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[54] TRAY PACKING METHOD AND APPARATUS 16 Claims, 4 Drawing Figs.

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ABSTRACT: A method of packing a plurality of contents elements into a series of trays in a continued sequence by separating the elements at their lower ends into groups at a packing station and lowering each of said groups sequentially into adjacent trays as they pass the packing station. Apparatus for carrying out said method comprises a guide rail which changes direction at the packing station for supporting the elements from their top ends and guiding them to the packing station.

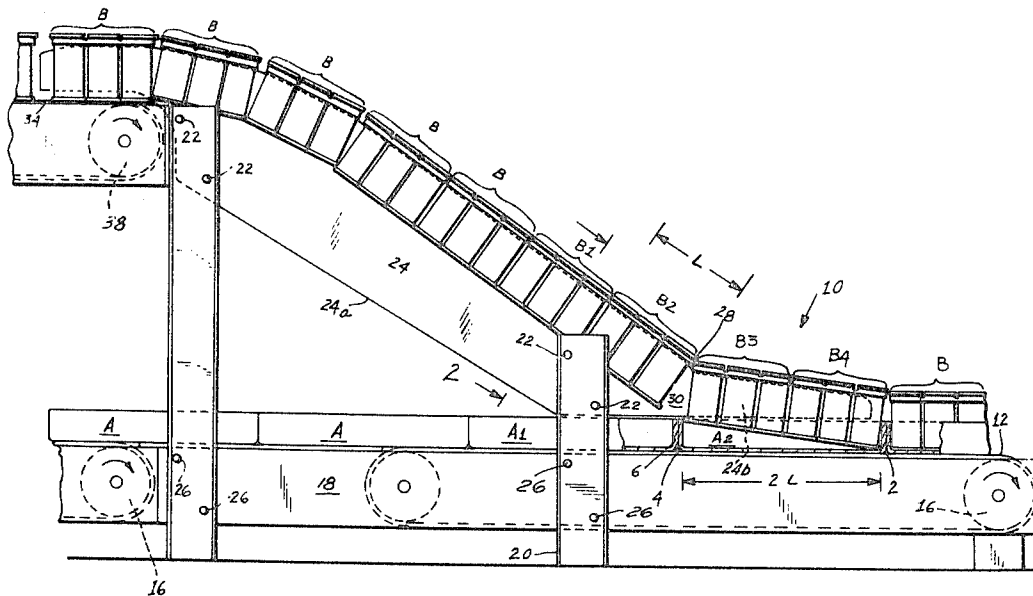


Fig. 2

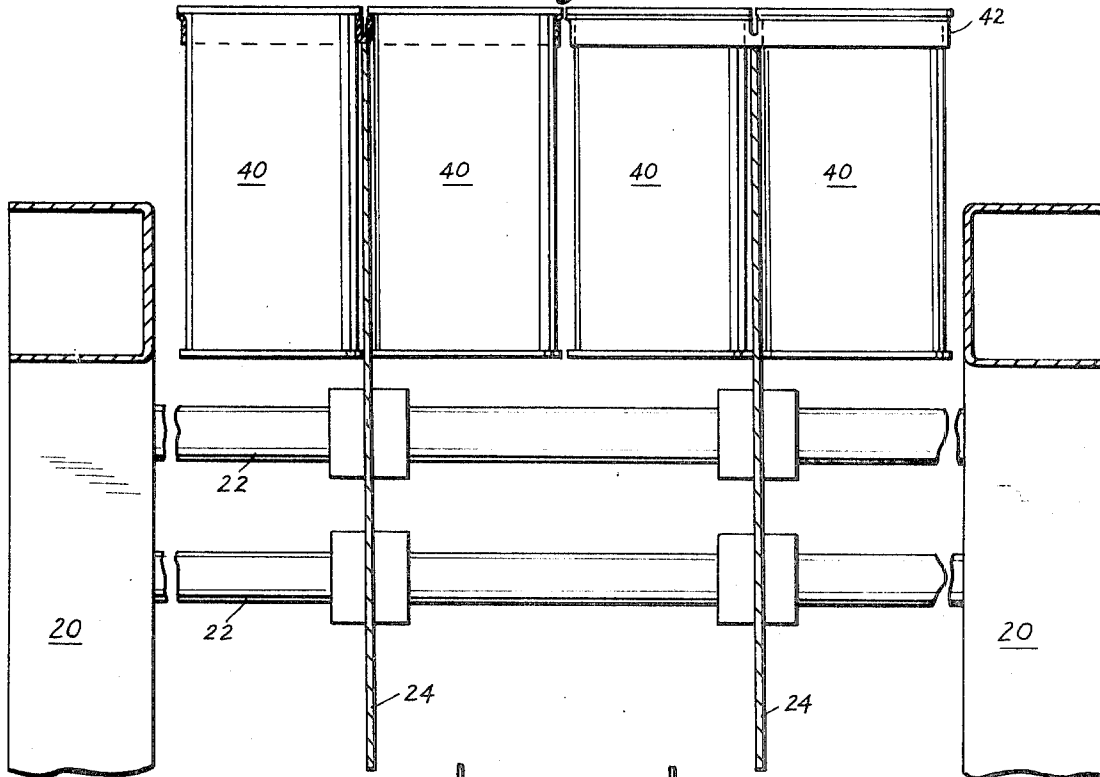
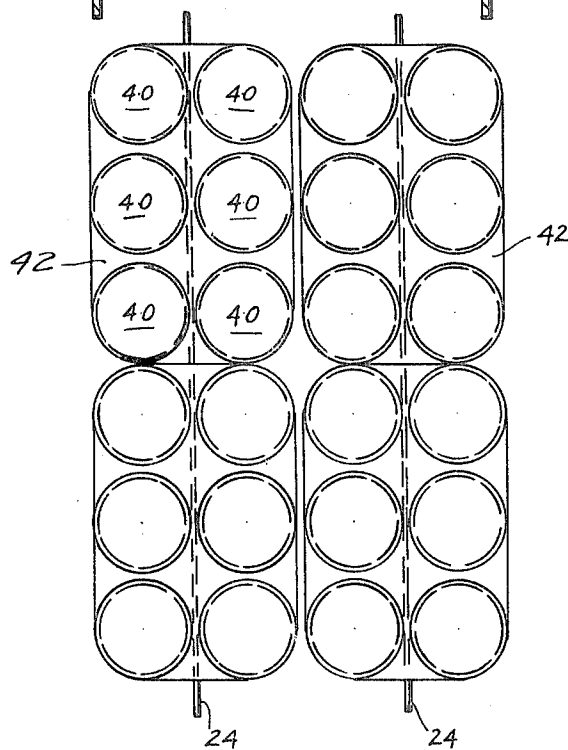


Fig. 3



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TRAY PACKING METHOD AND APPARATUS

The present invention relates to a method and apparatus for the automatic packing of traylike containers with a desired number of contents elements. The embodiment of the apparatus here specifically disclosed is designed for filling trays with a plurality of individual prepacked assemblages or groups of contents elements, such as a conventional "six-pack" of canned goods. Both the method and apparatus, however, are capable of use in connection with a wide variety of different types of contents elements.

The packaging of goods for shipment, and particularly shipment in quantity, represents an important factor of expense in the overall cost of distribution. The problem is particularly acute in connection with products such as food and drink, which must be initially packaged in a manner suitable for selection by the consumer on a supermarket shelf or the like, but which must be shipped to the distributor or market in larger quantity units. Thus a plurality of individual boxes, cans, bottles or packages must be packed in a shipping carton before transportation to a point of distribution or ultimate sale. The packing of these cartons, if performed by hand, is time consuming and, the cost of labor being what it is, quite expensive, thereby adding materially to the ultimate cost of the product to the consumer.

Conventional tray packing methods generally comprise feeding the elements to be packed and the trays in which they are to be packed to a packing station at which a designated number of such elements are deposited in the trays. A difficulty encountered in connection with this method is that of controlling the relative positions of the elements and the trays such that a designated number of elements are sequentially deposited in successive trays with a minimum of agitation. A common expedient is to employ separating means adapted to separate such objects into groups of a designated number and means to control and time the release of each group of elements for sequential, synchronous deposit in the trays as they travel past the packing station. These devices are often complex and costly and subject to frequent mechanical failure. In addition, such devices are normally designed to be utilized only with elements and trays of a particular size.

A special problem arises in connection with the packaging of products which are enclosed in fragile containers, such as glass-bottled beer or soft drinks. The tendency of the individual containers to be damaged if subjected to excessive shock or impact requires special care in the packaging of such containers, thus adding to the expense of packaging and multiplying the difficulties in devising a satisfactory automated tray packing apparatus. The susceptibility of metal cans to denting and deformation presents an analogous situation.

When a tray is packed with a plurality of contents elements such as bottles, cans or packages, it is usually necessary that it be packed snugly, so that the contents will not shift in transit and thereby become damaged. This is a problem which arises even in the case of less readily breakable elements such as cans, since a can which has become dented or deformed in transit is not readily saleable.

It is the prime object of the present invention to devise a method and apparatus for sequentially packing a tray with a plurality of contents elements such as packages, cans or bottles, whether considered individually or in the form of "prepacks," which will function rapidly and effectively and in a substantially automatic manner, and which will successfully solve the packaging problems set forth above.

The present invention obviates the need for separating, timing, and release devices by automatically separating and depositing a continuous series of elements in a continuous series of trays. Moreover, the apparatus disclosed for carrying out the method of the present invention may be used with a variety of sizes of objects and trays without any modification.

While tray packing machines have been proposed in the past, and in many instances have been made and used in indus-

try, such machines have generally been exceedingly complex and expensive and have required much floor space. From an economic point of view they are therefore useable substantially exclusively only by the largest businesses. The small or medium-size packing establishment neither has the space to accommodate such machines nor the means to purchase them and operate them on an economically satisfactory basis. Even with large packing establishments, the initial cost, as well as the upkeep and maintenance, of such machines represents an appreciable financial outlay.

It is a further prime object of the present invention to devise an automatic tray packing apparatus which is so simple in construction and mode of operation, and which takes up so little space, that it can be purchased and effectively used even by a small packing establishment, yet which can also be used by larger packing establishments with an appreciable saving in cost.

A further feature of the apparatus of the present invention is that it may be adapted to operate in the absence of a separate powered means for conveying trays past the packing station, such conveying being automatically accomplished by the packing operation itself.

The apparatus of the present invention is further particularly characterized by a design which provides for snug carton filling in a rapid and dependable manner, requiring substantially no supervision, the filling of the tray being accomplished in such a manner that damage to the elements does not occur.

In accordance with the present invention a continuous series of contents elements and trays are fed to a packing station at which the packing operation occurs. The contents elements are supported and guided to the packing station at their upper ends in a forward and downward path inclined to the path of the trays. As the groups of contents elements pass over the intersection of adjacent trays each element is caused to diverge from its contiguous element at its bottom end. Depending on the size of the trays, a designated number of groups of contents elements will accordingly be deposited in each tray.

In accordance with the embodiment of the invention here specifically disclosed, the divergence of contiguous groups of contents elements is accomplished by changing their direction of travel in the region of the packing station above the line of trays. Since the groups of contents elements are supported at their upper ends, this change in direction effects a divergence of said groups at their lower ends. Accordingly, such divergence provides a space within which to accommodate the intersection of adjacent trays defined by the trailing wall of a first tray and the leading wall of a second tray.

To the accomplishment of the above, and to such other objects as may hereinafter appear, the present invention relates to a method and means for tray packing as defined in the appended claims and as described in this specification, taken together with the accompanying drawings, in which:

FIG. 1 is a side elevational view of one embodiment of a complete tray packing apparatus showing the operation of the method of the present invention;

FIG. 1A is a fragmentary view of the packing station of FIG. 1 showing the trays and elements in a different position;

FIG. 2 is a fragmentary cross-sectional view taken along line 2-2 of FIG. 1; and

FIG. 3 is a fragmentary top plan view of the embodiment of FIG. 2.

The method of the present invention will be more easily understood with reference to the specific exemplary embodiment of the apparatus shown in the drawings. The apparatus will be here described in connection with the filling of open-topped packing cases (trays) of length 2L generally designated A, with a plurality of contents elements of length L in the form of prepackaged "six-packs" of canned beverages, generally designated B. In the specific embodiment shown, the trays A are designed to accommodate four elements B arranged in two rows of two each. It will be understood, of course, that this is by way of exemplification only, and that many other types and styles of trays A and contents elements

B, whether individually packaged or preassembled into groups, can be employed. Moreover, the trays can be dimensioned to accommodate any desired number of contents elements.

Referring specifically to FIG. 1 the apparatus comprises means for conveying a continuous line of trays A towards a packing station generally designated 10. In the embodiment shown the means for conveying the trays A comprises a conveyor belt 12 mounted on drums 16. Drums 16 are enclosed in and supported by housing 18 which in turn is supported on a frame 20 by means of crossrods 26. Drums 16 may be driven by any suitable means (not shown). However, as will hereinafter become apparent, the apparatus may be adapted to operate in the absence of means for driving belt 12.

A support and guide means in the form of guide rail 24 is mounted above and in a downwardly inclined position relative to conveyor belt 12, frame 20 and crossrods 26. Guide rail 24 consists of two parts, 24a and 24b, disposed angularly to each other such that their guide surfaces intersect at 28 in the region of packing station 10. FIG. 2 shows two guide rails 24 mounted in parallel relation with two elements B positioned thereon. As best shown in FIG. 3, elements B are composed of six individual beverage cans 40 arranged in parallel rows of three and connected at their upper ends by a conventional six-pack carrier unit 42, such as a "Hicone Plastic Carrier." As can be seen from FIG. 2, each guide rail 24 is located between adjacent rows of cans and engages the carrier 42 in the space between these rows.

In the position shown in FIG. 1, contiguous elements B2 and B3 are supported by parts 24a and 24b of guide rail 24 respectively and are in contact at their upper ends, their lower ends having diverged to form space 30 between them. FIG. 1A shows elements B2 and B3 at a subsequent time having advanced down the guide rail 24 approximately half the length L of an element. As can be seen from the drawing, element B2 has begun to diverge from contiguous elements B1, forming a space 32 between them at their lower ends. Suitable means, such as conveyor belt 34 mounted on drum 38 and driven by suitable means (not shown) are provided for feeding a continuous series of contents elements B to the upper extremity of guide rail 24 which, as shown in FIG. 1, is designed to receive such contents elements.

The method of this invention will now be described in connection with the apparatus disclosed. A continuous line of adjacent trays A are positioned on conveyor belt 12, preferably with the leading wall of each tray A abutting the trailing wall of the tray in front of it. The leading wall 2 of a tray A2 is placed in the region of the packing station 10 forward of intersection 28 on guide rail 24. When the forward cans of a leading element B4 engage the leading wall 2 of the leading tray A2, the apparatus is in condition for continuous automatic operation. As each element B reaches intersection 28 on guide rail 24 it will begin to rotate in a counterclockwise direction, thereby diverging at its lower end from the rearwardly contiguous element while continuing its forward and downward motion toward packing trays A. This rotation will continue until the rearwardmost portion of said contents element reaches point 28 as, for example, is the case with element B3 in FIG. 1. At this point the contiguous contents elements B2 and B3 are at their maximum divergence and provide a sizable space 30 between them. As can be seen from FIG. 1, the abutting trailing and leading walls 4 and 6 of trays A2 and A1 respectively are positioned below elements B2 and B3 in registry with space 30. This is a result of the trays being designed to accommodate two elements in their lengthwise direction. As elements B2 and B3 are advanced past packing station 10 they are automatically lowered into trays A1 and A2. An intermediate position in this process is illustrated in FIG. 1A. In this position the bottom of the leading end of element B2 has already been lowered to a position below the line defining the upper edges of the tray walls, and thus elements B2 and B3 have become permanently separated by the abutting walls 4 and 6 of trays A2 and A1. As best shown in FIG. 1, the leading

can of an element B4, as it reaches the terminal portion of part 24b of guide rail 24, has been lowered to a position such that its bottom surface comes in contact with the floor of tray A2. When the trailing edge of element B4 reaches the terminal portion of part 24b of rail 24 it will have been lowered to the position shown in FIG. 1A in which element B4 is supported entirely by the floor of tray A2. Thus each element is gently lowered into a tray by a gradual shift of support from guide rails 24 to the floor of a tray without any free fall and thus a minimum of shock.

The conveyance of trays A past packing station 10 may be accomplished in the absence of a separate powered conveyor means by means of the packing operation itself. As illustrated in FIG. 1, as the leading cans of an element engage the leading wall of a tray, a force is exerted on such wall in the direction of travel of the trays A. The magnitude of this force is a function of the angular inclination, length and height of guide rail 24, and the force exerted on elements B by conveyor belt 34. The force exerted on the tray being packed is transmitted to the already packed trays in front and all of these trays in turn transmit that force to conveyor belt 2 through frictional contact. Thus, it can be seen that if the apparatus is designed with the proper dimensions and drum 16 is made freely rotatable, the packing operation itself will effect a continuous movement of conveyor belt 12, thereby automatically conveying trays A past packing station 10.

If desired, of course, the trays could be fed to the packing station by powered means and conveyed away through utilization of the packing operation just described. This method could be carried out by means of two separate conveyor belts or the like; one mounted on a powered drum for conveying the trays to the packing station, the second mounted on a freely rotatable drum and adapted for taking advantage of the forces resulting from the packing operation as described above.

While but a single embodiment of the present invention is described it will be apparent that many variations may be made therein, all within the scope of the instant invention.

I claim:

1. A method of packing, in a continued sequence, a plurality of contents elements into a tray having front and rear walls comprising: supporting a series of contiguous contents elements from their upper ends on a support means, guiding said series of contents elements along the support means to a station, conveying a line of adjacent trays to said packing station, pivoting said contents elements relative to each other about an axis in the plane of their upper ends generally perpendicular to their direction of movement thereby to separate said contents elements at their lowermost ends in the region of said packing station into groups above the front and rear walls of adjacent trays, and lowering in sequence the separated groups of contents elements into said adjacent trays.

2. The method of claim 1, in which the step of lowering in sequence the groups of contents elements into said adjacent trays comprises the operation of engaging the leading wall of a tray at said packing station with the leading contents element of a group of contents elements along a forwardly and downwardly inclined path such that the lowermost portion of the last of said group of elements falls within said tray below the upper edge of the trailing wall of said tray, repeating said operation with the next contiguous designated number of contents elements and the next adjacent tray, and so on.

3. In the method of claim 2, the step of conveying said trays away from said packing station.

4. The method of claim 3, in which the step of conveying said trays away from said packing station is accomplished substantially solely by said operation of engaging the leading wall of said tray at said packing station with the leading contents elements of said group of contents elements and directing said group of contents elements along a forwardly and downwardly inclined path.

5. The method of claim 3, in which the steps of conveying a continuous line of adjacent trays to and away from said packing station are accomplished substantially solely by said

operation of engaging the leading wall of said tray at said packing station with the leading contents elements of said group of contents elements and directing said group of contents elements along a forwardly and downwardly inclined path.

6. A method of packing, in a continued sequence, a plurality of contents elements into a tray having front and rear walls comprising: supporting a series of contiguous contents elements from their upper ends on a support means, guiding said series of contents elements in a given direction along said support means to a packing station, changing the direction of travel of said series of contents elements in the region of said packing station while they are supported at their upper ends thereby to separate said contents elements at their lowermost ends in the region of said packing station into groups above the front and rear walls of adjacent trays, and lowering in sequence the separated groups of contents elements into said adjacent trays.

7. The method of claim 6, in which said change in direction is from a first direction forwardly and downwardly inclined to a given degree with respect to said continuous line of trays at said packing station to a second direction forwardly and inclined to said line of trays less steeply than said given degree at said packing station.

8. The method of claim 7, in which the step of lowering in sequence groups of contents elements into said adjacent trays comprises engaging the leading wall of a given tray at said packing station with the leading contents elements of a group of contents elements, directing said group of contents elements in said second direction such that the lowermost portion of the last of said group of elements falls within said given tray below the upper edge of the trailing wall of said tray, repeating said operation with the next contiguous group of contents elements and the next adjacent tray, and so on.

9. In a tray packer for depositing in a continued sequence a plurality of contents elements into a tray, comprising means for conveying a line of trays to a packing station and means for supporting said contents elements at their upper ends and guiding the same to said packing station for depositing the elements in sequence into said line of trays; the improvement wherein said supporting and guiding means include a first part for supporting and guiding said elements in a downward path inclined at a given angle with reference to said line of trays at said packing station and a second part connected to said first part for supporting and guiding said elements in a downward path inclined with reference to said line of trays at an angle

less than said given angle, thereby effecting a separation at their lowermost ends of contiguous contents elements, said connection between the guide elements being located above said trays in the vicinity of the packing station, whereby contiguous groups of contents elements diverge from one another in the region of adjacent trays and said separated groups of contents elements are thereby self-deposited in sequence into adjacent trays.

10. The combination of claim 9, wherein said contents elements are held together in groups by a carrier means and said guide means operatively engages said carrier means.

11. The combination of claim 10, wherein said first and second parts of said guide means comprise first and second guide rails in sliding engagement with said carrier.

12. The combination of claim 11, wherein said groups of contents elements comprise a plurality of contents elements arranged in rows, and said guide rails are located between adjacent rows of contents elements.

13. The method of claim 6, in which the step of lowering in sequence groups of contents elements into said adjacent trays comprises engaging the leading wall of a given tray at said packing station with the leading contents elements of a group of contents elements, directing said group of contents elements in said second direction such that the lowermost portion of the last of said group of elements falls within said given tray below the upper edge of the trailing wall of said tray, repeating said operation with the next contiguous group of contents elements and the next adjacent tray, and so on.

14. In the method of claim 13, the step of conveying said trays away from said packing station.

15. The method of claim 14, in which the step of conveying said trays away from said packing station is accomplished substantially solely by said operation of engaging the leading wall of said tray at said packing station with the leading contents elements of said group of contents elements and directing said group of contents elements along a forwardly and downwardly inclined path.

16. The method of claim 14, in which the steps of conveying a continuous line of adjacent trays to and away from said packing station are accomplished substantially solely by said operation of engaging the leading wall of said tray at said packing station with the leading contents elements of said group of contents elements and directing said group of contents elements along a forwardly and downwardly inclined path.

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