# United States Patent [19]

**Shapley et al.**

[11] **3,719,055**

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[54] **CONTINUOUS BELT FREEZER HAVING REMOVABLE COMPARTMENTS**


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[52] **U.S. Cl.** .....**62/63,** 62/345, 425/440

[51] **Int. Cl.**.....**F25d 13/06**

[58] **Field of Search** ....62/345, 72, 380, 63; 425/440, 425/436, 363, 424, 453



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[57] **ABSTRACT**

A continuous belt type freezer has a flat belt and one or more grid units of substantial length and breadth which are placed on the belt to form pockets for a product prior to being frozen, the individually frozen product units being separated from the belt and the grid as the belt moves downwardly and the grid continues forwardly from the discharge end of the freezer.


**5 Claims, 8 Drawing Figures**

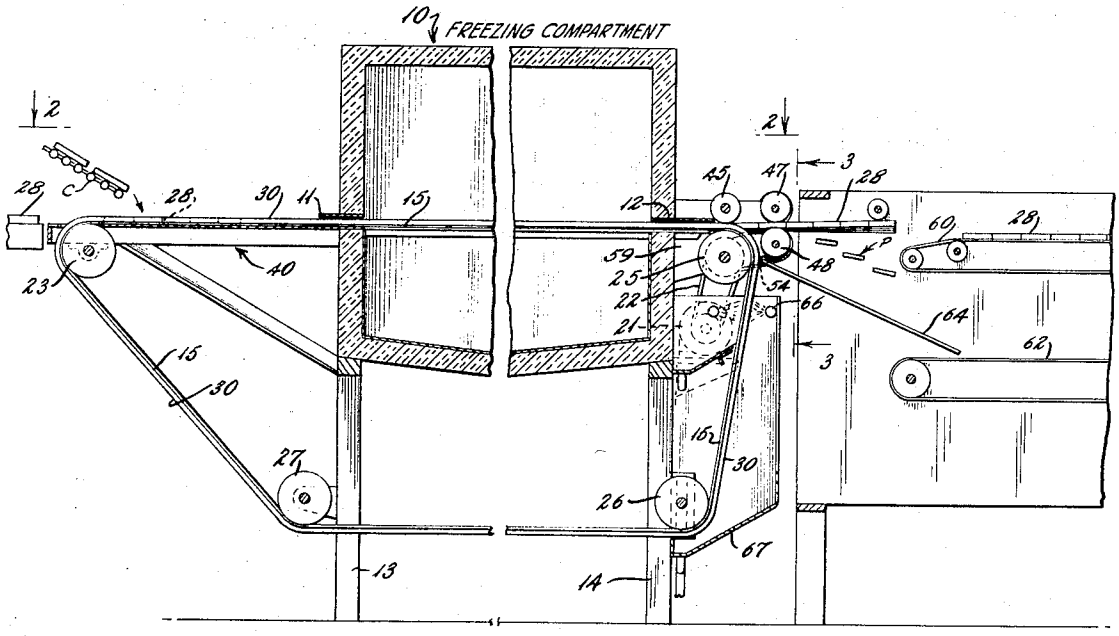
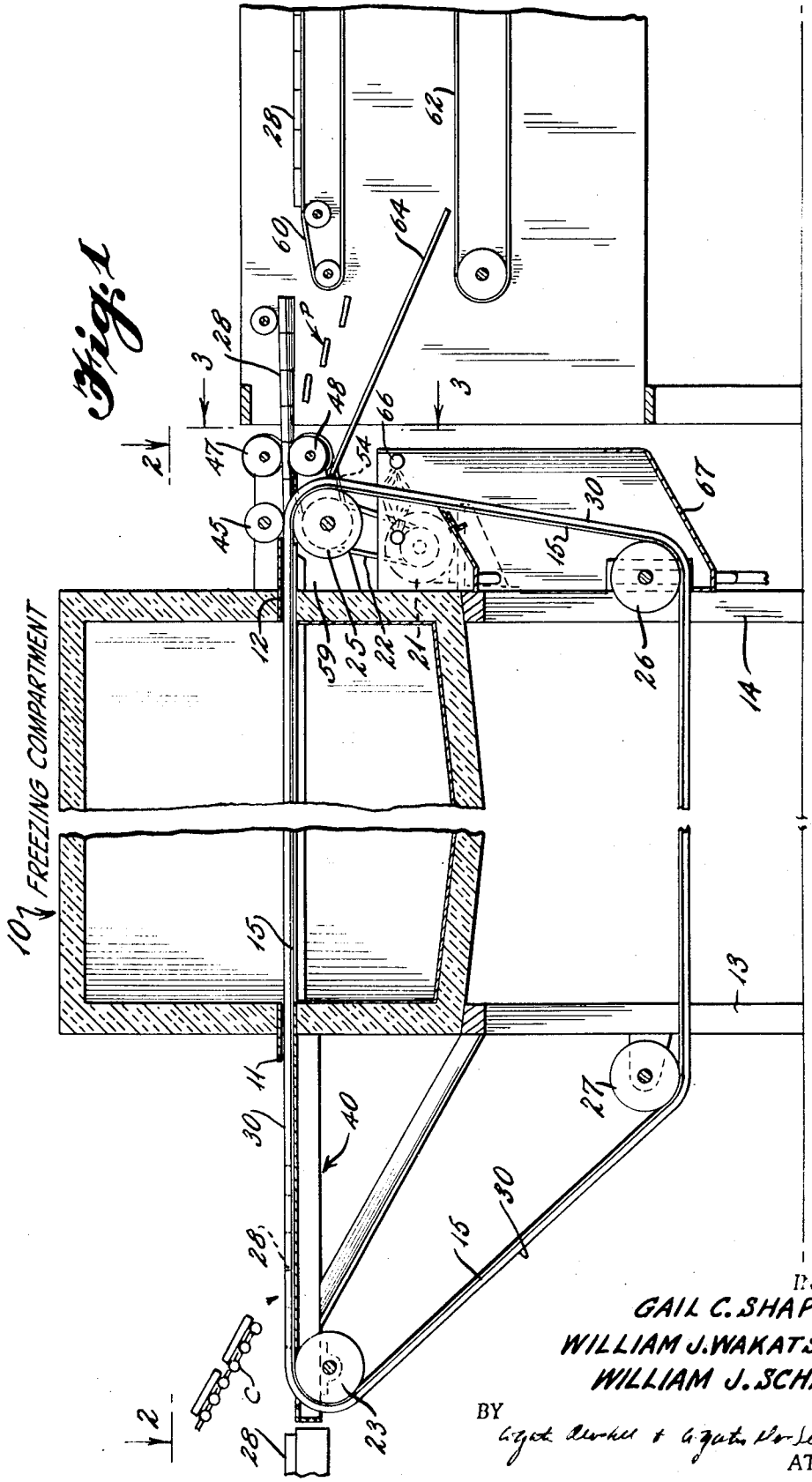


Fig. 1




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Fig. 2

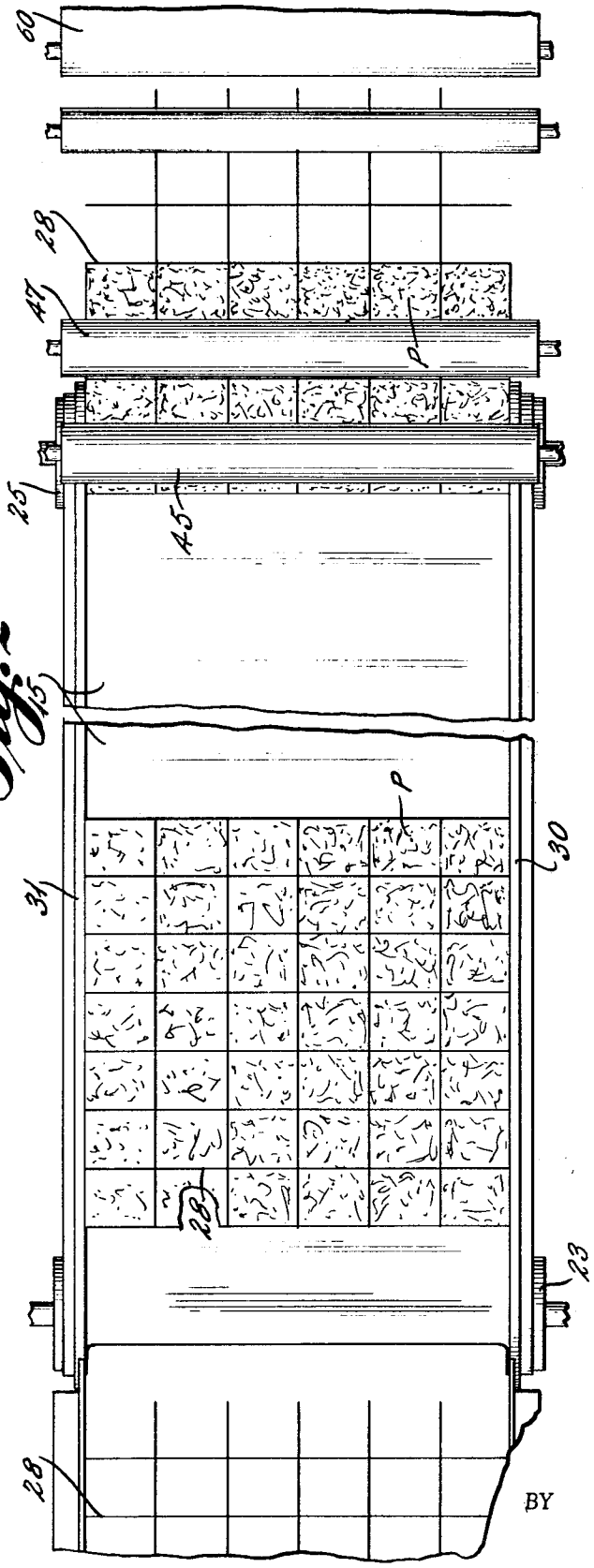
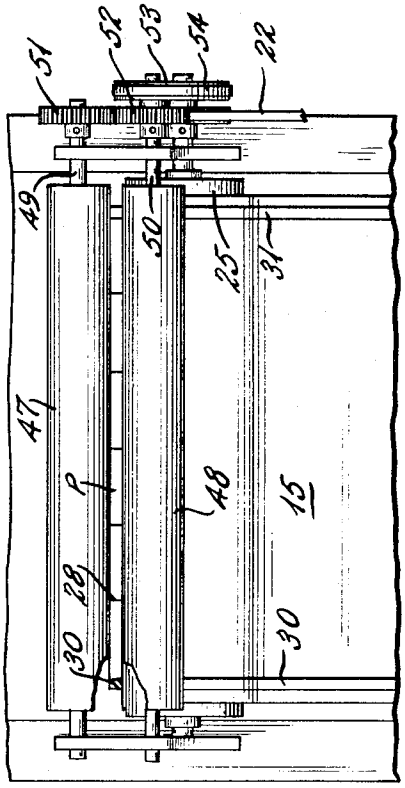



Fig. 3




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Fig. 4

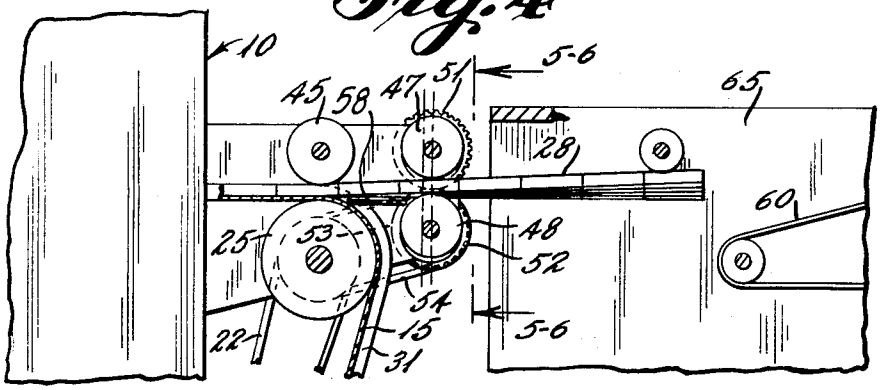



Fig. 5

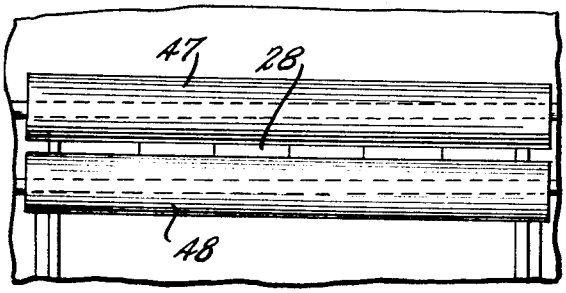
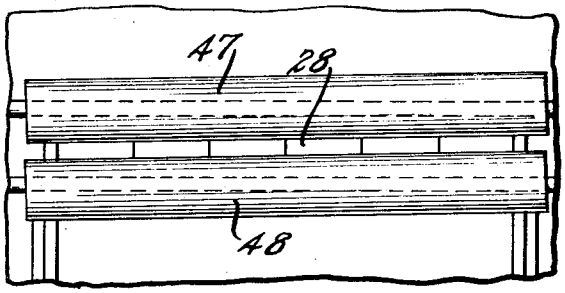



Fig. 6



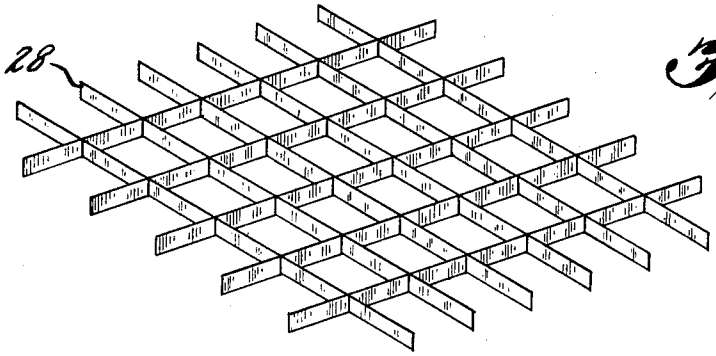




Fig. 7

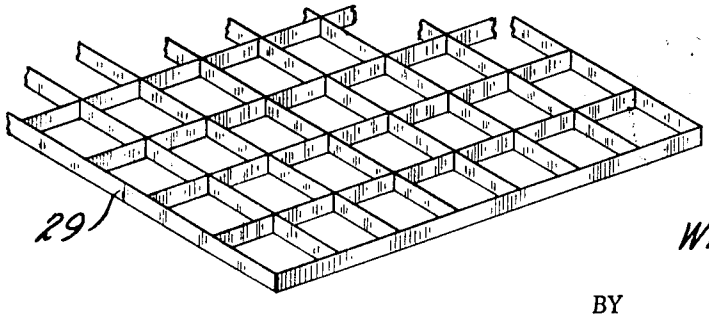



Fig. 8

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# CONTINUOUS BELT FREEZER HAVING REMOVABLE COMPARTMENTS

## BACKGROUND OF THE INVENTION

Tunnel type freezers, in which a conveyor carries a product therethrough, have been used for many years. Some of these have been of the flat belt type in which the product is placed on the belt without any provision for forming or maintaining units of the product. In some, the units have been preformed, such as fish cakes or various kinds. Others have employed packaging for the product, either partial or complete, in order to provide for freezing of product units of a desired size. There has been a need, however, for the freezing of units of product which have not been previously packaged, and for insuring that units being frozen are maintained separate from each other.

## SUMMARY OF THE INVENTION AND OBJECTS

It is an object of the present invention to provide in a continuous belt type freezer, a product sizing grid in which various products may be frozen in units of the desired size and shape and thereby result in products of uniform length, breadth, and thickness, ready for market packaging, and which is applicable to freezing apparatus of the flat belt type and without requiring the use of a different belt or belt driving means.

These and other objects of the invention will become apparent from the following description taken in conjunction with the accompanying drawings in which:

FIG. 1 is a diagrammatic vertical elevation, partially in section, with the length foreshortened illustrating one embodiment of the invention;

FIG. 2 is a horizontal section on the line 2—2 of FIG. 1;

FIG. 3 is a section on the line 3—3 of FIG. 1;

FIG. 4 is an enlarged detail of the discharge end of the freezer illustrating the separation of the product from the freezing belt and grid;

FIGS. 5 and 6 are sections on the lines 5—5 and 6—6 illustrating the freezing action of the rollers against the grid;

FIG. 7 is a perspective of an open-sided grid; and

FIG. 8 is a perspective of a grid having the sides enclosed.

With further reference to the drawings, a freezer is illustrated having a freezing compartment or housing 10 which may be of any suitable length and width and having an inlet end 11 and a discharge end 12, and mounted on supports 13 and 14. A conveyor of the flat belt type 15 is positioned to be continuously moved through the freezer. The belt runs over a first drive roller 25 which is illustrated as positioned at the discharge end of the freezer and is driven from a motor 21 by belt 22 through suitable pulleys. At the intake end the belt passes over an idler roll 23. From roller 25 the belt changes direction from substantially horizontal to a downward direction, passing over lower idler rolls 26 and 27 and back to idler roll 23 at the freezer inlet.

The apparatus described thus far is of conventional nature and well known to those skilled in the art. The housing 10 and the belt 15 as it passes through the housing may be refrigerated in any desired manner suitable for freezing the product onto the belt. This may include passing gaseous refrigerant through the housing, spraying liquid refrigerant onto the product, or onto the belt, or any combination of these or other means which are known to those skilled in the art.



The present invention includes provision for freezing the product in units of the desired size and shape on the belt. In order to accomplish this, one or more honeycomb structures, or grids, 28 and 29, such as indicated in FIGS. 7 and 8, are provided. These may have open sides as indicated in FIG. 7, or the sides may be closed, as indicated in FIG. 8. Although those indicated in FIGS. 7 and 8 are represented as approximately square, it is contemplated that the grids may be rectangular or elongated, this being a matter of choice and as suits the handling of a particular product in a given installation. The grids have open tops and bottoms and are of a height suitable to the predetermined height of the unit products which are to be frozen. In contact freezing, the height or thickness of the product is ordinarily in the range of ⅜ to 1 inch.

In order to positively move the grids with the belts, an endless belt 30, 31 is secured to the outer surface of each side of the freezing belt 15. The grid retaining belts may be of the rubber V-belt type and attached as by gluing to the outer surface of the freezer belt 15 adjacent to its edges. The height of the belts 30 and 31 should preferably correspond to that of the grid itself, which as indicated above in a contact freezing installation would ordinarily be in a range of about ⅜ to 1 inch.

It will therefore be seen that the freezer belt 15 with the grid retaining belts 30 and 31 move together as a continuous unit around rollers 23, 25, 26, 27. The overall width of the grids should be such that they fit closely between the belts 30, 31. The grids may be made of any suitable material which will retain its flat condition when placed on the freezer belt and which is easy to clean and handle. Various plastic materials are known which may be used.

In order to facilitate positioning of the product within the grid as from a conveyor C, a support table, or shelf, 40 is positioned adjacent to the entrance end of the freezer housing 10. The table 40 supports the underside of the belt prior to its entrance into the freezing compartment 10. Other supports may be used where needed.

At the discharge end of the freezer an upper roller 45 is mounted above roller 25 for engaging the grid as it discharges from the freezer housing, the rollers cooperating to hold the grid at this point in flat, unflexed position.

Mounted forwardly of the rolls 25 and 45 are upper and lower flexing rolls 47, 48. As indicated in FIGS. 3 and 4, the rolls 47 and 48 are mounted on shafts 49 and 50, respectively, which are driven through gears 51, 52 through a pulley 53 driven by belt 54 from a suitable source of power, not shown. At the other end, the shafts 49, 50 extend through bores in the rolls which are eccentric, the same for each roll, in order that as they rotate, the rollers will continuously tip from side to side and thereby produce flexing of the grids as indicated in FIGS. 5 and 6. The purpose of the flexing is to facilitate and insure dislodging of any product that may be retained in the grid after the freezing belt passes around the roll 25. In order to assist in dislodging any product from the belt itself, a blade or doctor 58 is mounted on the bracket 59 in a position to engage the

belt as it begins to change direction in passing around the roll **25**.

A support, such as a conveyor **60**, is positioned adjacent to the discharge end of the freezer **10** for receiving the empty grids **28** or **29** as they are discharged from the freezer. Beneath the support **60** is a conveyor **62** which receives the product units P from a slide **64** which is positioned with a downward inclination from beneath the rolls **47** and **48**. Conveyor **60** may be at approximately the same height as the run of the belt through the freezer in order that as the belt changes direction the grid is separated therefrom. However, conveyor **60** may be at a lower elevation, if desired, provided that there is space between the grid as it leaves the belt and the belt for the products to be discharged between the belt and the grid.

If desired, the support **60** and conveyor **62** may be mounted within the housing or framework **65**. To assist in cleaning the belt, sprays **66** may be positioned beneath the rolls **25** and **45**, a drain being provided in the bottom of shield **67**.

In the operation of the embodiment of the invention a grid of the desired type is placed on the belt prior to its entering the housing of the freezer and in engagement with the side belts **30, 31**. The belt may be stopped for sufficient period to fill the openings, or pockets, in the grid, although this may be accomplished while the belt is moving. The pockets are filled with the desired product which may include various items such as fish cakes, crab cakes, shrimp cakes, fish sandwich thins, clam cakes, eggs, stew meat, chicken meat, chili beans and meat, soups, sauces of all varieties, cake batter, preserved fruits, chopped vegetables, pet foods, and plastic materials. The product is frozen into individual units as it passes through the housing. Upon discharge from the housing the belt changes direction as it passes over the roll **25** and the grid continues in a substantially horizontal plane as it is flexed by the rolls **47** and **48**, the doctor **58** assisting in dislodging the product units from the belt and in retaining the product within the pockets until they have passed the rolls **47** and **48** following which they drop by gravity onto a chute **64** and conveyor **62** from which they are gathered for packaging. A quantity of grids may be collected at the discharge end of the freezer and periodically carried to the entrance end for re-use.

What is claimed is:

**1.** In a freezer of the type in which a continuous flexible belt is moved through a freezing zone and then changes direction and returns in which products on the belt are frozen, the improvement comprising providing a grid having openings at the top and bottom of a width which may be carried on the belt, and of a length which is convenient for handling, means adjacent to the discharge end of the freezing zone for supporting the grid and permitting it to continue in substantially the same plane as the belt changes direction, and means positioned adjacent to the discharge end of the freezing zone for receiving the product as it becomes dislodged from the belt and the grid.

**2.** The invention of claim **1**, and means adjacent to the discharge end of the freezing zone for flexing the grid.

**3.** The invention of claim **1**, and means on the belt for engaging a grid to cause the grid to move with the belt through the freezer.

**4.** The invention of claim **3**, in which the engaging means is an endless belt mounted on the outer surface of the flexible belt at each side thereof and spaced to receive closely a grid.

**5.** The method of freezing products on an endless belt which passes through a freezing zone comprising placing a substantially flat grid, which is open on the top and bottom, on the belt as it enters the freezing zone, the grid defining spaces of a size convenient for frozen units of the product, filling the spaces with the product as the grid rests on the belt prior to entering the freezing zone, moving the belt with the filled grid through the freezing zone and freezing the product in said spaces, continuing to move the grid forwardly after it leaves the freezing zone, changing the direction of the belt to a direction which diverges from the plane of the grid after it leaves the freezing zone, thereby separating the belt from the grid, and dislodging and collecting the individually frozen product units from the belt and the grid as the belt separates from the grid.

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