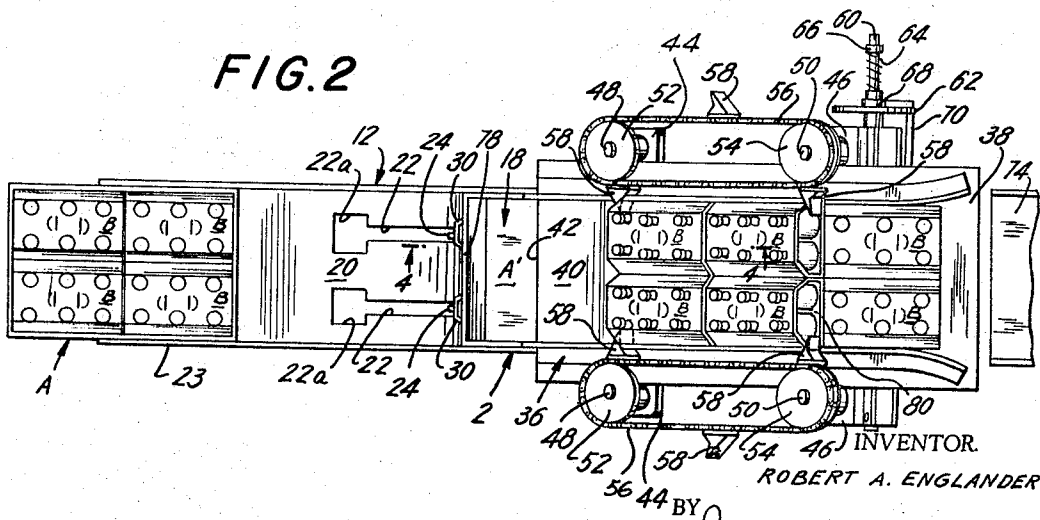


3,332,200

4 Sheets-Sheet 1

FIG. 1



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July 25, 1967

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3,332,200

TRAY PACKING MEANS

Filed May 3, 1963

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FIG. 4

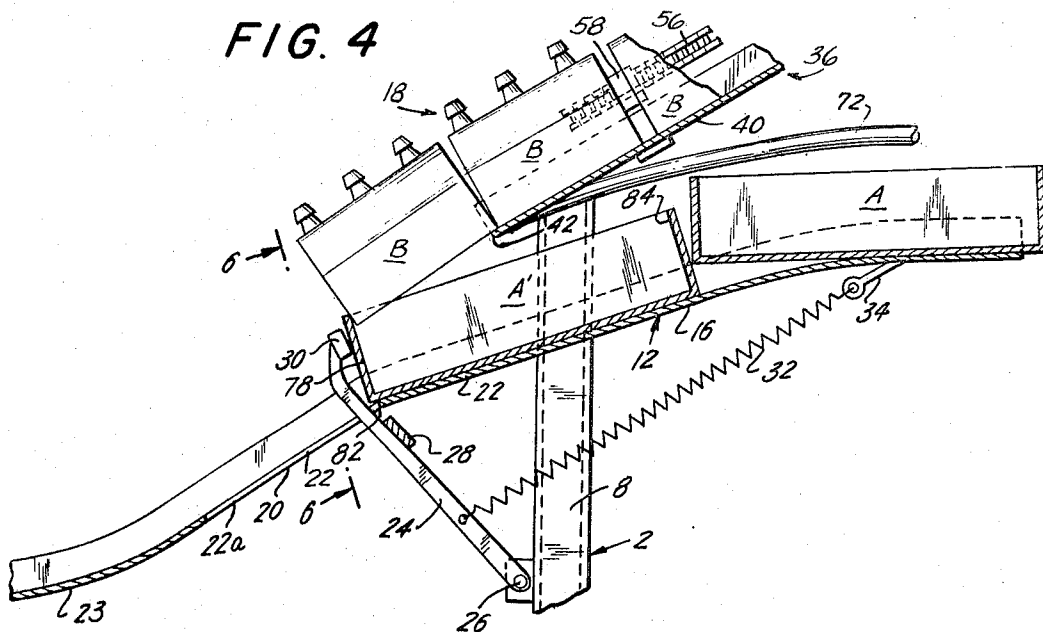


FIG. 6

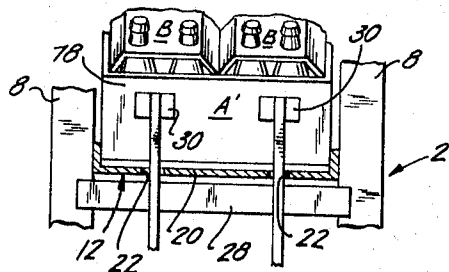
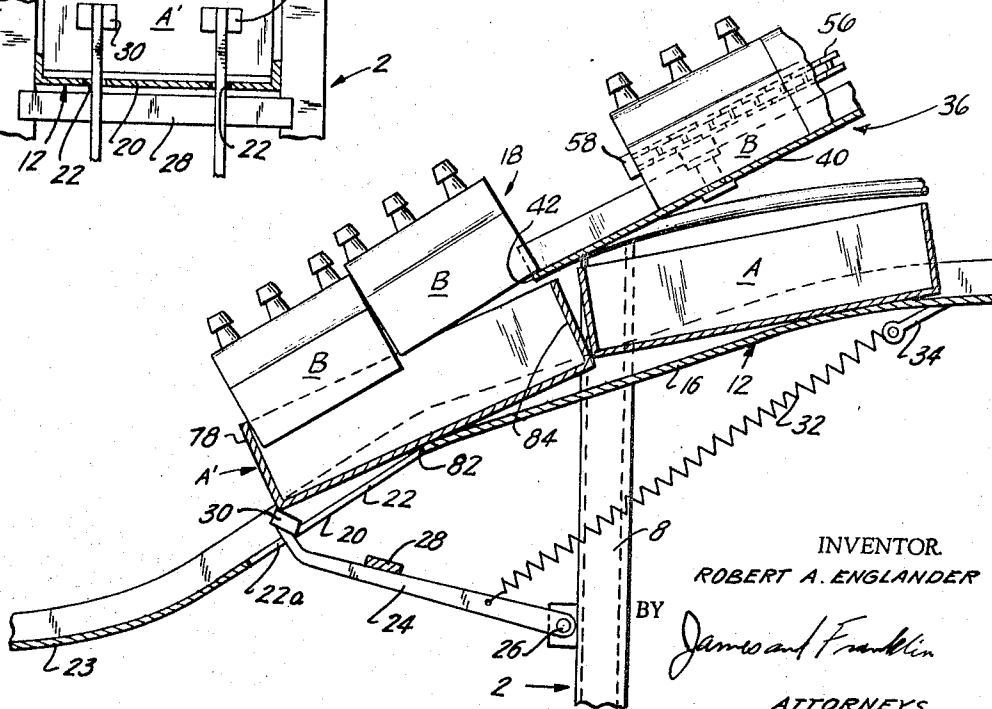


FIG. 5



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3,332,200

TRAY PACKING MEANS

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FIG. 7

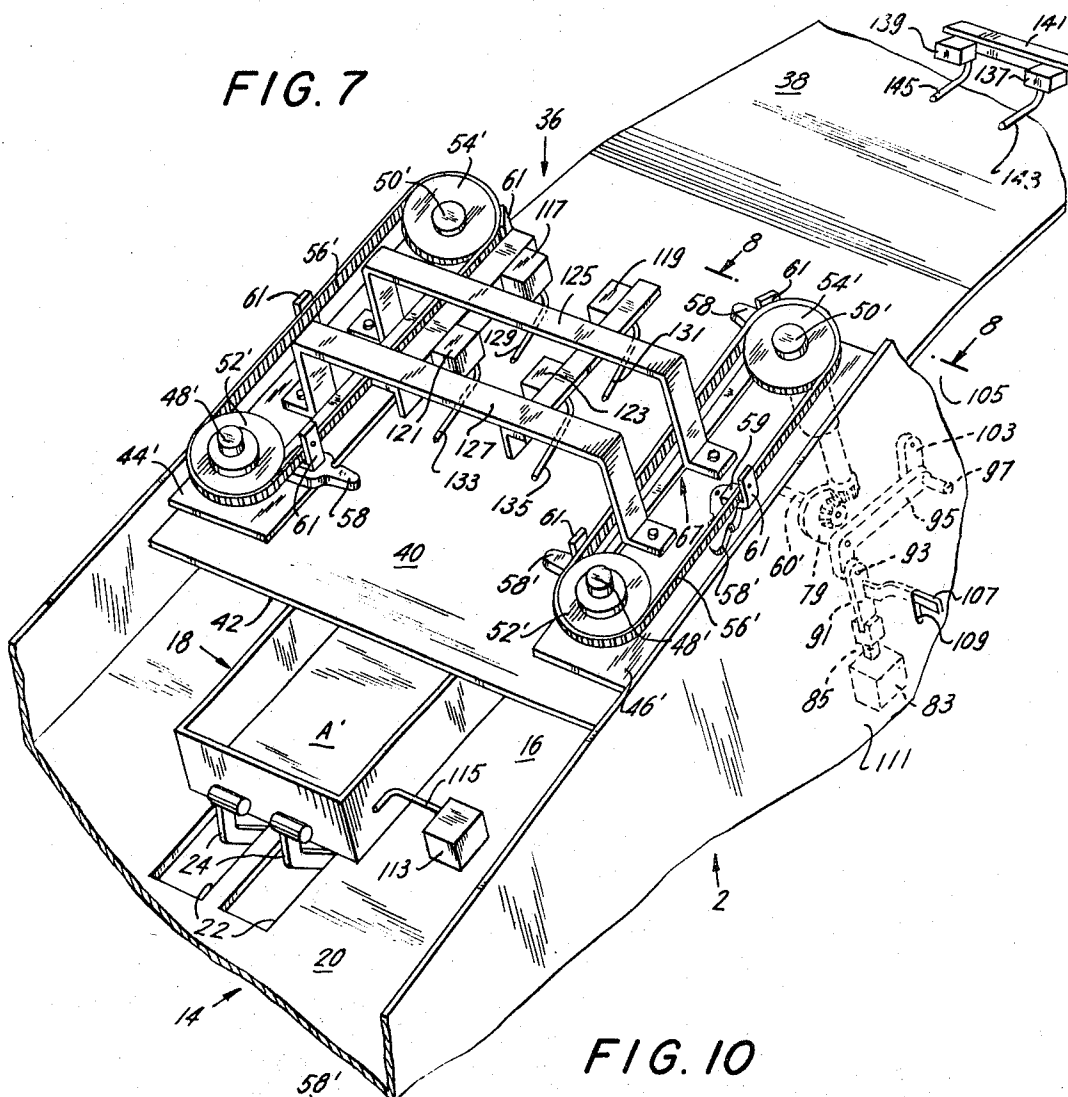
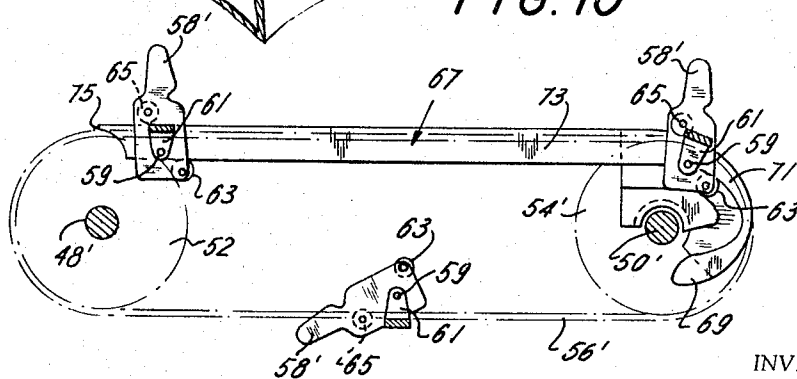


FIG. 10



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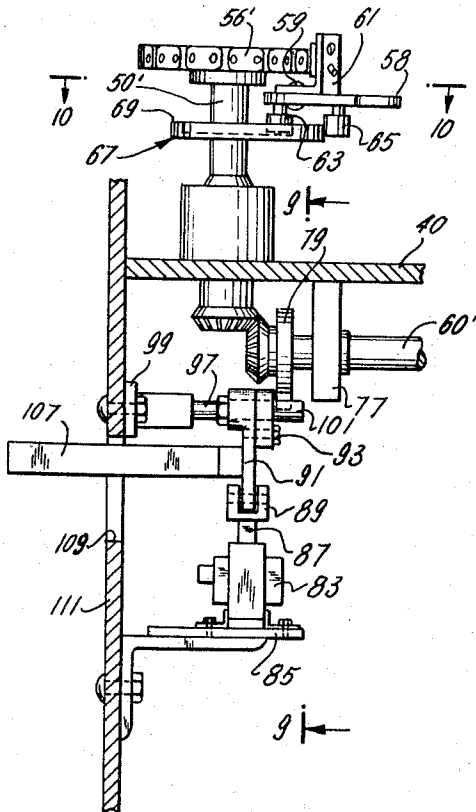
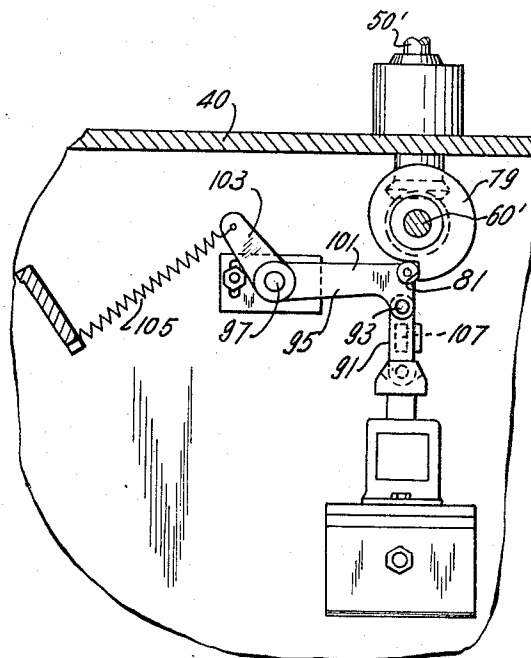
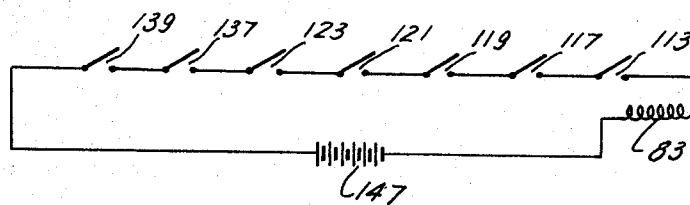
BY

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4 Sheets-Sheet 4



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3,332,200

TRAY PACKING MEANS

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Filed May 3, 1963, Ser. No. 277,758
47 Claims. (Cl. 53—55)

The present invention relates to apparatus for facilitating the packing of tray-like containers with desired contents elements. The embodiment here specifically disclosed is designed for filling trays with a plurality of individual pre-packed assemblages of contents elements, such as the conventional "six-pack" of bottled goods. The invention is, of course, capable of use in connection with a wide variety of different types of contents elements, whether packed singly or in pre-formed assemblages.

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.

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 break 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 means for packing a tray with a plurality of contents elements such as packages, cans or bottles, whether considered individually or in the form of pre-packs, which will function rapidly and effectively and in a substantially automatic manner, and which will successfully solve the packaging problems set forth above.

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

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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.

The apparatus of the present invention is particularly characterized by requiring no power source of its own, and by being inherently responsive to the feeding thereto of the contents elements to be packed. This not only makes for low initial cost and low upkeep, but also provides a built-in safety factor.

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 breakage of glass bottles or the like does not occur.

In accordance with the present invention the contents elements and the trays are supplied to the packing apparatus in any conventional manner, as through the use of standard conveyors which are readily available and usually pre-existing in a given plant. (The contents elements and trays could be fed by hand, and the apparatus would still function in proper manner, although conveyor feed is probably more economical and would probably be more commonly used than hand feed.) The power for the operation of the apparatus is derived from the feeding means for the contents elements, whether that feeding means be a motor driven conveyor or manual manipulation. The apparatus will function to pack trays for as long as contents elements are fed, to it, and the packing operation will automatically terminate, particularly with regard to the trays, when the supply of contents elements is interrupted. Thus only filled trays will be dispensed from the apparatus.

In accordance with the above, the trays to be filled are guided, preferably in a continuous line, to a packing station where the leading tray is releasably held in packing position, that packing position preferably being somewhat downwardly inclined. The contents elements are guided to the packing station above the leading tray, the guiding means for the contents elements including a track which is inclined downwardly toward the packing station and which terminates at a point above the leading tray retained at the packing station. The contents elements are adapted to move along this downwardly inclined track under the influence of gravity and to fall freely from the track into the leading tray. It is preferred that the guiding track for the contents elements be somewhat more steeply inclined than the leading tray when the latter is in packing position.

The leading tray is releasably retained in its packing position by a force-sensitive means such as a spring-loaded arm, that means being strong enough to support the weight of the tray alone, but yielding when the contents elements, or some of them, fall into the tray, thereby releasing the tray for movement along a further guiding means extending from the packing station to an exit point. Thus a tray will move from the packing station to the exit point only when the contents elements have fallen thereinto, that is to say, only when the tray has been packed.

The contents elements, as they move downwardly along their inclined track to the packing station, are preferably engaged by means which controls their movement therealong and which, in particular, controls their velocity. Hence the impact of the contents elements upon the track is controlled and modified, and the timing of the movement of the contents elements may also be controlled. This movement control means also preferably separates a substantially continuous stream of contents elements into individual element groups, each group being of a size such

as to snugly fill a given tray. In one illustrated embodiment the means which engage the contents elements slows them down, but permits a substantially continuous movement. In another, and preferred, embodiment the means in question engages the contents elements and slows them down to a complete stop at a preliminary station, retaining the contents elements in that preliminary station and then, at an appropriate time, releasing them for gravity-impelled movement into the tray. The moment of release is preferably determined by sensing mechanisms which determine that a tray is in position to receive the contents elements and that the proper number of contents elements are ready to move into a tray.

The leading ones of the contents elements, as they fall into the leading tray, fall against the front wall of that tray. In order to prevent the impact of the contents elements from rupturing or damaging the tray itself, support for the front tray wall is provided, preferably by the same means which releasably retains the tray in the packing position. In addition, in order to ensure snug packing of the tray, it has been found desirable to cause the rear end of the tray to move up, while the tray is being filled, in order to meet the last entering contents elements of a given group of elements. This is accomplished by causing the leading tray to start to move out from the packing station before it is completely filled, and by causing this movement to be carried out along a guiding path which imparts to the tray a rotative movement bringing its rear end up to meet the contents elements as described.

The result is a simple mechanism formed of sturdy and reliable parts, none of which need be made to any particularly precise tolerances, which is compact and inexpensive, which is substantially foolproof in operation, which has only a truly minimal number of adjustments to be made, yet which functions efficiently and effectively for the purposes for which it is designed.

To the accomplishment of the above, and to such other objects as may hereinafter appear, the present invention relates to tray packing means 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 an embodiment of the present invention, showing it in operation;

FIG. 2 is a top plan view of the embodiment of FIG. 1;

FIG. 3 is a fragmentary cross sectional view taken along the line 3—3 of FIG. 1;

FIG. 4 is an enlarged fragmentary cross sectional view, taken along the line 4—4 of FIG. 2, but showing a group of contents elements at a preliminary stage of entry into the leading tray to be packed;

FIG. 5 is a view similar to FIG. 4 but showing a succeeding stage in the filling of the leading tray;

FIG. 6 is a cross sectional view taken along the line 6—6 of FIG. 4;

FIG. 7 is a fragmentary top perspective view of an alternative embodiment;

FIG. 8 is a fragmentary cross sectional view taken along the line 8—8 of FIG. 7;

FIGS. 9 and 10 are cross sectional views taken respectively along the lines 9—9 and 10—10 of FIG. 8; and

FIG. 11 is a schematic circuit diagram for the electrical control system of the embodiment of FIGS. 7—10.

The packing apparatus will be here specifically described in connection with the filling of open-topped packing cases (trays), generally designated A, with a plurality of contents elements in the form of pre-packaged "six-packs" of bottled beverages, each contents elements being generally designated B. The trays A are specifically designed to snugly receive four elements B 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 pre-assembled into groups, could be employed.

The apparatus comprises a supporting frame generally

designated 2 which may consist of a base 4 and pairs of uprights 6, 8 and 10 of progressively decreasing height. A tray-guiding means in the form of a track generally designated 14 is mounted on the uprights 6, 8 and 10, that track comprising a substantially horizontal entry portion 14 which extends somewhat to the rear of the uprights 6, a downwardly inclined track portion 16 at the packing station, generally designated 18, a somewhat more sharply downwardly inclined track portion 20, and a substantially horizontal exit track portion 23, all continuously connected to one another. The track 12, adjacent the packing station 18 and along the portion 20 thereof, is provided with one or more elongated slots 22 through which arms 24 are adapted to extend, those arms being pivotally mounted on the upright 8 at 26, being connected together beneath the track 12 by bar 28, and carrying shoes 30 at their upper ends above the track 12. The slots 22 have enlarged end portions 22a through which the shoes 30 are freely passable. One or more tension springs 32 are connected at one end to the arms 24 and at their other end to mounting means 34, the springs 32 being active to bias the arms 24 to pivot in a clockwise direction as viewed in FIG. 1 until those arms 24 engage the right hand ends of the slots 22. In this position of the arms 24 the shoes 30 will be at the left hand end of the packing station 18.

The means for guiding the contents elements B is in the form of a track generally designated 36 mounted on the uprights 6. It has a horizontal entry portion 38 which extends somewhat to the rear of the uprights 6, followed by a downwardly inclined portion 40, preferably inclined more steeply than the portion 16 of the tray-guiding track 12, the portion 40 of the contents elements guiding track 36 terminating at a point 42 which is located above the packing station 18 and which, as here specifically disclosed, is positioned slightly forwardly of the midpoint of the tray A at the packing station 18.

Longitudinally spaced brackets 44 and 46 are mounted on either side of the track portion 40. Upwardly extending shafts 48 and 50 respectively are journaled therein, those shafts carrying at their upper ends sprocket wheels 52 and 54 respectively. A sprocket chain 56 is engaged around each pair of sprocket wheels 52 and 54, that chain 56 carrying a plurality of appropriately spaced outwardly extending separating elements 58. The separating elements 58 on the sprocket chains 56 on each side of the track portion 40 are positioned so as to oppose one another as the sprocket chains 56 move. In order to synchronize the movement of the sprocket chains 56, and thus keep the separating elements 58 on the two sprocket chains in registration, the right hand shafts 50 on each side of the track portion 40 are positively connected by means of gearing to horizontal shaft 60, which is journaled at the bottom of the brackets 46.

In the embodiment of FIGS. 1—6, one end of the horizontal shaft 60 carries a friction wheel 62 rotatably fixed thereto. A compression spring 64 is received on the shaft 60 and is maintained in compression by adjustable collar 66, that spring acting to press arm 68 against the wheel 62. The arm 68 is prevented from rotating in any appropriate manner, as by extension 70 which engages the upright 6. The friction effect of the arm 68 on the wheel 62 retards the rotation of the sprocket wheels 54, and hence retards the movement of the sprocket chains 56, the degree of that retardation being adjustable by fixing the longitudinal position of the collar 66 of the shaft 60, thereby varying compression of the spring 64.

In the embodiment of FIGS. 7—11, the brackets 44' and 46', mounted on opposite sides of the track portion 40, have journaled therein upwardly extending shafts 48' and 50', those shafts carrying at their upper ends sprocket wheels 52' and 54' respectively. A sprocket chain 56' is engaged around each pair of sprocket wheels 52' and 54', that chain 56' carrying a plurality of appropriately spaced outwardly extending separating elements 58'.

Instead of being fixed to the sprocket chain 56', as in the embodiment of FIGS. 1-6, in this embodiment the separating elements 58' are, as may best be seen from FIG. 10, pivotally mounted at 59 on brackets 61 which are fixed to the sprocket chain 56', the separating elements 58' being movable between outwardly extending positions shown at the upper end of FIG. 10 and a retracted position shown at the lower end of FIG. 10. The separating elements 58' are provided with a pair of separated rollers 63, 65 on their undersurface, and the brackets 44' and 46' carry, in a position where they may be engaged by the rollers 63 and 65, cam plates 67. These plates 67 are provided, at a point adjacent the laterally outer sides of the areas adjacent the sprocket wheels 54', with an entry nose 69 adapted to interpose itself between the rollers 63 and 65 as the sprocket chain moves. The portion 71 of the cam 67, which is then straddled by the rollers 63 and 65, serves to snap the separating elements 58' whose rollers 63, 65 are engaged therewith into outwardly projecting position, thus causing those elements 58' to enter between adjacent contents elements B at the area 80 (see FIG. 1). The portion 73 of the cam 67, which extends along the entire lateral inner length of the sprocket chain 56', positively ensures that the separating element 58' whose rollers 63, 65 are engaged therewith will be retained in its outwardly projecting position. When a given separating element 58' reaches the end 75 of the cam plate 67, its rollers 63, 65 move off from the cam plate 67, and the separating element 58' is then free to move to its retracted position, thereby releasing the contents element B which had previously been in contact therewith. The separating elements 58' on the sprocket chains 56' on each side of the track portion 40 are positioned so as to oppose one another as the sprocket chains 56' move, similarly to the arrangement shown in the previously described embodiment.

In order to synchronize and control the movement of the sprocket chains 56', and thus keep the separating elements 58' on the two sprocket chains in registration, the right hand shafts 50' on each side of the track portion 40 are connected by means of gearing to horizontal shaft 60', which is journaled in brackets 77 (see FIG. 8) mounted on the underside of the track portion 40. In this embodiment the sprocket chains 56' and their associated separating elements 58' are utilized to control and time the release of the contents elements B for tray packing purposes. To this end there is rigidly mounted on the shaft 60' a clutch disk 79 provided with an abutment 81 (see FIG. 9). A solenoid 83 is mounted on bracket 85 and its armature 87, normally extending up therefrom, as by means of a spring (not shown) but retractable into the solenoid 83 when the latter is energized, is pivotally connected at 89 to a link 91 the upper end of which is pivotally connected, at 93, to a crank arm 95 pivotally mounted at 97 on bracket 99 and carrying at its upper end cam roller 101, that roller being adapted to engage the periphery of the clutch disk 79. The crank arm 95 may be provided with an extension 103 to which tension spring 105 is connected, the spring 105 serving to bias the roller 101 into engagement with the clutch disk 79. For manual control purposes a finger 107 connected to the link 91 may extend out through slot 109 in the side wall 111 of the housing.

As the contents elements engage a given opposed pair of separating elements 58' and move them downwardly and to the left as viewed in FIG. 7, the clutch disk 79 is caused to rotate in a clockwise direction as viewed in FIG. 9. When the abutment 81 engages the roller 101 further rotation of the clutch disk 79 is prevented, and hence further movement of the sprocket chains 56' is prevented. This will occur when a pair of separating elements 58' are in their forward position shown in FIG. 7, the rollers 63, 65 on those separating elements still being engaged with the cam plates 67. Hence a predetermined individual group of contents elements B will be

positively retained at a preliminary loading station, which is approximately that shown for the first pair of contents elements B in FIGS. 1 and 2.

A normally open switch 113 is located on the tray track portion 16 and is provided with a feeler 115 adapted to be engaged by the leading tray A' when that tray is at the packing station 18. A plurality of normally open switches 117, 119, 121 and 123 are mounted on brackets 125 and 127 above the preliminary loading station for the contents elements B, and are provided respectively with feelers 129, 131, 133 and 135, those feelers adapted to engage with contents elements B when those elements reach the aforesaid preliminary loading station. If desired, an additional pair of normally open switches 137 and 139 may be mounted in any appropriate manner, is on bracket 141, above the horizontal entry portion 38 of the track 36, those switches being provided with feelers 143 and 145 respectively. The switches 113, 117, 119, 121, 123, 137 and 139 are adapted to be connected in series with the solenoid 83 and with any suitable electrical source 147. When a tray A' is in position at the packing station, when the preliminary loading station is filled with contents elements B, and when a supply of contents elements B is ready for movement into the preliminary packing station, all of the aforementioned switches will close, the solenoid 83 will be energized, the roller 101 will be pulled down out of engagement with the abutment 81 on the clutch disk 79, and that disk 79 will be permitted to rotate. The weight of the contents elements B in the packing station (probably augmented by the feeding pressure of the packing elements B on the entry portion 38) will then cause the sprocket chains 36' to move, the leading separating elements 58' will move off the ends 75 of the cam plates 67, and the group of contents elements B will be released for gravity-impelled movement into the tray A'. The leading contents elements B in the feeding line will engage the next pair of separating elements 58', thus causing the sprocket chains 56' to continue to move. Escape of the first mentioned group of contents elements B from the preliminary packing station, and movement of the tray A' from the loading station, will cause the switches associated therewith to open, the solenoid 83 will be de-energized, the roller 101 will be resiliently urged into engagement with the periphery of the clutch disk 79, and rotation of that disk, and hence movement of the sprocket chains 56', will be arrested after the clutch disk 79 has made a complete rotation. The new group of contents elements B will thus be retained in the preliminary packing station until a new tray A has moved into the loading station 18 and closed the switch 113, after which the cycle will be repeated.

Struts 72 may be connected between the upper portions of the uprights 6 and 8 and to the termination point 42 of the contents elements guiding means 36, thereby adding structural rigidity to the assembly.

The apparatus as thus described is adapted to be used in conjunction with a pair of external conveyors 74 and 76 of any appropriate design for feeding trays A and contents elements B respectively to the apparatus. Only the ends of those conveyors are shown in FIGS. 1 and 2, those ends being aligned with the track entry portions 14 and 38 respectively so that trays A and contents elements B, as they are fed along the conveyors 74 and 76 respectively, will enter and slide along the tray guiding means 12 and the contents elements guiding means 36 respectively.

The operation of the apparatus of the present invention, as shown in FIGS. 1-6, is as follows: A substantially continuous line of trays A will be fed along the conveyor 74 and along the tray guiding means 12 until the leading tray, designated A', reaches the packing station 18. Its front wall 78 will then engage the shoes 30 carried by the arms 24, and the force of the spring 32 will be such as to retain the leading tray A' at the packing

station 18, in its preferably downwardly inclined position as shown, the succeeding trays A backing up therefrom, the trays A on the conveyor 74 slipping relative thereto. Thus the line of trays A is stationary, and will remain stationary for so long as contents elements B do not enter the leading tray A'.

A supply of contents elements B is fed along the external conveyor 76 until the leading elements enter and slide over the guiding means 36. While it is not essential to the operation of the present device that the contents elements B be supplied to the apparatus in a continuous line, the apparatus of the present invention is capable of accommodating such continuous line feeding, as will become apparent hereinafter, this being an important advantage of the construction here disclosed. The tips of a pair of opposed separating elements 58 carried by the sprocket chains 56 extend into the path of the leading pair of contents elements B and are engaged by the front edges of those leading contents elements B as those elements move onto the downwardly inclined track portion 40. The contents elements B, both the leading ones and those behind it which have reached the downwardly inclined track portion 40, will tend to slide down that track portion under the influence of gravity. The speed of their movement down the track 40 will be controlled by the frictional drag exerted between the elements 62 and 68. When a predetermined number of contents elements B, constituting a group of such elements B capable of filling a tray A, have reached the downwardly inclined track portion 40 the next pair of separating elements 58 will engage behind them, thus separating them from the succeeding contents elements B, those separating elements 58 also being engaged by the leading contents elements of the next group, so as to retard their rate of descent down the inclined track portion 40. As may be seen particularly from FIGS. 1 and 2, the pair of separating elements 58 adapted to be interposed between the first group of contents elements B and the next succeeding group are adapted to enter between those groups in line with the point where the substantially horizontal track portion 38 joins the downwardly inclined track portion 40. The different inclinations of the contents elements B immediately before and immediately after that point produce a gap therebetween, identified by the reference numeral 80 in FIGS. 1 and 2, and it is into this gap 80 that the tips of the separating elements 58 in question enter.

The group of contents elements B contained between the appropriate separating elements 58 slide down the track 40 until the forward separating elements 58 reach the end of the inner length of the sprocket chains 56 (see FIG. 2). Thereafter those leading separating elements 58 swing away, and the group of contents elements B then slide freely along the track portion 40 to the end 42 thereof. As may be seen from FIG. 4, the leading contents elements B fall freely from the end 42 of the track element 40 into the leading tray A', engaging the front wall 42 thereof. The force exerted by these contents elements B on the leading tray A', which force is derived in part from the weight of the contents elements B and in part from their momentum, causes the arms 24 to pivot in a counter-clockwise direction, against the action of the springs 32, thus releasing the leading tray A' for movement onto the tray track portion 20. As the tray A' thus moves (see FIG. 5), it passes over the connecting point 82 between the tray track portions 16 and 20, the tray then pivoting in a counter-clockwise direction by virtue of the weight of the leading contents elements B, which are now properly seated against the front wall 42 of the tray. The rear end 84 of the tray A' thus moves up to meet the last contents elements B adapted to enter that tray, thereby ensuring that all of the contents elements B will enter and be properly seated in the tray A' even when they make a snug fit therein, as is desirable.

The weight of the tray A' and the contents elements B which it contains is sufficient to cause the arms 24 to

move completely out of the way, the shoes 30 thereof passing through the enlarged slot portions 22a, and the filled tray slides to the exit point 22, where it may be grasped by an operator and removed, or, if desired, the filled trays could slide onto another conveyor which would take it to any desired location.

As the leading tray A', now filled, moves from the packing station 18 the tray conveyor 74 will cause the line of trays A to move ahead. The arms 24 will snap back to their initial position at the right hand ends of the slots 22 before the next to be filled tray A reaches the packing station 18, and therefore will arrest movement of the line of trays A when the next tray is in position to be filled, said next tray thus becoming the leading tray A' for the next succeeding filling cycle. That tray will remain in proper position in the packing station until the next group of contents elements B falls therinto. Filling cycles will succeed one another for as long, and as rapidly, as contents elements B are fed to the apparatus.

The fact that the shoes 30 engage the front wall 42 of the leading tray A' at the packing station 18 has several desirable results. Such engagement not only retains the tray A' at the packing station until it starts to be packed, but also reinforces the front tray wall 42 against the impact of the contents elements B as they fall therinto, thus preventing damage to the tray A', and also serves to cushion the fall of the contents elements B, thus preventing damage thereto. This last is a particularly important factor when the contents elements B comprise glass bottles or the like.

It will be noted that the operation of the apparatus here disclosed is inherently dependent upon the supply of contents elements B thereto. When that supply stops, packing stops, and the leading tray A' remains in position until the supply of contents elements B is re-established.

Once the apparatus is set up, the only adjustment which need be made is the compression of the spring 64 which controls the retardation of the gravity slide of the contents elements B along the track portion 40. The extent of this adjustment will be dependent upon the weight of the contents elements B being packed at any given time and the nature of the containers involved—whether they are fragile or not.

In the embodiment of FIGS. 7-11 loading of the contents B into the tray A' is automatically controlled in a foolproof manner, so that such loading will occur only at the proper time and when the contents elements B and the tray A' are in proper position therefor. Moreover, the speed with which the contents elements B will enter the tray A' is controlled because the contents elements B will always be released for falling into the tray A' after they have first come to a full stop. A most significant feature of this embodiment is the absolute automation involved, the mechanism operating only on the command of the contents elements B and the trays A themselves. A continuous and proper supply of both allows continuous operation; an interruption of the supply of either automatically causes a discontinuance of operation.

The apparatus is simple and inexpensive, positive and rapid in operation, does not need its own power source, and takes up but a minimal amount of space. Nevertheless it functions as efficiently and effectively as more complicated machines costing many times as much, even when glass bottles are being packed, and without damage to the contents elements.

While but a single embodiment of the present invention has been here specifically disclosed it will be apparent that many variations may be made therein, all within the scope of the instant invention as defined in the following claims.

I claim:

1. Tray packing means comprising means for supporting a tray at a packing station in a forwardly and downwardly inclined packing position, means for guiding said tray from said station, force-sensitive means active on

said tray for normally retaining it at said packing station and releasing it to move from said packing station when the force which it exerts on said means exceeds a predetermined value, means located generally above said packing station for guiding a group of contents elements along a forwardly and downwardly inclined path to a point in the vicinity of and above said tray, whereby said contents elements fall freely from said contents-guiding means into said tray while moving in a direction which is substantially a continuation of that of said contents-guiding means, said force-sensitive means being active to release said tray from said packing station when said contents elements fall into said tray and exert a force on said means.

2. In the tray packing means of claim 1, means active on said tray as it starts to move from but is still partially within said packing station so as to cause the trailing end of said tray to move up toward said contents elements.

3. Tray packing means comprising means for supporting a tray at a packing station in a forwardly and downwardly inclined packing position, means for guiding said tray from said station, force-sensitive means active on said tray for normally retaining it at said packing station and releasing it to move from said packing station when the force which it exerts on said means exceeds a predetermined value, means located generally above said packing station for guiding a group of contents elements along a forwardly and downwardly inclined path steeper than the inclination of said tray at said packing station to a point in the vicinity of and above said tray, whereby said contents elements fall freely from said contents-guiding means into said tray while moving in a direction which is substantially a continuation of that of said contents-guiding means, said force-sensitive means being active to release said tray from said packing station when said contents elements fall into said tray and exert a force on said means.

4. Tray packing means comprising means for supporting a tray at a packing station in a forwardly and downwardly inclined packing position, means for guiding said tray from said station, force-sensitive means active on said tray for normally retaining it at said packing station and releasing it to move from said packing station when the force which it exerts on said means exceeds a predetermined value, means located generally above said packing station for guiding a group of contents elements along a forwardly and downwardly inclined path to a point in the vicinity of and above said tray, whereby said contents elements fall freely from said contents guiding means into said tray while moving in a direction which is substantially a continuation of that of said contents-guiding means, said contents elements being substantially gravity-impelled while moving along said guiding means therefor, said force-sensitive means being active to release said tray from said packing station when said contents elements fall into said tray and exert a force on said means.

5. Tray packing means comprising means for supporting a tray at a packing station in a forwardly and downwardly inclined packing position, means for guiding said tray from said station, force-sensitive means active on said tray for normally retaining it at said packing station and releasing it to move from said packing station when the force which it exerts on said means exceeds a predetermined value, means located generally above said packing station for guiding a group of contents elements along a forwardly and downwardly inclined path to a point in the vicinity of and above said tray, whereby said contents elements fall freely from said contents-guiding means into said tray while moving in a direction which is substantially a continuation of that of said contents-guiding means, said contents elements being substantially gravity-impelled while moving along said guiding means therefor, and means active on said

contents elements while they are on the forwardly and downwardly inclined guiding means therefor to control their movement therealong, said force-sensitive means being active to release said tray from said packing station when said contents elements fall into said tray and exert a force on said means.

6. In the tray packing means of claim 5, means active on said tray as it starts to move from but is still partially within said packing station so as to cause the trailing end of said tray to move up toward said contents elements.

7. The tray packing means of claim 6, in which said movement controlling means for said contents elements is effective selectively to hold said contents elements stationary and to release said contents elements for movement along the guiding means therefor.

8. The tray packing means of claim 6, in which said movement controlling means for said contents elements is active on said elements as they move along said guiding means therefor to slow down but not stop their speed of movement.

9. The tray packing means of claim 5, in which said movement controlling means for said contents elements is effective selectively to hold said contents elements stationary and to release said contents elements for movement along the guiding means therefor.

10. The tray packing means of claim 5, in which said movement controlling means for said contents elements is active on said elements as they move along said guiding means therefor to slow down but not stop their speed of movement.

11. Tray packing means comprising means for supporting a tray at a packing station in a forwardly and downwardly inclined packing position, means for guiding said tray from said station, force-sensitive means active on said tray for normally retaining it at said packing station and releasing it to move from said packing station when the force which it exerts on said means exceeds a predetermined value, means located generally above said packing station for guiding a group of contents elements along a forwardly and downwardly inclined path steeper than the inclination of said tray at said packing station to a point in the vicinity of and above said tray, whereby said contents elements fall freely from said contents guiding means into said tray while moving in a direction which is substantially a continuation of that of said contents-guiding means, said contents elements being substantially gravity-impelled while moving along said guiding means therefor, said force-sensitive means being active to release said tray from said packing station when said contents elements fall into said tray and exert a force on said means.

12. Tray packing means comprising means for supporting a tray at a packing station in a forwardly and downwardly inclined packing position, means for guiding said tray from said station, force-sensitive means active on said tray for normally retaining it at said packing station and releasing it to move from said packing station when the force which it exerts on said means exceeds a predetermined value, means located generally above said packing station for guiding a group of contents elements along a forwardly and downwardly inclined path steeper than the inclination of said tray at said packing station to a point in the vicinity of and above said tray, whereby said contents elements fall freely from said contents guiding means into said tray while moving in a direction which is substantially a continuation of that of said contents-guiding means, said contents elements being substantially gravity-impelled while moving along said guiding means therefor, and means active on said contents elements while they are on the forwardly and downwardly inclined guiding means therefor to control their movement therealong, said force-sensitive means being active to release said tray from said packing station when said contents elements fall into said tray and exert a force on said means.

13. In the tray packing means of claim 12, means active on said tray as it starts to move from but is still partially

within said packing station so as to cause the trailing end of said tray to move up toward said contents elements.

14. The tray packing means of claim 13, in which said movement controlling means for said contents elements is effective selectively to hold said contents elements stationary and to release said contents elements for movement along the guiding means therefor.

15. The tray packing means of claim 13, in which said movement controlling means for said contents elements is active on said elements as they move along said guiding means therefor to slow down but not stop their speed of movement.

16. The tray packing means of claim 12, in which said movement controlling means for said contents elements is effective selectively to hold said contents elements stationary and to release said contents elements for movement along the guiding means therefor.

17. The tray packing means of claim 12, in which said movement controlling means for said contents elements is active on said elements as they move along said guiding means therefor to slow down but not stop their speed of movement.

18. Tray packing means comprising means for guiding trays to a packing station and supporting the leading tray in a packing position, means at said packing station for engaging and releasably retaining said leading tray in said packing position, means located generally above said packing station for guiding a substantially continuous supply of contents elements toward said packing station, means associated with said contents-guiding means for separating said contents elements into individual element groups corresponding to individual trays, means for causing said groups to move on said contents-guiding means along a forwardly and downwardly inclined path and then to pass freely from said contents-guiding means into said leading tray, and means for guiding said filled tray away from said packing station.

19. In the tray packing means of claim 18, means active on said tray as it starts to move from but is still partially within said packing station so as to cause the trailing end of said tray to move up toward said contents elements.

20. The tray packing means of claim 18, in which said contents-guiding means comprises first and second sections which meet at an angle, said second section defining the part of said guiding means over which said contents elements move downwardly, said group separating means entering between adjacent contents elements substantially at the meeting point between said first and second sections, thereby to separate said elements into groups.

21. Tray packing means comprising means for guiding trays to a packing station and supporting the leading tray in a packing position, means at said packing station for engaging the front wall of and releasably retaining said leading tray in said packing position, means located generally above said packing station for guiding a substantially continuous supply of contents elements toward said packing station, means associated with said contents-guiding means for separating said contents elements into individual element groups corresponding to individual trays, means for causing said groups to move on said contents-guiding means along a forwardly and downwardly inclined path and then to pass freely from said contents-guiding means into said leading tray so that said leading contents elements engage said front wall of said leading tray, and means for guiding said filled tray away from said packing station.

22. The tray packing means of claim 21, in which said contents-guiding means comprises first and second sections which meet at an angle, said second section defining the part of said guiding means over which said contents elements move downwardly, said group separating means entering between adjacent contents elements substantially at the meeting point between said first and second sections, thereby to separate said elements into groups.

23. Tray packing means comprising means for guiding

trays to a packing station and supporting the leading tray in a forwardly and downwardly inclined packing position, means at said packing station for engaging and releasably retaining said leading tray in said packing position, means located generally above said packing station for guiding a substantially continuous supply of contents elements toward said packing station, means associated with said contents-guiding means for separating said contents elements into individual element groups corresponding to individual trays, means for causing said groups to move on said contents-guiding means along a forwardly and downwardly inclined path and then to pass freely from said contents-guiding means into said leading tray, and means for guiding said filled tray away from said packing station.

24. Tray packing means comprising means for guiding trays to a packing station and supporting the leading tray in a forwardly and downwardly inclined packing position, means at said packing station for engaging and releasably retaining said leading tray in said packing position, means located generally above said packing station for guiding a substantially continuous supply of contents elements toward said packing station, means associated with said contents-guiding means for separating said contents elements into individual element groups corresponding to individual trays, means for causing said groups to move on said contents-guiding means along a forwardly and downwardly inclined path steeper than the inclination of said leading tray and then to pass freely from said contents-guiding means into said leading tray, and means for guiding said filled tray away from said packing station.

25. In the tray packing means of claim 24, means active on said tray as it starts to move from but is still partially within said packing station so as to cause the trailing end of said tray to move up toward said contents elements.

26. Tray packing means comprising means for guiding trays to a packing station and supporting the leading tray in a packing position, means at said packing station for engaging and releasably retaining said leading tray in said packing position, means located generally above said packing station for guiding a substantially continuous supply of contents elements toward said packing station, means associated with said contents-guiding means for separating said contents elements into individual element groups corresponding to individual trays, means for causing said groups to move under the influence of gravity on said contents-guiding means along a forwardly and downwardly inclined path and then to pass freely from said contents-guiding means into said leading tray, and means for guiding said filled tray away from said packing station.

27. In the tray packing means of claim 26, means active on said tray as it starts to move from but is still partially within said packing station so as to cause the trailing end of said tray to move up toward and said contents elements.

28. The tray packing means of claim 26, in which said contents-guiding means comprises first and second sections which meet at an angle, said second section defining the part of said guiding means over which said contents elements move downwardly, said group separating means entering between adjacent contents elements substantially at the meeting point between said first and second sections, thereby to separate said elements into groups.

29. Tray packing means comprising means for guiding trays to a packing station and supporting the leading tray in a packing position, means at said packing station for engaging and releasably retaining said leading tray in said packing position, means located generally above said packing station for guiding a substantially continuous supply of contents elements toward said packing station, means associated with said contents-guiding means for separating said contents elements into individual element groups corresponding to individual trays, means for causing said

groups to move under the influence of gravity on said contents-guiding means along a forwardly and downwardly inclined path and then to pass freely from said contents-guiding means into said leading tray, and means active on said contents elements as they move downwardly under the influence of gravity to control their velocity.

30. The tray packing means of claim 29, in which said contents-guiding means comprises first and second sections which meet at an angle, said second section defining the part of said guiding means over which said contents elements move downwardly, said group separating means entering between adjacent contents elements substantially at the meeting point between said first and second sections, thereby to separate said elements into groups.

31. The tray packing means of claim 30, in which said velocity controlling means is effective to hold an individual group of said contents elements stationary at a preliminary station and then release them for gravity-im-pelled downward movement.

32. The tray packing means of claim 30, in which said velocity controlling means is effective to hold an individual group of said contents elements stationary at a preliminary station and then release them for gravity-im-pelled downward movement, control means operatively connected to said velocity controlling means and effective, when actuated, to cause the release of said group of contents elements, said control means being sensitive to the presence of a tray in said packing station and contents elements in said preliminary station and actuating said control means in accordance therewith.

33. The tray packing means of claim 30, in which said velocity controlling means is effective to hold an individual group of said contents elements stationary at a preliminary station and then release them for gravity-im-pelled downward movement, control means operatively connected to said velocity controlling means and effective, when actuated, to cause the release of said group of contents elements, said control means being sensitive to the presence of a tray in said packing station and contents elements in said preliminary station and in flow advance of said preliminary station and actuating said control means in accordance therewith.

34. The tray packing means of claim 29, in which said velocity controlling means is effective to hold an individual group of said contents elements stationary at a preliminary station and then release them for gravity-im-pelled downward movement.

35. The tray packing means of claim 29, in which said velocity controlling means is effective to hold an individual group of said contents elements stationary at a preliminary station and then release them for gravity-im-pelled downward movement, control means operatively connected to said velocity controlling means and effective, when actuated, to cause the release of said group of contents elements, said control means being sensitive to the presence of a tray in said packing station and contents elements in said preliminary station and actuating said control means in accordance therewith.

36. The tray packing means of claim 29, in which said velocity controlling means is effective to hold an individual group of said contents elements stationary at a preliminary station and then release them for gravity-im-pelled downward movement, control means operatively connected to said velocity controlling means and effective, when actuated, to cause the release of said group of contents elements, said control means being sensitive to the presence of a tray in said packing station and contents elements in said preliminary station and in flow advance of said preliminary station and actuating said control means in accordance therewith.

37. Tray packing means comprising means for guiding trays to a packing station and supporting the leading tray in a forwardly and downwardly inclined packing position, means at said packing station for engaging the front wall of and releasably retaining said leading tray in said

packing position, means located generally above said packing station for guiding a substantially continuous supply of contents elements toward said packing station, means associated with said contents-guiding means for separating said contents elements into individual element groups corresponding to individual trays, means for causing said groups to move under the influence of gravity on said contents-guiding means along a forwardly and downwardly inclined path steeper than the inclination of said leading tray and then to pass freely from said contents-guiding means into said leading tray, the leading ones of said contents elements engaging said front wall of said leading tray and said contents elements causing said leading tray to move out of said packing station against the action of said tray engaging and retaining means, and means for guiding said filled tray away from said packing station.

38. The tray packing means of claim 37, in which said contents-guiding means comprises first and second sections which meet at an angle, said second section defining the part of said guiding means over which said contents elements move downwardly, said group separating means entering between adjacent contents elements substantially at the meeting point between said first and second sections, thereby to separate said elements into groups.

39. In the tray packing means of claim 38, means active on said tray as it starts to move from but is still partially within said packing station so as to cause the trailing end of said tray to move up toward said contents elements.

40. In the tray packing means of claim 37, means active on said contents elements as they move downwardly under the influence of gravity to control their velocity.

41. The tray packing means of claim 40, in which said velocity controlling means is effective to hold an individual group of said contents elements stationary at a preliminary station and then release them for gravity-im-pelled downward movement..

42. The tray packing means of claim 40, in which said velocity controlling means is effective to hold an individual group of said contents elements stationary at a preliminary station and then release them for gravity-im-pelled downward movement, control means operatively connected to said velocity controlling means and effective, when actuated, to cause the release of said group of contents elements, said control means being sensitive to the presence of a tray in said packing station and contents elements in said preliminary station and actuating said control means in accordance therewith.

43. The tray packing means of claim 40, in which said velocity controlling means is effective to hold an individual group of said contents elements stationary at a preliminary station and then release them for gravity-im-pelled downward movement, control means operatively connected to said velocity controlling means and effective, when actuated, to cause the release of said group of contents elements, said control means being sensitive to the presence of a tray in said packing station and contents elements in said preliminary station and in flow advance of said preliminary station and actuating said control means in accordance therewith.

44. In the tray packing means of claim 1, means active on said contents elements as they move along said forwardly and downwardly inclined path to control their velocity therealong.

45. The tray packing means of claim 44, in which said velocity controlling means is effective to hold an individual group of said contents elements stationary at a preliminary station and then release them for gravity-im-pelled downward movement.

46. The tray packing means of claim 44, in which said velocity controlling means is effective to hold an individual group of said contents elements stationary at a preliminary station and then release them for gravity-im-

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pelled downward movement, control means operatively connected to said velocity controlling means and effective, when actuated, to cause the release of said group of contents elements, said control means being sensitive to the presence of a tray in said packing station and contents elements in said preliminary station and actuating said control means in accordance therewith.

47. The tray packing means of claim 44, in which said velocity controlling means is effective to hold an individual group of said contents elements stationary at a preliminary station and then release them for gravity-im-
pelled downward movement, control means operatively connected to said velocity controlling means and effective, when actuated, to cause the release of said group of con-

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tents elements, said control means being sensitive to the presence of a tray in said packing station and contents elements in said preliminary station and in flow advance of said preliminary station and actuating said control means in accordance therewith.

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