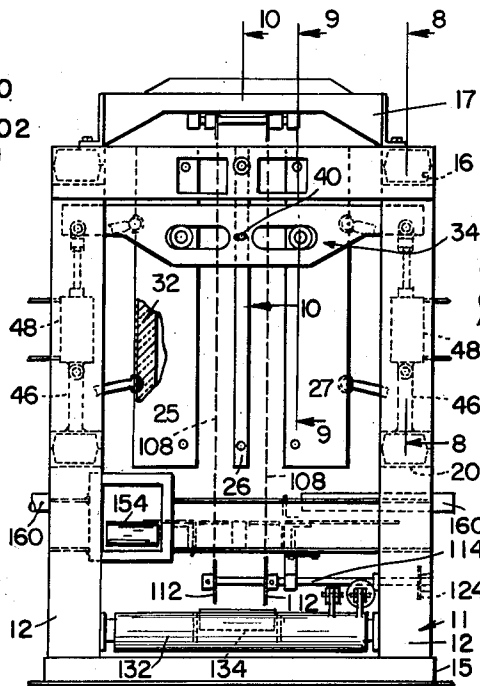


FIG. 15.

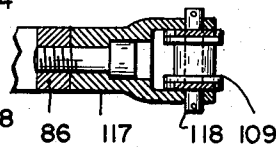


FIG. 8.

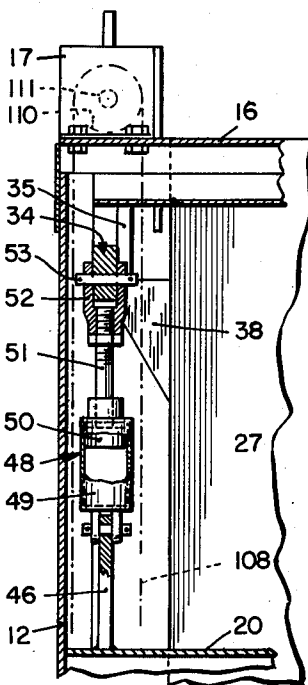


FIG. 9.

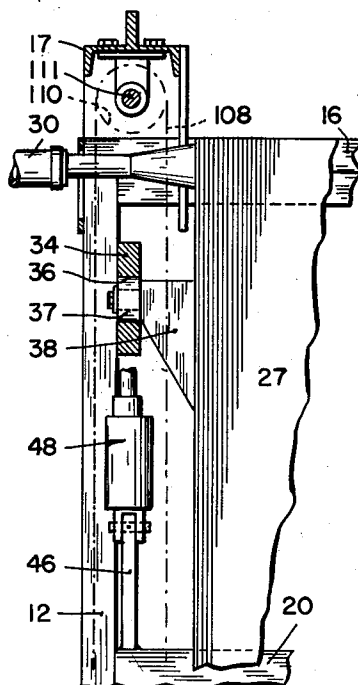
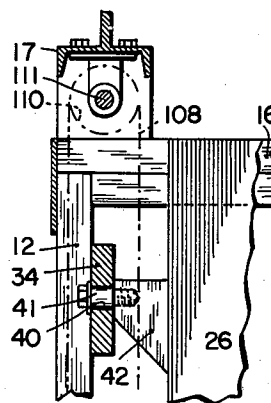


FIG. 10.



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MACHINE FOR FREEZING PACKAGED PRODUCTS

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FIG. 12.

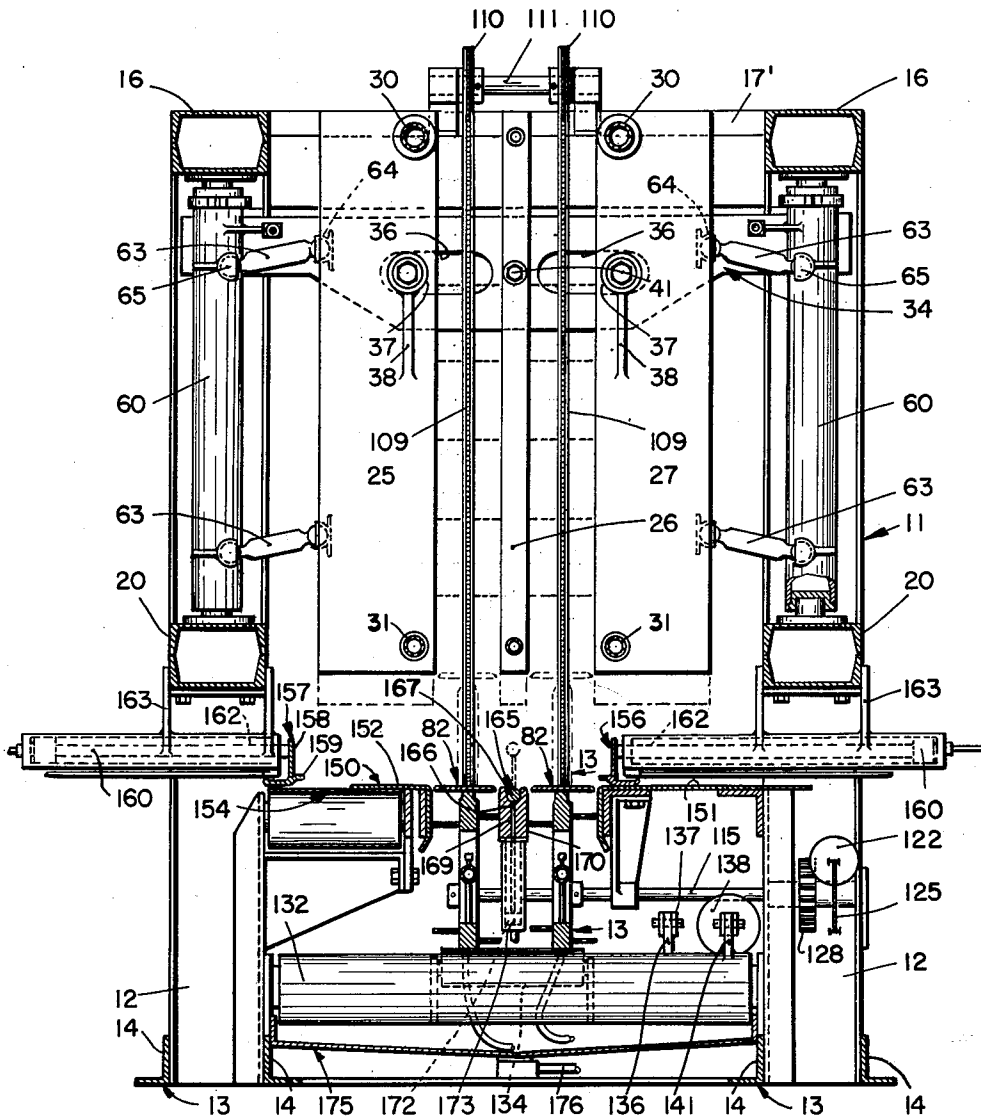
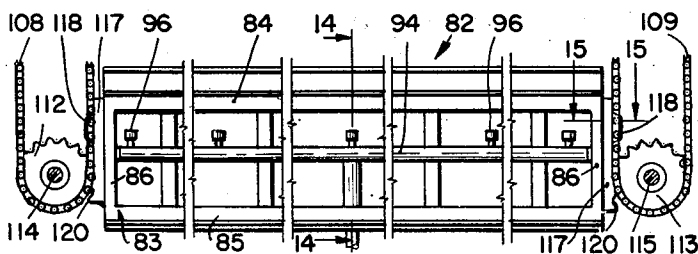


FIG. 13.



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FIG. 16a.

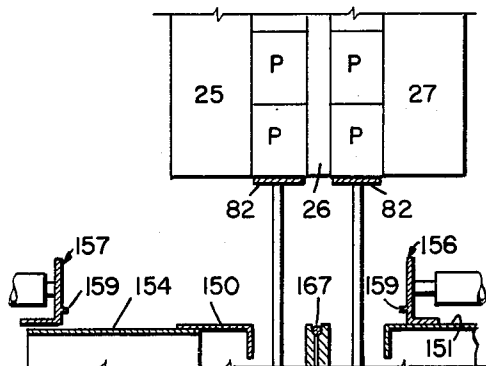


FIG. 16b.

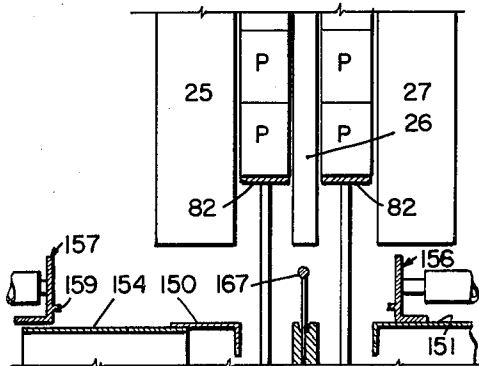


FIG. 16c.

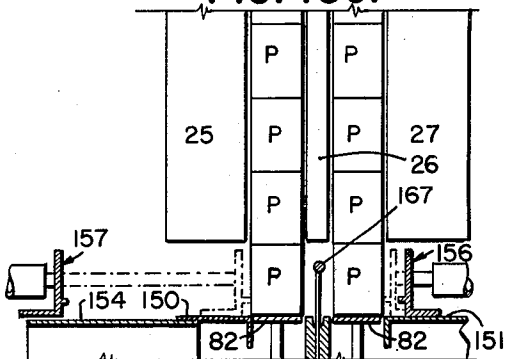


FIG. 16d.

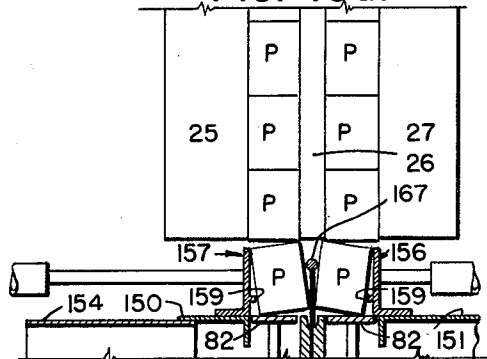


FIG. 16e.

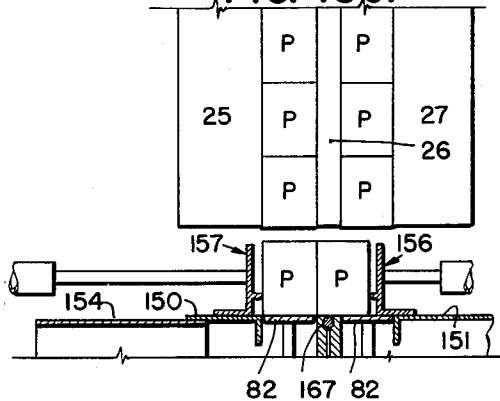
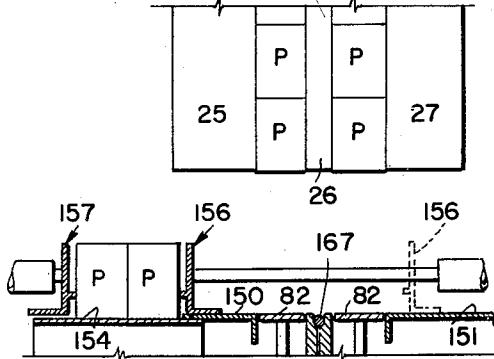


FIG. 16f.



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UNITED STATES PATENT OFFICE

2,631,440

MACHINE FOR FREEZING PACKAGED PRODUCTS

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Application December 18, 1948, Serial No. 66,050

21 Claims. (Cl. 62—114)

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This invention relates generally to apparatus for the sharp or quick freezing of packaged food. More particularly the invention is an improvement upon the inventions set forth in my copending applications for patent Serial No. 691,962 for Tunnel Freezing Apparatus and Method and Serial No. 8,553 for Vertical Pressure Plate Food Freezing Machine and Method. Reference is made to said applications for an explanation of the many disadvantages of present-day apparatus in commercial use with which I am familiar.

An object of this invention is to provide a novel automatic machine for the sharp freezing of packaged food wherein a large number of packages can be progressively frozen in such a manner that intermittently within short intervals of time a given number of frozen packages can be delivered by the machine and a like number of unfrozen packages fed to the machine.

Another object is to provide a machine of this type embodying vertically disposed freezing plates between which the packages are received together with improved means for suspending the plates and for causing vertical movement thereof when desired. A further object is to provide improved apparatus for moving the plates toward and away from each other and for maintaining the plates in pressure engagement with packages of food disposed between them.

It is a particular object of the invention to provide a new and improved method of and means for charging or loading the machine with packages and for discharging or unloading packages from the machine. In this connection it is an object to provide a method of and means for intermittently feeding a limited number of packages into the machine at the top thereof and intermittently removing a like number from the bottom of the machine while maintaining the machine charged with a larger number of packages in progressive stages of freezing.

Another object is to provide a method of and means for removing the outermost, such as the lowermost, row of frozen packages from between the plates, together with a method and means for rupturing frost adhesions which may exist between the said row of packages and the next adjacent row of packages.

A still further object is to provide a freezing machine wherein the newly added unfrozen packages are subjected, during handling and freezing, to less pressure than those which are frozen.

Another object is to provide an improved

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means for periodically de-icing the surfaces of the freezing plates, together with improved means for actuating the de-icing means.

These and other objects will be apparent from the description and the drawings.

Referring to the drawings, which are for illustrative purposes only:

Fig. 1 is an elevational view of the side of a machine embodying the invention;

Fig. 2 is a sectional plan view on the line 2—2 of Fig. 1;

Fig. 3 is a sectional plan view on the line 3—3 of Fig. 1;

Fig. 4 is a sectional plan view on line 4—4 of Fig. 1;

Fig. 5 is an enlarged fragmentary sectional view on the line 5—5 of Fig. 1;

Fig. 6 is an enlarged fragmentary sectional view on the line 6—6 of Fig. 1;

Fig. 7 is an elevational view of the left end of the machine shown in Fig. 1;

Fig. 8 is a section on the line 8—8 of Fig. 7;

Fig. 9 is a section on the line 9—9 of Fig. 7;

Fig. 10 is a section on the line 10—10 of Fig. 7;

Fig. 11 is a fragmentary detail section of one adjustable stop for an end of one of the hangers;

Fig. 12 is a section on the line 12—12 of Fig. 1;

Fig. 13 is a fragmentary elevational view of one of the de-icing and package supporting elements as on the line 13—13 of Fig. 12;

Fig. 14 is an enlarged section on the line 14—14 of Fig. 13;

Fig. 15 is an enlarged section on the line 15—15 of Fig. 13; and

Figs. 16a to 16f are diagrammatic views showing the operation of the machine.

More particularly describing the invention, reference numeral 11 generally indicates a frame which is shown as made up of four corner posts 12 connected together at their lower ends by longitudinally extending base members 13, each comprising a pair of rails 14 of angle cross section, and by cross members 15 of like construction. The posts support upper longitudinally extending frame elements 16 of box-like section which are connected by end cross members 17 and 17'. Intermediate the upper and lower ends of the posts are longitudinally extending frame elements 20. Certain other elements of the frame will be described later. However, the details of the frame itself are unimportant insofar as their exact construction and the means for securing the parts together are concerned.

Mounted on the frame in a manner to be described are three vertically disposed freezing

plates indicated by 25, 26, and 27, respectively. Any number of such plates may be provided, and the three shown are merely illustrative of a simple form of the invention. The plates are adapted to receive between them packages of food P to be frozen, and these packages are preferably disposed with their least dimension at right angles to the plates to provide for the most efficient freezing of the product within the packages.

The plates are provided with planiform parallel outer surfaces and are hollow or partially hollow to permit the circulation of refrigerant therethrough which may be introduced through the inlets 30 and removed through outlets 31. The construction of the interior of the plates is immaterial to this invention and reference is made to my above-referred-to copending applications for constructions which may be used. Preferably the outer sides of the outer plates are covered with a thick layer of heat insulation indicated at 32.

The two outer plates 25 and 27 are mounted for movement laterally of the central plate 26, and all plates are mounted for a variable limited amount of vertical movement. The plates are supported at each end on hangers 34 which extend transversely of the frame and are guided for vertical movement between rails 35 and posts 12. The hangers each are provided with a pair of slots 36 which receive rollers 37 mounted on brackets 33 on the two outer plates. This construction permits adjustable limited lateral movement of the plates relative to the hangers.

The central plate is also supported on the hangers. Intermediate slots 36, each hanger is provided with a bolt receiving hole 40 (Figs. 7 and 10) which receives a stud bolt 41 mounted in a bracket 42 on the central plate.

The hangers are mounted at each end upon hydraulic supports generally indicated by 48 (Figs. 7 and 8). These supports each comprise a cylinder 49 pivotally mounted on a vertically extending bracket 46 which is welded or otherwise secured to the longitudinally extending frame element 20. The cylinders 49 contain double-acting pistons 59 which have upwardly extending piston rods 51 provided with a clevis joint member 52 which is secured to the hanger bar by a pin 53. In the normal position of the plates hydraulic fluid in the cylinders 49 serves to hold the pistons extended with the hangers in their uppermost position as shown in the drawings.

Stops 56 comprising set screws 56a mounted in the guide rails 35 provide an adjustable means for limiting downward movement of the hangers.

Means are provided for moving the two outer plates toward and away from the central plate. This means comprises a plurality of vertically extending pivotally mounted bell cranks of which three are shown mounted on each side of the outer plate between frame elements 16 and 20. In each set of bell cranks the end cranks, which are identical, are indicated by numeral 60, and the center one by 61. Each crank has a pair of spaced arms 62 which are connected to the outer plates by rods 63 having ball ends received in sockets 64 (Fig. 6) on the outer faces of the outer plates and sockets 65 at the ends of the cranks.

Each set of cranks 60-61 is actuated by a hydraulic means which includes a cylinder 68 pivotally mounted on a bracket 69 fastened to the upper frame element 16. The cylinder contains a double-acting piston 70 having a piston rod 71 which is adjustably secured to an actuat-

ing crank arm 72 attached to the central bell crank 61. The crank arm forms part of a split collar 73 (Fig. 5) to facilitate the proper adjustment of the mechanism. In order to limit relative movement of the bell cranks, and thence the plates, depending bars 74 and 74' are mounted on the upper frame elements 16 of the frame. These members are provided with inwardly extending set screws 75 which can be adjusted to provide abutments for end portions 73' of the split collar 73. It will be apparent that such adjustment is necessary to adjust the apparatus to accommodate packages of various widths.

A connecting rod 77 serves to transmit the motion of the center crank 61 to the end cranks 60, the rod being connected to arm 72 of crank 61 and arms 79 of cranks 60. Outward movement of the piston 70 serves to rotate the central crank in a direction to cause the rods 63 to move inwardly and thus move the associated plates in a like direction. Opposite movement of the piston, of course, moves the plates outwardly.

The apparatus is provided with means for supporting the packages when the same are not held supported solely by the freezing plates. The apparatus is also provided with means for applying a deicing fluid to the surfaces of the plates whenever this is desirable. Such apparatus is best shown in Figs. 2, 3, 12, 13, and 14. Referring to these figures, 82 generally indicates a package support and deicing member. It is contemplated that one such member is provided for each space between plates and, in the form of the invention shown, two such members are utilized. These members each comprise an elongated body 83 extending the length of the plates having upper and lower longitudinally extending portions 84 and 85, respectively, and upright end portions 86. The upper portion 84 is adapted to receive a package support table 88 which, in the form of the invention shown, comprises a flat member 89 having a depending central rib 90 which is received within a groove 91 in the upper portion 84 of the package support and deicing member. The table is preferably secured in place by a suitable number of machine screws 92 as shown in Fig. 14. Various width tables may be interchangeably mounted so that a table of appropriate width may be used, depending upon the width of the packages being frozen.

The package support and de-icing member also carries a longitudinally extending pipe 94 which is provided with an inlet pipe 95 (Fig. 13) leading from an inlet passage 95' which may be connected by a hose 97 to a source of fluid. The pipe 94 has a plurality of spray heads 96 designed to spray a de-icing fluid onto the walls of the freezing plates when the de-icing apparatus is raised between the plates. The pipe is supported between posts 99 extending between the pipe and the upper and lower portions of the member 82.

The member 82 is provided with two pairs of wipers indicated by 100 and 101. The upper set of wipers 100 comprises flexible rubber-like strips 102 mounted in suitable holders 103 which are adjustably secured to the upper portion 84 of member 82 by screws 104. The lower wipers 101 also comprise flat rubber-like strips 102 mounted in holders 105 which are secured to the lower portion 85 of member 82.

The function of the wipers is the same as that in my copending applications previously referred to, namely, the lower wipers serving to spread the de-icing fluid as the same is sprayed from

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heads 96 of pipe 94 during upward movement of the apparatus between plates; the upper wiper elements being adapted to more firmly engage the surfaces of the plates so that on downward movement of the device these will substantially remove the fluid and any melted frost from the plates.

Each of the members 82 is suspended on a pair of vertically extending chains individually designated by numerals 108 and 109. The chains are supported at their upper ends on sprocket wheels 110 mounted on a shaft 111 which may be journaled to the frame of the machine in any suitable manner. At their lower ends the chains pass around sprocket wheels 112 and 113 mounted on shafts 114 and 115, respectively. Each end of a member 82 is secured to its corresponding chain as by means of a bracket 117 thereon (Fig. 13) which receives the chain and is secured to it by suitable pins 118. The bracket is provided with a serrated outer surface 120 to receive the chain links and sprocket wheel.

The shafts 114 and 115 are actuated by a hydraulic means including a cylinder 122 which contains a piston (not shown) to which is attached a chain 123 which extends around a sprocket wheel 124 mounted on shaft 114 and around a sprocket 125 mounted on a counter-shaft 126 at the opposite end of the frame. The end of this chain is connected to the piston rod 127 which extends from the cylinder 122. Inter-meshing pinions 128 and 129 are provided on shafts 126 and 115.

With this construction movement of the piston within cylinder 122 will cause movement of the chain 123 thereby rotating the shafts 114 and 115, and the sprockets 112 and 113 keyed thereto thereby imparting movement to the member 82.

For reasons which will later become apparent it is desirable to be able to raise the package support and de-icing members 82 a predetermined distance when desired to engage and support the lowermost row of packages in the machine. To accomplish this, means are provided independent of the heretofore described means for raising the members 82, for effecting such movement. This means comprises three rotatively mounted horizontally extending cranks 132. These elements may be supported in any suitable manner on the frame for rotation. Each member is provided with a pair of arms 133 which carry a roller 134 rotatably mounted thereon. The lower edges of the members 82 rest upon and are supported by the rollers 134 when the members 82 are in their lowermost position. Each of the members 132 is provided with a crank arm 136, and these are connected by a connecting rod 137. Actuating means is provided for the members 132 in the form of a hydraulic unit comprising a cylinder 138 pivotally mounted on a bracket 139 attached to the frame. The cylinder contains a piston (not shown) and an outwardly extending piston rod 140 which is pivotally connected to an actuating arm 141 mounted on the member 132 shown at the left end of Fig. 4.

It will be apparent that by actuating the hydraulic unit the members 82 may be cammed upwardly. In order to limit the extent of this upward movement a stop means is provided which consists of a removable stop 144 on a bracket 145 at the end of the cylinder 122. It may be stated in this connection that in the normal operation of the device both cylinders 138 and 122 are actuated simultaneously, and the stop serves to limit travel of the chain 123.

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The machine is provided with means for forming a package delivery surface generally indicated by numeral 150 below the lower ends of the plates. The surface is made up in part by the tables 80 at the upper ends of elements 82 and in part by the plates 151 and 152. The plates may be attached to the frame in any suitable manner. Plate 152 is preferably made so that it may be adjusted laterally as may be necessary where the device is adjusted to accommodate different sized packages. Forming a substantial continuation of the surface 150 is a conveyor 154 of any suitable endless type.

Adapted to operate over the package delivery surface is a pair of package sweeps, indicated generally by numerals 156 and 157. The sweeps each consist of an elongated rail 158 of generally angle cross section having a protruding rib 159 on their inner faces. Each sweep is actuated by three hydraulic units 160, each of which consists of a cylinder having a double-acting piston with an extending piston rod 162 attached to the sweep. The cylinders are supported on brackets 163 which are dependently mounted from the frame members 20.

The machine is also provided with a central rail 165, the purpose of which is to act in coordination with the sweeps to cause tilting of a row of packages extending below the freezing plates to break the same away from the packages immediately above and to which they may be attached by frost adhesions as will be explained. The rail, normally in lowered position, comprises a flat body 166 terminating at its upper edge in a bulbous-like head 167. The rail is received within a longitudinally extending recess 169 in a rail guard 170 mounted on the frame in any suitable manner. Any suitable means may be provided for raising the rail from the position in which it is shown in Fig. 12 to the broken-line position thereof in the figure. This may be done hydraulically as by means of one or more pistons 172 operating in cylinders 173 below the member 165.

Since the member 82 is used for applying a de-icing fluid to the surfaces of the plates and thereafter removing the same, a drip pan 175 is provided at the lower part of the frame beneath the de-icing members, and a conduit 176 may be provided for conveying the fluid away.

It is contemplated that various hydraulic systems may be used for operating the hydraulic units previously described and that any suitable control means may be used for coordinating the movements of the pistons to achieve operation of the machine in a manner to be described, and it is therefore thought unnecessary to describe a system.

Referring now to Figs. 16a to 16f, inclusive, for a description of a preferred method of operating the machine, although the machine may be operated in various ways, the following is the method or way in which the machine is designed to be operated.

Assuming that the machine has been charged with a load of packages of food or the like and that the contents of the packages are progressively frozen from bottom to top, the ones on top being unfrozen and the ones at the bottom being completely frozen and at the lowest temperature desired, the machine will be in the position such that the plates 25, 26, and 27 are in their uppermost position and in firm pressure engagement with the packages. Assuming then that the lowermost row of packages is ready for

removal from the machine, the package supports 22 are moved upwardly to engage the lower edges of the lowermost row of packages as shown in Fig. 16a. This movement is accomplished by the actuation of hydraulic unit 138 which rotates the cranks 132 and raises the members 82 a predetermined distance which is the distance necessary to cause the tables to engage the lower edges of the lowermost row of packages.

The next step comprises the movement of the plates to the position in which they are shown in Fig. 16b. This is accomplished by relieving the pressure of plates against the packages and then moving the plates downwardly to shear any frost adhesions between the plates and packages. In the operation of the device it is preferable to merely relieve the pressure of the plates against the sides of the packages and then move the plates downwardly without appreciably opening them any farther until the frost or ice adhesions between the packages and plates are ruptured. Practicably, this is accomplished by applicant's device by connecting the inner ends of the cylinders 68 (the pistons of which actuate the plates laterally) to the upper ends of the cylinders 48 which form part of the hanger and plate supporting apparatus, and to a common source of hydraulic fluid under pressure and at the same time relieving the pressure at the opposite ends of the cylinders. When pressure fluid is introduced into the inner ends of the cylinders 68 and the upper ends of the cylinders 48, since the packages are presumably adhering to the plates and the plates are in pressure engagement with the packages, the first action that takes place is the relieving of the pressure against the packages. Following this the fluid acting on the piston in cylinders 48, the effective area of which greatly exceeds the effective area of the pistons in cylinders 68, together with a force of gravity acting on the plates, forces the plates down, shearing any frost adhesions. Once the adhesions have been ruptured the plates are free to separate widely enough to permit of the easy removal of packages from between them.

In the lower position (Fig. 16b) the lower edges of the plates are at a distance above the package delivery surface equal to the height of the packages. During the downward movement of the plates the rail 165 moves upwardly as shown in the figure.

In the next operation the package supporting members 32 are lowered to their original position as shown in Fig. 16c.

As the packages move down from the position of Fig. 16b to that of 16c an unfrozen row of packages is introduced between the plates at the top in any desired manner.

As shown in Fig. 16d, the plates are then moved inwardly to firmly engage the load of packages therebetween and thereafter the two sweeps 156 and 157 move inwardly to engage the lower portions of the outer sides of the two rows of packages shown which are then tilted when the plates are raised in the next movement of the apparatus. The plates are moved upwardly very gradually and the sweeps pushing in against the packages tilt them by pushing them against the head 157 of the rail 165, as shown in Fig. 16d. This, of course, frees the lower row of packages from the lowest row of packages remaining between the plates by disrupting the frost adhesions between said rows. As the plates move upwardly the rail 165 moves downwardly, permitting the sweep 156 to push both rows of packages and

the other sweep 157 toward the left, as shown in Fig. 16e, until the packages are placed on the conveyer 154 as shown in Fig. 16f. The sweep 156 may then be returned to its original position. In the operation of the sweeps a differential of pressure is maintained between the sweeps so that sweep 156 always exerts a greater force against the packages than the other sweep.

While the invention has been shown and described with particularity, it is contemplated that various changes and modifications may be made without departing from the scope of the invention as indicated by the claims.

I claim:

1. In a method of freezing flat-sided packages of uniform size between vertical refrigerated surfaces by conduction wherein the space between the surfaces is filled with packages arranged row upon row and the surfaces are in pressure engagement with the packages, the steps of supporting the packages against downward movement by supporting the lower row of packages at their lower edges, relieving the pressure of the surfaces against the packages and moving the surfaces downwardly to rupture frost adhesions between surfaces and packages, lowering the entire load of packages until the lowermost row of packages is below the bottom of the surfaces, adding an unfrozen row of packages at the top of the load, moving said surfaces laterally into pressure and holding engagement with all the packages except said lowermost row, raising said surfaces and the packages held therebetween to the original height of the surfaces, and removing said lowermost row of packages.

2. In a method of freezing flat-sided packages of uniform size between vertical refrigerated surfaces by conduction wherein the space between the surfaces is filled with packages arranged row upon row and the surfaces are in pressure engagement with the packages, the steps of supporting the packages against downward movement by supporting the lower row of packages at their lower edges, relieving the pressure of the surfaces against the packages and moving the surfaces downwardly to rupture frost adhesions between surfaces and packages, lowering the entire load of packages until the lowermost row of packages is below the bottom of the surfaces, adding an unfrozen row of packages at the top of the load, moving said surfaces laterally into pressure and holding engagement with all the packages except said lowermost row, raising said surfaces and the packages held therebetween to the original height of the surfaces, removing said lowermost row of packages by tilting the packages thereof relative to the packages remaining between said surfaces as said surfaces are raised to thereby rupture any frost adhesions between said lowermost row and the next adjacent row, and subsequently conveying the packages away.

3. The method of removing an outer row of frozen, flat-sided packages from an adjacent row of such packages to which it is attached by frozen adhesions and from between conduction freezing surfaces in pressure engagement with said rows, the steps of relieving the pressure of the surfaces against said packages and causing said outer row to project beyond the edges of said surfaces, causing said surfaces to grip said adjacent row of packages, and tilting said outer row of packages relative to said adjacent row thereby rupturing the frozen adhesions between said adjacent row and said outer row.

4. In a method of freezing flat-sided packages

of uniform size between vertical refrigerated plates by conduction wherein the space between the plates is filled with packages arranged row upon row and the plates are in pressure engagement with the packages, the steps of providing a substantially planar horizontal package delivery surface below said plates, supporting the packages against downward movement by supporting the lower row of packages at their lower edges, moving the plates laterally away from each other to remove pressure from the packages and substantially simultaneously moving the plates downwardly until they are a distance above the package delivery surface equal to the height of a package, lowering the entire load of packages until the lower edges of the lowermost row of packages are in the plane of the package delivery surface, moving the plates laterally into pressure and holding engagement with all the packages except those of the lower row, raising said plates and held packages to the original position of the plates, and removing said lower row of packages by exerting lateral pressure thereon to cause said packages to move over said delivery surface.

5. In a method of freezing flat-sided packages of uniform size between vertical refrigerated plates by conduction wherein the space between the plates is filled with packages arranged row upon row and the plates are in pressure engagement with the packages, the steps of providing a substantially planar horizontal package delivery surface below said plates, supporting the packages against downward movement by supporting the lower row of packages at their lower edges, moving the plates laterally away from each other to remove pressure from the packages and, substantially simultaneously moving the plates downwardly until they are a distance above the package delivery surface equal to the height of a package, lowering the entire load of packages until the lower edge of the lowermost row of packages are in the plane of the package delivery surface, moving the plates laterally into pressure and holding engagement with all the packages except those of the lower row, raising said plates and held packages to their original position, and simultaneously breaking said lower row of packages away from the next row by exerting lateral pressure thereon from one side below the centers thereof and providing an abutment at the opposite side of the packages above the area of exerted lateral pressure, and subsequently removing said abutment and moving said packages away over said delivery surface.

6. In a method of freezing flat-sided packages of food, providing a pair of opposed refrigerated surfaces, moving the packages intermittently from one end of said surfaces to the opposite end, and subjecting the packages to progressively greater pressures from said surfaces from the time the packages are introduced between the surfaces to the time they are removed, the pressure on said packages being relieved during movement of the packages.

7. In a method of freezing flat-sided packages of unfrozen food, providing a pair of opposed refrigerated surfaces, introducing said packages between said surfaces at one point, intermittently moving said packages between said surfaces to another point and subjecting said packages to pressure from said surfaces during periods of rest of the packages and relieving the pressure during movement of the packages, the pressure exerted being relatively greater on packages in

which the contents are frozen than on those in which the contents are not frozen.

8. In a machine having vertically disposed laterally spaced freezing plates between which packages of food to be frozen can be received, means for moving said plates toward and away from each other, means for moving said plates vertically, a vertically movable package support and anti-icing fluid applicator structure normally positioned below said plates and between the planes of opposed sides of adjacent plates, means for moving said structure a predetermined limited distance to bring it into supporting engagement with the packages between the plates and means for moving said structure to the upper edges of said plates.

9. In a machine having vertically disposed laterally spaced freezing plates between which packages of food to be frozen can be received, means for moving said plates toward and away from each other, means for moving said plates vertically, means forming a horizontal package delivery surface below said plates, a vertically movable package support normally positioned below said plates with its upper surface in the plane of said delivery surface, and means for raising and lowering said support.

10. In a machine having vertically disposed laterally spaced freezing plates between which packages of food to be frozen can be received, means for moving said plates toward and away from each other, means for moving said plates vertically, means forming a horizontal package delivery surface below said plates, a vertically movable package support normally positioned below said plates with its upper surface in the plane of said delivery surface, means for raising and lowering said support, and means for tilting a package wholly projecting beyond the lower edges of said plates and connected to a package between said plates by frost adhesions.

11. In a vertical plate food freezing machine, a frame, vertically arranged laterally spaced freezing plates between which packages of food to be frozen can be received, vertically movable means carried by said frame normally supporting said plates in a given position, a vertically movable package support normally positioned below said plates and between the planes of opposed sides of adjacent plates, means for moving said supports upwardly a predetermined distance for supporting engagement with a row of packages between the plates, and means for causing downward movement of the plate supporting means.

12. In a vertical plate food freezing machine, a frame, vertically arranged laterally spaced freezing plates between which packages of food to be frozen can be received, a hanger at each end of said frame, means supporting said plates on said hanger, and hydraulic means supporting said hangers for limited vertical movement.

13. A device as defined in claim 12 in which an odd number of plates are employed and all but the center plate are mounted for limited movement on said hangers in a direction whereby said plates can be moved toward and away from each other in a direction at right angles to their planes of disposition.

14. In a device of the type described having vertically arranged freezing plates, package supporting means arranged below said plates for movement therebetween comprising elongated package supporting members, a plurality of rotatably mounted horizontal cranks below said

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members, each crank having a pair of spaced arms and a roller carried by said arms, said cranks being normally disposed in position to support said members in lower position with the members resting on said rollers, and means for rotating said cranks to raise said arms and said members.

15. In a method of removing frozen flat-sided packages of uniform size from between vertical refrigerated surfaces disposed in pressure engagement with the sides of the packages, the steps of supporting the edges of the packages disposed along a margin of said surfaces, relieving the pressure of the surfaces against the packages, moving said surfaces in a direction parallel to the sides of said packages in the direction of the support to shear frost adhesions between the surfaces and packages, and moving the surfaces laterally away from the sides of the packages to permit their removal.

16. In a machine having vertically disposed laterally spaced freezing plates between which packages of food to be frozen can be received, a package delivery surface below said plates, a sweep member movable over said surface, and a package abutment rail movable to a position over said surface, said rail being constructed and arranged for engagement with a package depending below said plates on a side of said package opposite said sweep and at a level out of alignment with the sweep, and means for actuating said sweep into engagement with a package to tilt the same by forcing it against said rail.

17. For use in a device of the type described, means for effecting lateral movement of a vertically disposed plate suspended from a frame and mounted for lateral movement, a plurality of bell cranks mounted on said frame for rotation about vertical axes to one side of said plate, said cranks each having a pair of vertically spaced arms, a link pivotally mounted on each crank and pivotally connected to said plate, said cranks each having an actuating arm, a rod connecting the actuating arms of said cranks, and means for actuating one of said cranks.

18. In a vertical plate food freezing machine, a frame, vertically arranged laterally spaced freezing plates between which packages of food to be frozen can be received, means supporting said plates on said frame for vertical and for lateral movement, means for moving said plates vertically and laterally, a vertically movable package support normally positioned below said

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plates and between the planes of the opposite sides of adjacent plates, and means for moving said support vertically.

19. The method of freezing flat-sided articles between a pair of spaced opposed relatively movable refrigerated plates during a predetermined freezing cycle, comprising the sequential steps of so laterally moving one of the plates relative to the other as to compress the articles between the plates for a predetermined portion of said cycle and then to release said compression, then, substantially simultaneously with the release of said compression, effecting relative movement as between the plates and articles in a direction parallel to the planes of the opposed surfaces of the plates, and intermittently repeating said described series of steps throughout the remainder of said cycle.

20. The method of claim 19 wherein the space between said plates is maintained substantially filled with said articles throughout said cycle.

21. The method of freezing flat-sided articles between a pair of spaced opposed vertically disposed relatively laterally movable refrigerated plates having an article support mounted for vertical movement relative to and between said plates, comprising the sequential steps of laterally moving the first of the plates towards the other far enough to compress said articles between the plates, maintaining the plates in said position during a predetermined freezing period, moving said first plate in the opposite direction to relieve said compression, substantially simultaneously with the latter movement effecting relative movement in a vertical plane as between the articles and said plates to break ice adhesion of the articles to the plates occurring during said freezing period, and then moving the article support vertically downwardly between and relative to the plates to permit gravity movement of said articles into lowered position between the plates.

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