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QUICK-FREEZE APPARATUS AND METHOD

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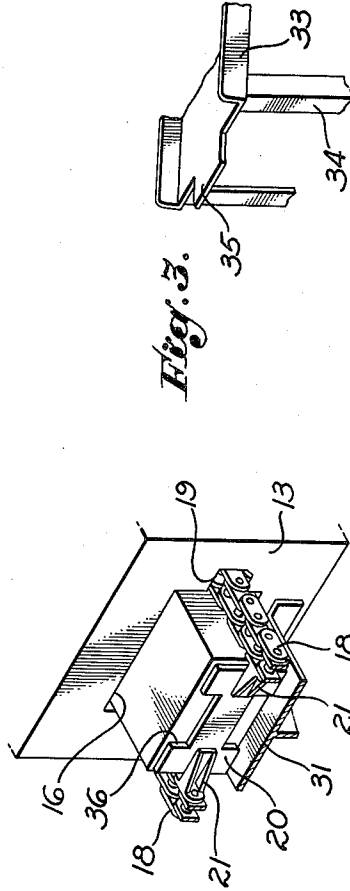
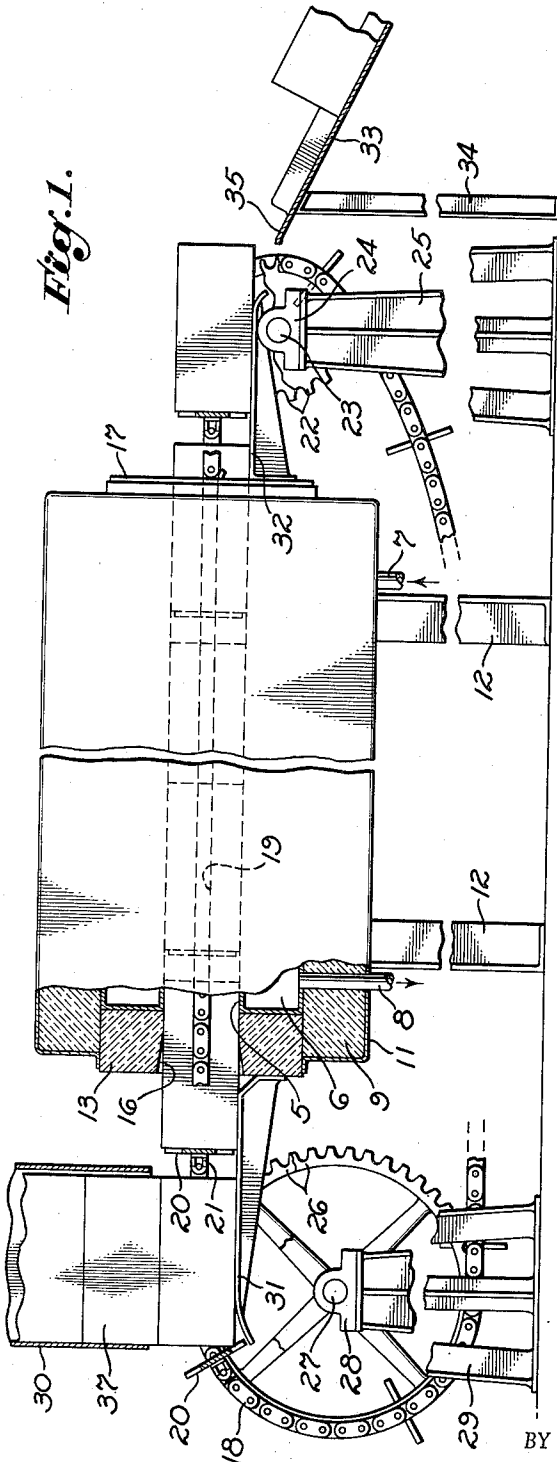
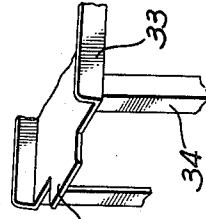


Fig. 3.



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QUICK-FREEZE APPARATUS AND METHOD

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This invention relates to the production of frozen foods and is concerned more particularly with the quick-freezing of packaged foods.

It is a general object of the invention to provide improved methods and apparatus for the quick-freezing of packaged foods.

Another object of the invention is to provide methods and apparatus of the above character in which a series of food packages can be treated in an efficient and economical manner.

A further object of the invention is to provide methods and apparatus of the above character in which the food packages are subjected to pressure while being moved along a refrigerating surface.

Another object of the invention is to provide methods and apparatus of the above character in which a series of packages are carried through a freezing tunnel with a maximum area of each package in heat transfer relation with the walls of the tunnel.

Other objects and advantages of the invention will be apparent from the following description of a preferred embodiment of the invention, as illustrated in the accompanying drawings, in which:

Figure 1 is a side elevational view of quick-freezing apparatus embodying the instant invention, certain of the parts being shown in section.

Figure 2 is a perspective view of the feed end of the apparatus.

Figure 3 is a perspective detail view of the discharge chute of the apparatus.

In the production of packaged frozen foods it is highly desirable that each package of food be subjected to an efficient quick-freezing operation, and at the same time be formed to a compact, uniform size for ease in shipping and storage. To obtain the most efficient quick-freezing operation it is desirable that a maximum area of each package be placed in contact with the cooperating refrigerating surfaces during the freezing operation. In accordance with the instant invention, this is accomplished effectively by providing a refrigerating tunnel corresponding in cross-section to one cross-sectional size of the packages to be refrigerated, and conveying means which progresses the packages through the tunnel in sliding contact with the refrigerating surfaces.

Referring to the drawing, the apparatus includes a refrigerating tunnel 5 of rectangular cross-section formed of four refrigerating walls or surfaces which form the inner walls of a refrigerant chamber 6 that completely surrounds the

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tunnel. The walls of the refrigerant chamber 6 are formed of sheet metal of good heat conducting qualities, such as copper or steel, and the joints of the walls may be formed by brazing or welding to provide a closed liquid-tight chamber around the tunnel 5. A suitable refrigerant such as brine is supplied to the chamber 6 through an inlet pipe 7 and is withdrawn through an outlet pipe 8, which with the chamber 6 form part of a refrigerant circulating or cycling system including a brine refrigerating machine (not shown). The refrigerant chamber 6 is, in turn, surrounded by a suitable layer of insulating material 9 contained within a casing 11 supported by legs or standards 12. At the feed end of the tunnel 5, a block of insulating material 13 is provided having a flared entrant opening 16 to the tunnel 5, and a similar apertured block of material 17 is provided at the discharge end.

In order to progress the packages of food through the freezing tunnel, an endless conveyor is provided including a pair of spaced apart chains 18 engaging in respective longitudinal recesses or tracks 19 formed in the side walls of the tunnel 5. A series of progressors or impellers 20 are secured in spaced relation between the chains 18 by brackets 21, the spacing between the progressors corresponding to one or more lengthwise dimensions of the packages of the food. As shown, the progressors 20 are spaced apart to receive one package between each adjacent pair of progressors.

The respective chains 18 engage similar drive sprockets 22 carried by a drive shaft 23 which is journaled in suitable bearings 24 carried by respective supporting standards 25. The drive shaft 23 may be connected in any suitable manner to a source of power, such as an electric motor (not shown). At the feed end of the apparatus, the chains 18 engage a pair of idler sprockets 26 which are secured on a shaft 27 also journaled in suitable bearings 28 carried by respective standards 29.

To feed packages to the conveyor for progression through the tunnel, a feed hopper 30 is provided which contains a stack of packages, the bottom package of which rests upon a feed ramp 31 for engagement by a progressor 20, so that by maintaining a stack of food packages within the hopper 30 an automatic gravity feed of the packages to the conveyor is insured. At the discharge end of the tunnel, a discharge ramp 32 is provided leading to a discharge chute 33 supported by suitable standards 34. As seen in Figure 3, the discharge chute 33 has a central lip 35 of a

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width to pass through the central cut away portion 36 of the progressors 20 so that each package is positively fed to the discharge chute 33.

In operation, a stack of food packages 37 is provided in the feed hopper 30. The packages are preferably of the usual cardboard box type with hinged lids which are more or less tightly closed when the box is packed with food. The bottom package of the stack is engaged by a progressor 20 and moved along the feed ramp 31 to enter the flared opening 16 to the refrigerating tunnel. Preferably, the packages will be disposed with the hinged edge of their lids in leading position so that in entering the tunnel the lids will be tightly closed. Preferably, the dimensions of the tunnel at the feed end are slightly larger in cross-section than the cross-section of the package so as to provide a loose sliding fit of the package within the tunnel. As the food within the package is frozen in progressing through the tunnel, the swelling or expansion of the food product is such as to bring the four sides of the package into close sliding engagement with the refrigerating walls of the tunnel so that the package is, in effect, compacted and formed to the desired dimensions as it is frozen. The length of the refrigerating tunnel is, of course, chosen with relation to the speed of travel of the conveyor to effect the desired quick-freezing operation and to deliver the frozen food packages at the discharge end ready for packing in cases or storage, as may be desired.

It will be noted that in accordance with the instant invention, four sides of the frozen food package are in engagement with refrigerating surfaces so that a maximum area of the package is in heat transfer relation and a very rapid and efficient quick-freezing operation can be performed.

It will be understood that while the invention has been described in connection with a rectangular cross-section of the frozen food package, other cross-sectional outlines could be employed, such as circular or triangular, by appropriate changes in the cross-sectional outline of the tunnel and of the food package.

While I have disclosed the invention in connection with a preferred embodiment thereof, it will be understood that the invention is capable of variation and modification from the form shown and its scope should be limited only by the claims appended hereto.

What is claimed is:

1. In a quick-freeze system for rectangular food packages, a refrigerating tunnel of rectangular cross-section for lengthwise progression of food packages therethrough and having opposed pairs of refrigerating walls for engaging the four side surfaces of a package, a track formed in a wall of said tunnel, and a conveyor for progressing a package through the tunnel including a progressor for engaging the package and a drive element for said progressor disposed in and travelling along said track.

2. In a quick-freeze system for rectangular food packages, a refrigerating tunnel of rectangular cross-section for lengthwise progression of food packages therethrough and having opposed pairs of refrigerating walls for engaging the four side surfaces of a package, a pair of opposed tracks formed in an opposed pair of said tunnel walls, and a conveyor for progressing a package through the tunnel including a progressor for engaging the package and a pair of drive elements for said progressor disposed in and travelling along said tracks.

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3. In a quick-freeze system for rectangular food packages, refrigerating means comprising opposed refrigerating walls forming a freezing path and spaced apart a distance to engage the opposed side surfaces of maximum area of the package, a track extending along said walls at one side thereof, and a conveyor for progressing a package through the refrigerating means including a package progressor disposed between said walls and a drive element for said progressor disposed in and travelling along said track.

4. In a quick freeze system for rectangular food packages, a refrigerating tunnel of rectangular cross-section for progression of food packages therethrough, and having an opposed pair of refrigerating walls for engaging the opposite side surfaces of maximum area of a package, a track formed adjacent one side of said tunnel, and a conveyor for progressing a package through the tunnel including a drive element disposed in and travelling along said track and a progressor connected to said drive element and projecting inwardly between said refrigerating walls to engage a package therebetween.

5. In a quick freeze system for food packages, refrigerating means comprising opposed refrigerating walls forming a freezing path and spaced apart a distance to engage a pair of opposite side surfaces of a package, a track at one side of said path, a drive element travelling in said track, package conveying means carried by said drive element and extending into the space between said walls to engage a package surface disposed at a right angle to said side surfaces, and means for driving said element to cause progression of said packages through said refrigerating means in sliding contact with said opposed refrigerating walls.

6. In a quick freeze system for food packages, tunnel-like refrigerating means forming a freezing path, a track extending alongside said freezing path, a drive element travelling in said track, a series of progressor elements carried by said drive element and projecting from said drive element into said freezing path for engagement with packages therein, and means for driving said drive element to cause progression of packages through said refrigerating means in sliding contact with said refrigerating means.

7. In a quick freeze system for food packages having a pair of end surfaces and side surfaces joining said end surfaces, a refrigerating tunnel for lengthwise progression of food packages therethrough and having refrigerating wall means for slidably engaging all side surfaces of a package, said wall means being interrupted by a longitudinal slot, and a conveyor including a progressor element extending inwardly through said slot for progressing a package through the tunnel with its side surfaces in sliding engagement with the refrigerating walls of the tunnel.

8. In a quick freeze system for rectangular food packages, a refrigerating tunnel of rectangular cross section for lengthwise progression of food packages therethrough and having opposed pairs of refrigerating walls for engaging the four side surfaces of a package, at least one of said walls being interrupted by a longitudinal slot, and a conveyor including a progressor element extending inwardly through said slot for progressing a package through the tunnel with its side surfaces in sliding engagement with the refrigerating walls of the tunnel.

9. In a quick freeze system for food packages, tunnel-like refrigerating means having refrig-

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erated wall structure forming a freezing path for substantially encompassing a package traveling therethrough, the contact of said wall structure with a package being interrupted by a longitudinal slot in said wall structure, a progressor projecting within said wall structure through said slot, a drive element carrying said progressor, and track means for said element disposed in parallel relation to said wall structure.

10. In a quick freeze system for rectangular food packages, a refrigerating tunnel for progression of food packages therethrough, said tunnel having an opposed pair of refrigerating walls for engaging the opposite side surfaces of maximum area of a package, a progressor element extending between said refrigerating walls to engage a package disposed therebetween, a drive element disposed on opposite sides of said tunnel walls and connected to opposed portions of said progressor element, and track means for said drive

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element disposed in parallel relation to said refrigerating walls of said tunnel.

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