

March 10, 1953

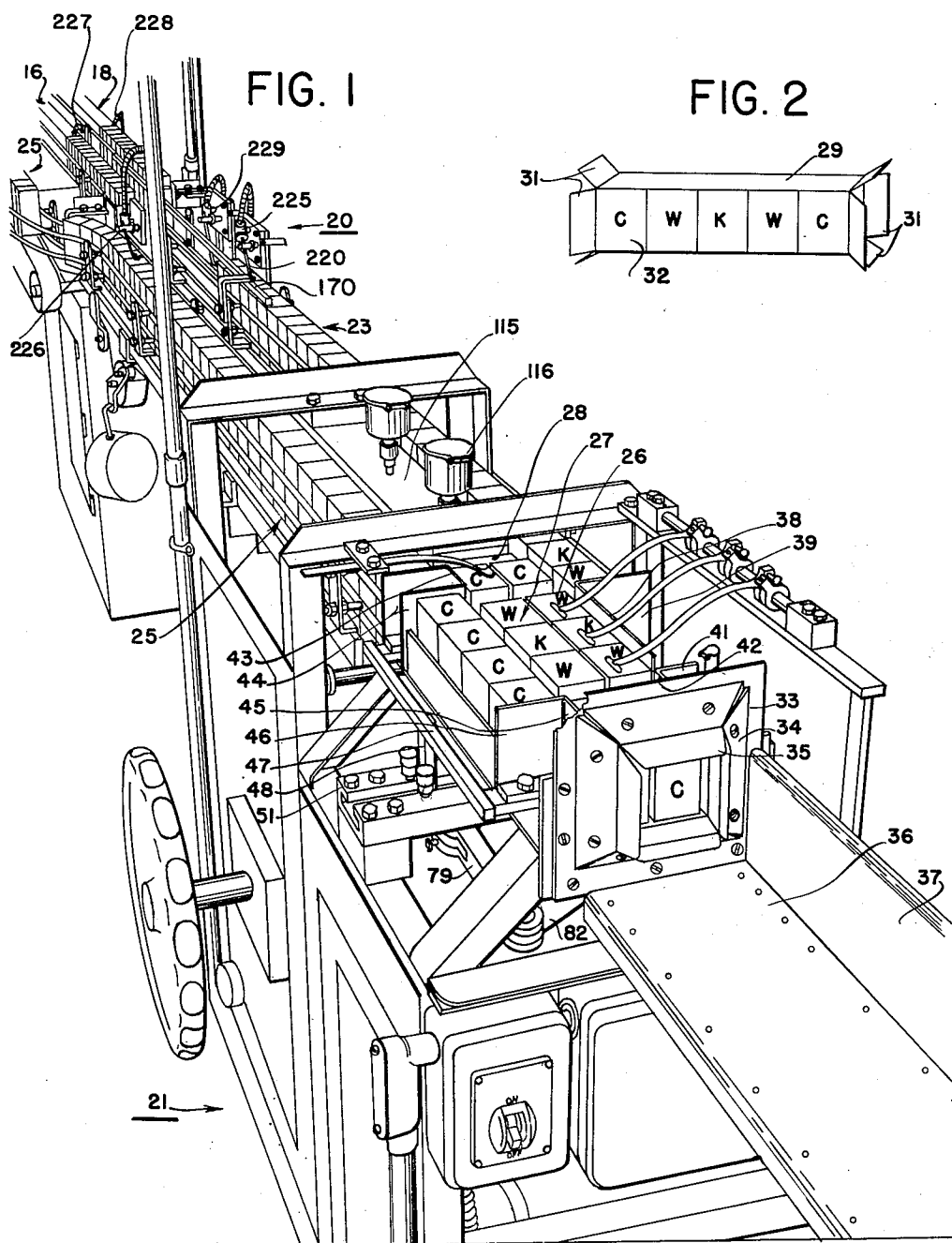
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2,630,951

SELECTIVE ASSEMBLER AND CARTON FILLER

Filed March 5, 1947

5 Sheets-Sheet 1



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FIG. 3

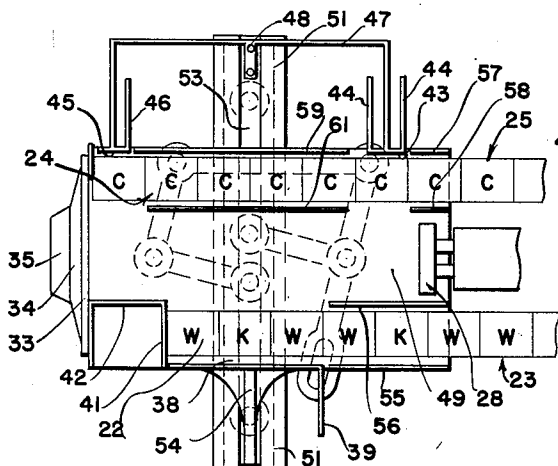


FIG. 4

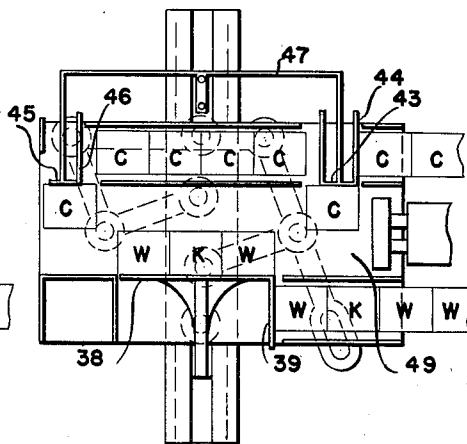


FIG. 5

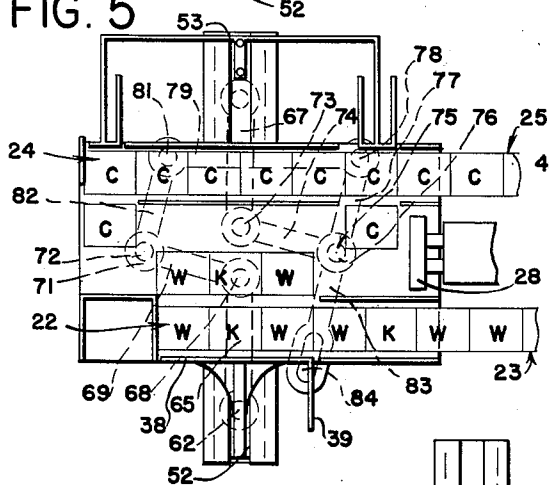


FIG. 6

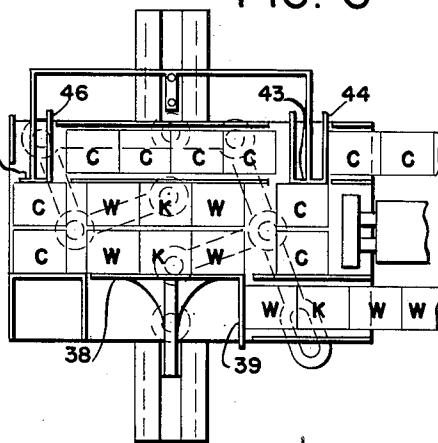
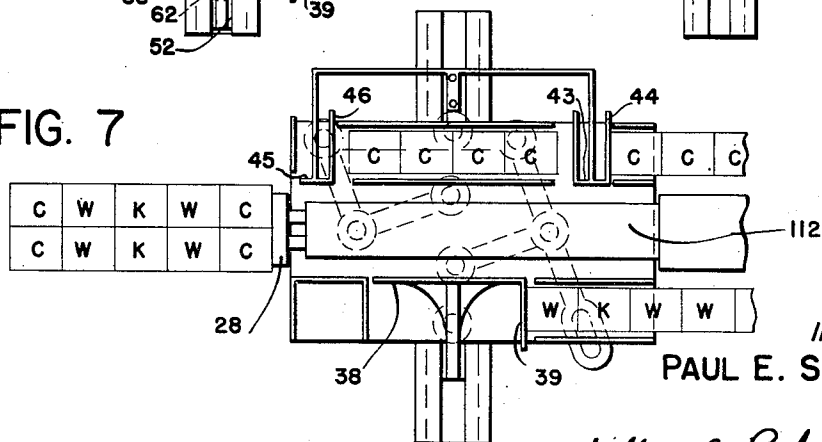


FIG. 7



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FIG. 9

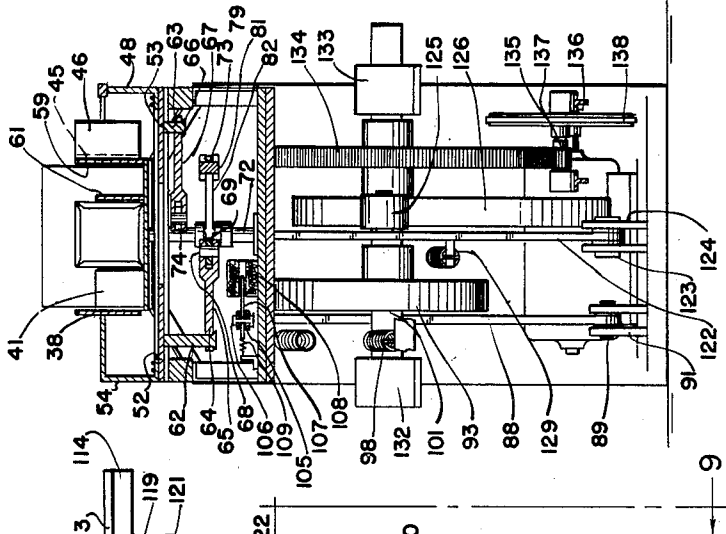
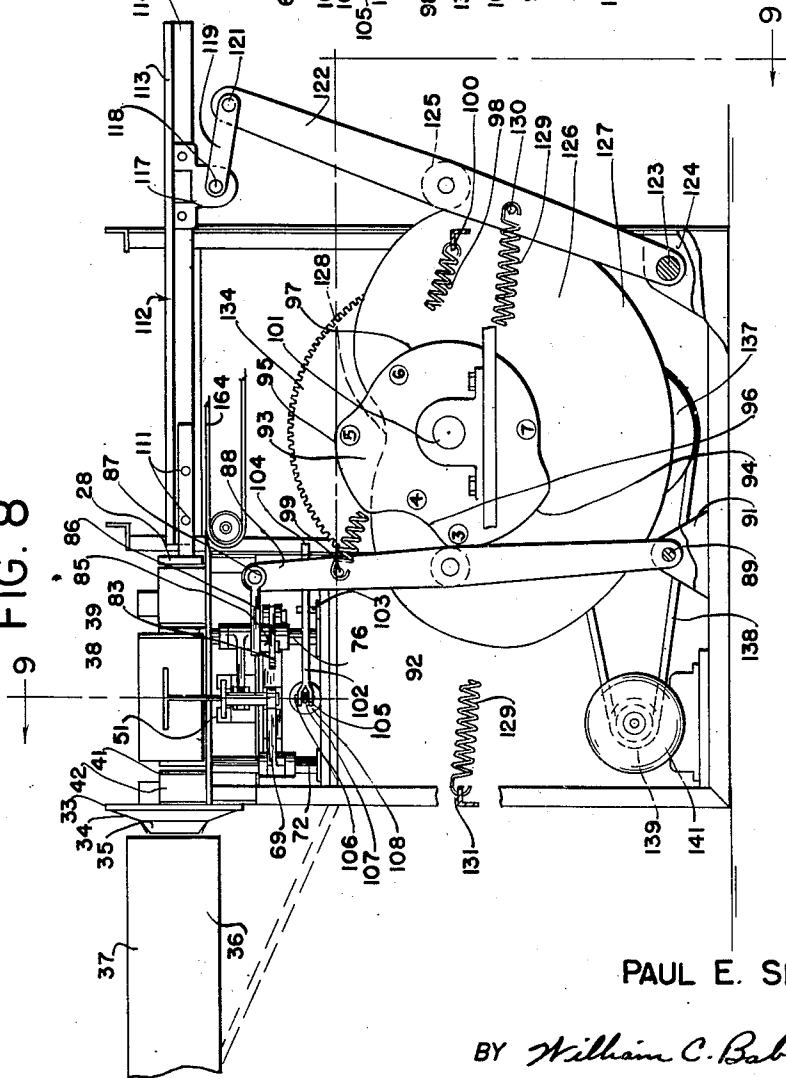


FIG. 8



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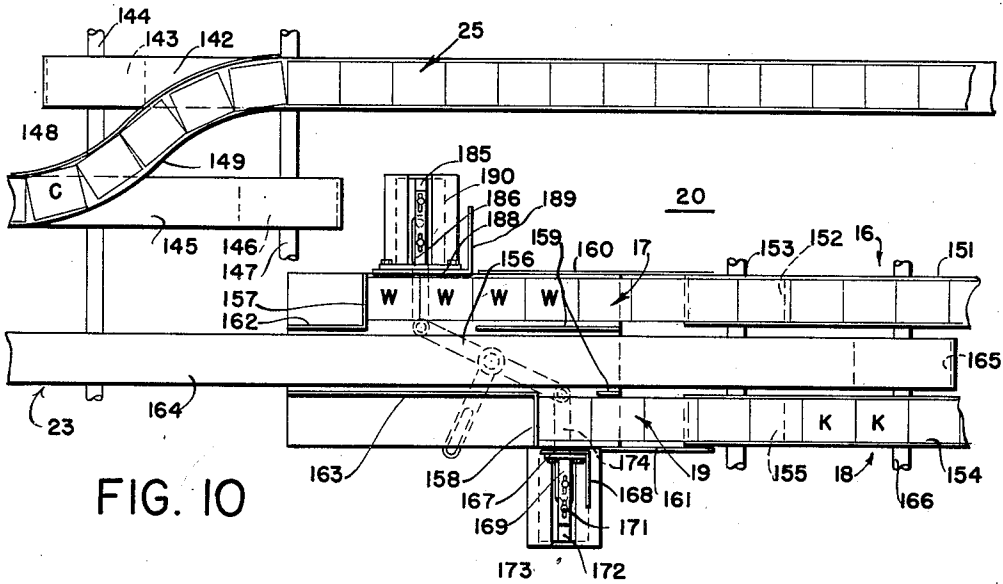


FIG. 10

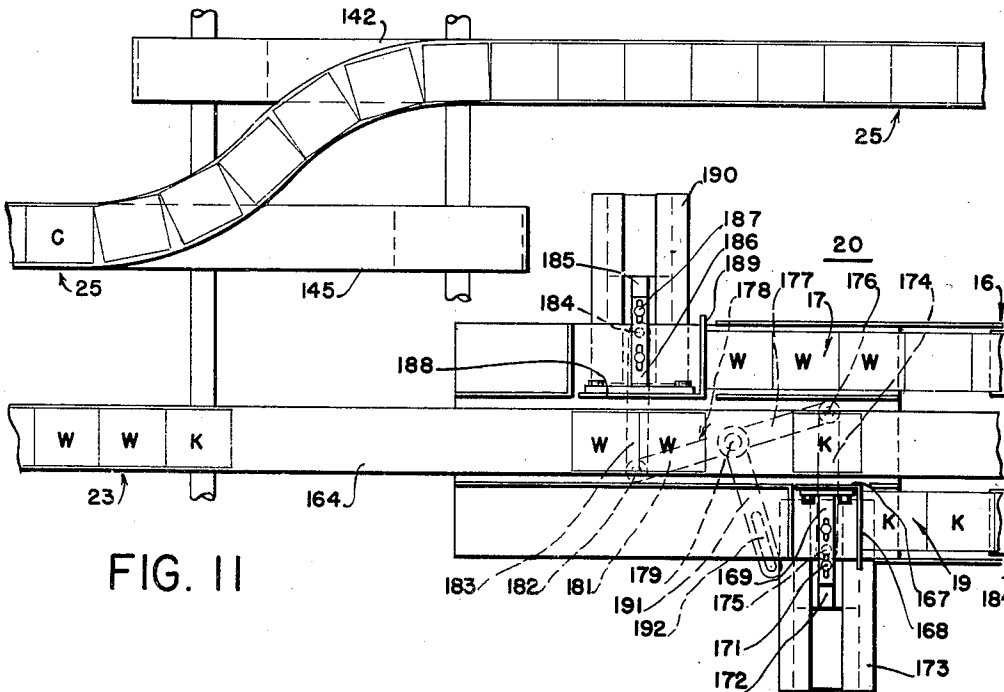


FIG. 11

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FIG. 13

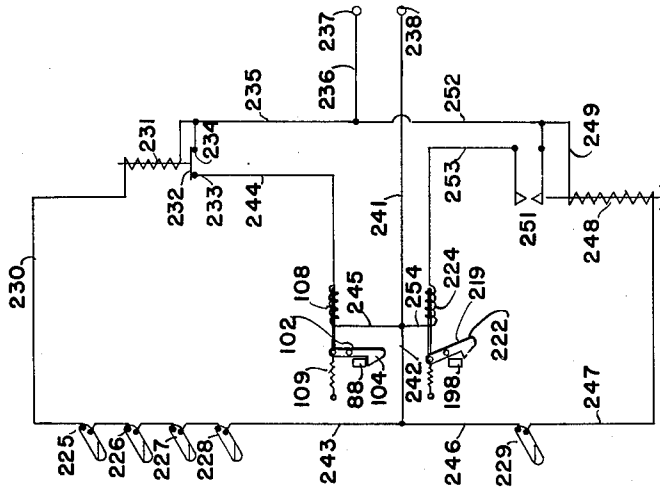
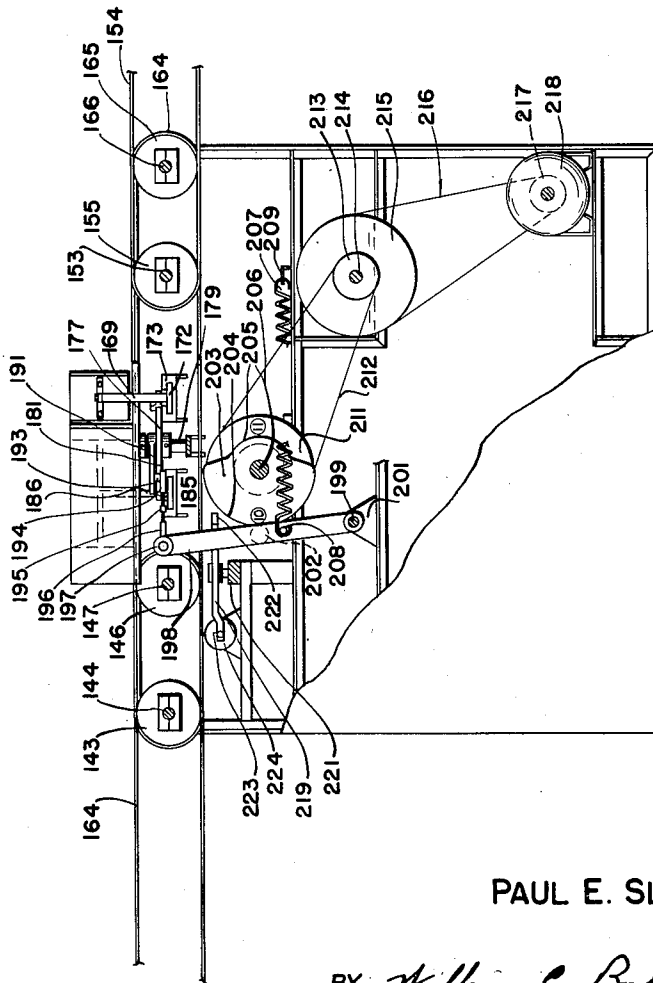


FIG. 12



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UNITED STATES PATENT OFFICE

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SELECTIVE ASSEMBLER AND CARTON FILLER

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Application March 5, 1947, Serial No. 732,554

25 Claims. (Cl. 226—14)

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This invention relates to an apparatus for filling cartons with individual package units and more particularly to such an apparatus in which the individual package units are of different kinds and are arranged within the carton in a predetermined sequence or relative position.

Various devices are known for filling cartons with a plurality of individual packages. Such packages may consist of cans, bottles, small boxes, or the like. Such devices, however, have been designed for use with packages of the same kind and there has been no particular problem of selection or arrangement of different kinds of unit packages within the carton.

It is an object of the present invention to provide a selective assembler and carton filler which can assemble unit packages of different products and can load said packages into a larger carton with the individual packages in a given predetermined position and sequence relative to each other.

It is a further object of the invention to provide an apparatus of this type for filling a carton with a plurality of rows or layers of individual packages, each of said rows having packages of different products arranged in predetermined relative position.

Still another object of the invention is to provide a device which can arrange unit packages of two or more products into predetermined relationship to each other and can then load said packages into a large carton, such as a shipping carton or retail display carton.

It is a further object to provide apparatus for filling a carton which bears external indicia or advertising showing the position of packages of different types therein, so that the packages placed in the carton will be arranged therein in the same relative positions shown by the external indicia on the carton.

Other objects and advantages of this invention will be apparent from the following specification, in which one embodiment of the present invention has been shown.

With reference to the drawings, wherein like reference characters indicate like parts,

Figure 1 is a perspective view of a selective assembler and carton filler embodying the features of my invention;

Fig. 2 is a perspective view of a carton to be filled by the device of Fig. 1;

Fig. 3 is a top partial view of the final assembler and carton filler of Fig. 1 with the parts in inactive position;

Fig. 4 is a view similar to Fig. 3 showing the

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transfer mechanism in its first cycle of operation with half of the desired cartons transferred into the assembly station preparatory to filling the carton;

Fig. 5 is a view similar to Fig. 3 with the transfer mechanism returned to its original position;

Fig. 6 is a similar view showing the second operating cycle of the transfer mechanism with the remainder of the desired packages in position for filling;

Fig. 7 is a similar view showing the operation of the loading plunger for filling a carton;

Fig. 8 is a side elevation of the final assembly station with certain parts broken away to show the operating mechanism for the transfer means and filling plunger;

Fig. 9 is an end view, partly in section, taken on the line 9—9 of Fig. 8;

Fig. 10 is a top view of the preliminary assembly station of the device of Fig. 1 showing the transfer mechanism in its first position preparatory to assembly of the desired packages from the individual conveyers;

Fig. 11 is a view similar to Fig. 10 with the transfer mechanism in its second position and the desired packages shifted from the initial conveyers to the intermediate conveyor;

Fig. 12 is a side elevation of the preliminary assembly station of Figs. 1, 10, and 11 with certain parts broken away to show the driving mechanism which operates the transfer means; and

Fig. 13 is a circuit diagram showing the electrical connections for automatically stopping the operations at the respective stations under certain conditions.

As shown in Fig. 1 the apparatus according to the present invention comprises a final assembly and filling station 21, at which selected unit packages containing cereal or other desired products are arranged in predetermined sequence and position and are then moved by suitable plunger mechanism into the open end of a larger carton.

The device may also include a preliminary assembly station, designated generally as 20, at which unit packages of two different products may be initially combined for transportation by an intermediate conveyor, designated generally as 23, to the final assembly station. As shown in the figure, there are initially three conveyor lines, designated generally as 16, 18, and 25, each of which carries packages of a different product, designated in this case by letters W, K, and C respectively (see Fig. 10). Packages W and K on conveyers 16 and 18 are combined at the preliminary assembly station 20 in a desired pre-

determined order and are subsequently removed from this station by an intermediate conveyer, designated generally as 23, for transportation to the final assembler and carton filler 21.

It will be readily understood that the use of additional pre-assembly stations would make possible the combination in pre-arranged order of more than three separate products. Similarly, with the pre-assembly station omitted, two products could be combined as desired at the final station. For the sake of clarity, however, this description has been limited to an operation in which three different products are handled, as shown. The operation of the final assembler and carton filler will first be described.

Final assembler and carton filler

As shown in Fig. 1, conveyers 23 and 25, which may be of any desired standard construction, are employed to feed packages in two approximately parallel lines, one at each side of the final assembly station. In the device illustrated, belt conveyers have been shown. Said conveyers run continuously and are sufficiently smooth for sliding engagement with the bottoms of the packages after the packages have accumulated at the final station. Thus, as individual packages are removed from the final station and inserted into the carton, the belt conveyers will immediately advance the remaining unit packages, so that the supply at the final station will be promptly replenished.

As shown in Fig. 1 the desired cartons are moved laterally from the positions in which they are delivered by conveyers 22 and 24 to a central assembly station or supporting platform. In Fig. 1 this transfer operation has been completed so that there are two rows (26 and 27) of cartons in position on this central platform and ready for ejection into the final shipping or display carton.

A typical final carton is shown in Fig. 2 and is designated as 29. Carton 29 has end flaps 31 which are left open at the ends. One or more sides of the carton 32 may be provided with external lithographing, printing or other indicia to designate the particular products in the unit packages within the carton. As shown in Fig. 2 the letters C, W, and K have been used to designate not only the nature of the products, but also the relative position of the corresponding unit packages to be placed within that carton.

One open end of carton 29 is designed to be placed against the end plate or guide 33 of the final assembly station. This end plate 33 may be provided with sloping projections 34, against which the open flaps 31 of the carton may be placed. To facilitate the positioning of the carton, flexible guide flaps 35 are provided and are of such dimensions that they may project slightly into the carton 29 and serve to guide the unit packages smoothly into the open end of the carton during the filling operation. A supporting table 36 and side plate 37 are also provided to assist in positioning the carton. This carton has been omitted from Fig. 1 for the sake of clearness, although the next operation to take place after the parts are in the position of Fig. 1 will be the movement of the filling plunger head 28 to transfer the rows 26 and 27 of individual packages toward the lower right of the figure and into a carton held against the guide plate 33.

Transfer mechanism at final assembly station

The transfer or shifting means for moving the

desired unit packages onto the central supporting platform of the assembly station will now be described. As shown in Fig. 3 conveyers 23 and 25 feed their packages in parallel rows, 22 and 24 respectively, at each side of the central assembly station. A reciprocating pusher plate or shifter 38 is mounted for movement laterally across the path of row 22. This plate is at the outside of the row of packages and is adapted to engage the outer face of the desired number of packages, in this case three. Pusher plate 38 also has a side flange 39 which prevents feeding movement of additional unit packages in row 22, while the pusher 38 is in its inner operative position. The two positions of the pusher plate will be readily apparent from a comparison of Figures 3 and 4. As shown in Fig. 4, the plate has moved upwardly in the figure to shift the first three packages, W, K and W, of the row 22 out onto the central supporting platform 49 of the assembly station. It may be noted here that the unit packages on intermediate conveyer 23 are in groups of three, with one package of product K between two packages of product W in each group. The manner in which this arrangement is obtained by use of pre-assembler 20 will be described later.

At the other side of the station, shifters or pusher plates 43 and 45, which carry side flanges 44 and 46 respectively, and are mounted for simultaneous lateral movement by means of a connecting bar 47, are adapted to move the desired unit packages from the row 24. In this particular case two such packages are moved; namely, the first and sixth packages, as shown particularly in Figs. 3 and 4. As indicated in these figures, the respective pusher plates are so located with respect to each other that the individual packages C from row 24 will be moved onto the supporting platform 49 of the assembly station at each end thereof, while the packages W, K and W from row 22 will be moved into the intermediate portion of the platform. The arrangement of the parts is such in this particular case that the reciprocating movements of the pushers at each side take place simultaneously. It will be understood that one such movement would be sufficient to provide a single row of unit packages for loading into a final carton. In the present case, however, two such rows are desired, in order that the final carton may include a total of 10 unit packages. Therefore, two cycles of operation of the transfer or shifting means will be required as shown in Figs. 3 to 6, inclusive. In Fig. 3, the reciprocating pushers are in their inactive position prior to the initiation of the assembling and filling operation. In Fig. 4, the first shifting operation has taken place and a total of five packages, three from line 22 and two from line 25, have been moved onto the supporting platform. In Fig. 5, the reciprocating pushers have moved back to their inactive positions and the conveyers 23 and 25 have advanced the respective unit packages so that the gaps left by transfer of the first five packages from rows 22 and 24 have been filled.

In Fig. 6, the reciprocating pushers have just completed their second transfer operation, and have moved five additional packages onto the central assembly platform, so that the desired ten packages are now in position in a definite pre-arranged order. It will be apparent from the figure that there are four packages of product C, two at each end of the platform 49, four packages of product W, two at each end just inside

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of the packages of product C; and finally two packages of product K at the very center of the station. This arrangement of the unit packages with products in the order C, W, K, W, C is the same as that indicated on the carton in Fig. 2.

Fig. 7 shows the final operation of the assembling and filling device, in which the reciprocating pushers have remained in the position of Fig. 6 and the loading plunger head 28 has moved the assembled unit packages to the left where they would have entered a carton held in loading position as previously described. The carton itself is omitted from this view.

As will be understood from the foregoing discussion the pusher plates 38, 43, and 45 reciprocate above the supporting platform 49, which constitutes the main assembly station. Beneath this supporting plate 49 is a transverse guide member 51 provided with guide slots, best shown in Figs. 1 and 8. This guide member extends at right angles to the parallel rows 22 and 24. Two plates 52 and 53 are slidable in the guide 51, at the respective ends of these slots, as shown in Figs. 3 to 9. Plate 52 is provided with a supporting bracket 54 which carries the pusher plate 38 at one side of the assembly station. Similarly, plate 53 is provided with a supporting bracket 48 carrying the connecting bar 47 to which pusher plates 43 and 45 are operatively fastened. Thus, sliding movement of plates 52 and 53 in the slots of guide 51 will cause corresponding movement of the respective pusher plates laterally across the rows of packages and the assembly station to effect the transfer of packages as described above.

It will be noted from Figs. 3 to 7 particularly that additional guide plates may be provided at the final assembly station to prevent movement of any of the packages except those to be actuated by the transfer or pusher mechanism. Thus, guide plates 55 and 56 serve to position the packages which arrive in row 22 at one side of the assembly station and hold the unwanted packages in their original line while pusher plate 38 moves the first three packages of the row into the central assembly area.

Similarly, plates 57 and 58 serve as an initial guide for packages C in row 24 at the other side of the assembly station, while plates 59 and 61 serve as a further guide for the packages in this line and also prevent the intermediate packages from being transferred into the central assembly area when pusher members 43 and 45 effect the desired transfer of the sixth and first packages respectively.

It should be noted here that the arrangement of the guide plates and the respective package lines is such that there are four unmoved packages in the row 24 between the two unit packages which are actually moved into the assembly station. Thus, the two desired packages are positioned on the supporting plate separated by a distance equivalent to the four unmoved packages. Since only three packages are moved from the other side of the assembly station from row 22 into the space between the two separated packages just mentioned, it will be obvious that there will be a space equivalent to one-half of a package at each end of the three packages being moved into the assembly station. By means of this arrangement, there is sufficient working space so that there is no possibility of packages from rows 22 and 24 engaging each other and being accidentally deflected from their desired position.

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Driving connections for transfer mechanism

The reciprocating plates 52 and 53 are provided with downwardly extending stub shafts 62 and 63 respectively, as best shown in Fig. 9. These stub shafts are of different length, shaft 62 being shown longer than shaft 63 in order that the lever arms used to actuate these shafts may pass each other at different levels without conflict. A connecting link 65 is pivoted to the lower end of stub shaft 64 and a similar connecting link 67 is pivotally fastened to the lower end of shaft 63. Movement of the connecting links will thus cause reciprocation of the plates 52 and 53.

Connecting link 65 in turn is fastened by a pivot pin 68 to one arm 69 of a bell crank lever 71, shown in dotted outline in Fig. 5. This bell crank 71 is pivotally mounted on a vertical shaft 72 supported by the frame of the machine. Thus, movement of the bell crank 71 on its pivot 72 will actuate the sliding plate 52 and pusher 38 by means of bell crank arm 69 and connecting link 65.

Similarly, connecting link 67 is connected by pivot pin 73 to one arm 74 of a three arm lever or bell crank 75. Lever 75 is pivotally mounted on a vertical shaft 76 supported by the frame of the machine. This lever 75 has an additional crank arm 77 extending generally parallel to the second lever arm 82 of bell crank 71. These two crank arms are connected together by a further connecting rod 79 which is pivoted at 78 to arm 77 of lever 75 and is further pivoted at 81 to arm 82 of bell crank 71. It will thus be apparent that movement of lever 75 about its pivot 76 will cause reciprocating movement of plate 53 and pusher 43 and 45 by reason of crank arm 74 and connecting link 67. Furthermore, such movement of lever 75 will be communicated by means of link 79 to the other bell crank 71 and will thus cause simultaneous movement of plate 52. In other words, actuation of lever 75 will produce simultaneous opposed movements of slides 52 and 53 and their corresponding pusher plates.

This movement of lever 75 is achieved by means of the third lever arm 83 on said lever. Arm 83 is provided with a slot 84 at one end as shown in Figs. 3 to 7. This slot is adapted to be engaged by a suitable stud 85 on a connecting link 86 (shown in Fig. 8). Link 86 in turn is pivoted at 87 to one end of an operating lever 88. The other end of lever 88 is pivoted at 89 to a suitable supporting bracket 91 on the machine frame. Pivot 89 is at right angles to the direction of rows 22 and 24 so that movement of the upper end of the operating lever 88 and connecting link 86 will be in a direction substantially parallel to these rows or at right angles to the direction of movement of plates 52 and 53.

With the foregoing linkage in mind, it will be clear that movement of operating lever 88 about its pivot 89 will cause the necessary reciprocating movement of plates 52 and 53 and the corresponding pusher or transfer plates 38, 43 and 45. The necessary movement of operating arm 88 is obtained by providing said arm with a cam follower 92 which engages the surface of a cam 93. Cam 93, as best shown in Fig. 8, has two raised portions 94 and 95 separated by two sections of lesser radius 96 and 97. Section 96 is relatively small while section 97 extends over a relatively larger segment of the cam. A spring 98, fastened at one end to a pin 99 on operating lever 88 and at the other end to a frame mem-

ber 100, serves to urge operating lever 88 and cam follower 92 constantly against the surface of cam 93. It will be understood that spring 98 is sufficiently strong to move lever 88 and the previously described connecting linkage so as to actuate the plates 52 and 53 and their respective pushers, whenever the low portions 96 and 97 of the cam 93 approach the cam follower 92.

For the sake of convenience the numbers 3, 4, 5, 6, and 7 have been placed upon cam 93 in the drawing, to indicate the portions of the cam engaged by cam follower 92 when the transfer mechanism or pusher plates are in the positions of Figs. 3 to 7 respectively. Thus, in Fig. 8 the mechanism is in a position corresponding to that of Fig. 3. Subsequent counterclockwise rotation of cam 93 on its shaft 101 will bring the low portion 96 of the cam opposite the cam follower and will permit movement of operating lever 88 under the influence of spring 98 so that the pusher plates will be moved into the position of Fig. 4. Further rotation of the cam will cause engagement of the raised portion 95 of the cam with the cam follower and will move the operating lever 88 to the left in Fig. 8 to restore the pusher plates to their original position, as indicated at Fig. 5.

As rotation of the cam 93 continues, the lower cam surface 97 will be engaged by cam follower 92 and the pusher plates will move into the position shown in Fig. 6 and will remain in that position until the movement of filling plunger 28 has taken place as shown in Fig. 7.

Automatic stop for transfer mechanism

A stop mechanism has been provided to prevent operation of the transfer plates 32, 43, and 45 under certain conditions. This stop mechanism includes a locking lever 102 pivoted at 103 to the machine frame. A latching hook 104 at one end of the locking lever 102 is arranged as shown in Fig. 8 so that upon rotation of lever 102 on pivot 103, the latch 104 will block the movement of operating lever 88. Thus, when latching hook 104 is in position in front of lever 88, the operating lever will be prevented from movement even though the low portions 96 and 97 of cam 93 come into position opposite cam follower 92. This latching mechanism makes it unnecessary to stop the rotation of cam 93 at any time. Thus the cam and its shaft 101 may, if desired, be connected to the same driving means used to operate the continuously running belt conveyers which feed the packages to the machine.

Operation of locking lever 102 is achieved as follows:

The end of said lever opposite latch 104 may be bifurcated as shown at 105 in Figs. 8 and 9 and this bifurcated end of the lever is fastened by a pin 106 to the plunger 107 of a suitable solenoid 108. A spring 109 (shown in Fig. 9) serves to urge the bifurcated end 105 of lever 102 and the solenoid plunger 107 to the left in Fig. 9 so as to hold latching arm 104 in inoperative position with respect to control lever 88. Actuation of solenoid 108 will move the plunger 107 and end 105 of lever 102 to the right in Fig. 9 and will move latching hook 104 into position to block the further movement of lever 88. The circuit connections by which the solenoid is actuated are described in a later section of this specification.

Loading plunger mechanism

As seen from the foregoing description, the assembled packages on supporting plate 49 are

moved through the end guide plate 33 and into the carton 29 by head 28 of a suitable plunger mechanism. With reference to Fig. 8, this head 28 is fastened by bolts 111 to a plunger member 112. This plunger member is T-shaped in cross section and includes a lateral horizontal flange 113 and a vertical depending central flange 114. The lateral edges of horizontal flange 113 are adapted to be carried by suitable guide members (not shown) of standard construction, so that the plunger 112 can be reciprocated longitudinally within said guide members. The plunger and guide members are contained within a housing 115 (see Fig. 1) and suitable oil fittings 116 are provided to permit lubrication of the plunger and guides without removal of the casing.

With reference to Fig. 8 again, a driving bracket 117 is fastened to the depending flange 114 of plunger 112. One end of a connecting link 118 is pivoted at 119 to this driving bracket 117, and the other end of the connecting link is pivoted at 121 to one end of a plunger operating lever 122. The other end of lever 122 is pivoted at 123 to a supporting bracket 124 on the main frame. The axis of pivot 123 is at right angles to the desired line of movement of plunger 112 so that rotation of lever 122 about pivot 123 will cause reciprocating movement of plunger 112 in its guides.

To obtain the necessary movement of lever 122 this lever carries a cam follower 125 adapted to engage the operating surface of a plunger cam 126. This plunger cam is mounted on the same shaft 101 which carries the cam 93 for the transfer mechanism. Cam 126 has a substantially circular segment 127, i. e., a segment of continuous radius extending around most of the circumference of the cam. A depressed section 128 of shorter radius is provided at one point in the periphery of the cam, and this low point is so oriented with reference to the transfer cam 93 that the low point 128 will be engaged by cam follower 125 when position 7 of cam 93 is opposite cam follower 92 to position the transfer mechanism as shown in Fig. 7.

It will be understood that the difference in radii of cam portions 127 and 128 is such that lever 122 in following the cam will actuate plunger 112 through the desired distance. A suitable spring 129 is fastened at one end to pin 130 on plunger lever 122 and at the other end to a frame member 131. Thus, spring 129 will urge plunger lever 122 to the left in Fig. 8 so that the cam follower 125 will be constantly engaged against the surface of cam 126. Plunger 112 will therefore be actuated to the position of Fig. 7 every time the low point 128 of cam 126 comes into position opposite cam follower 125.

Driving mechanism

As indicated above, cams 93 and 126 are both mounted on shaft 101. This shaft is rotatably mounted in suitable journals 132 and 133 on the main frame. Shaft 101 also carries a relatively large gear 134 which is keyed to the shaft and serves to rotate the shaft and the cams as a unit. Gear 134 in turn is driven by a pinion 135 carried by auxiliary shaft 136. The auxiliary shaft 136 is also provided with a pulley 137 which is driven by a belt 138. Belt 138 effectively connects pulley 137 with the drive pulley 139 of a suitable electric motor 141. It will be apparent that any desired equivalent driving mechanism for shaft 101 may be provided as long as the driving connections are so

selected that the speed of the shaft will be within the desired range. In the present case, it has been found that this device operates satisfactorily if shaft 101 rotates at a speed of approximately 30 revolutions per minute.

It is also possible, if desired, to provide a spring operated brake for one of the drive shafts or for shaft 101, and to further provide a solenoid for retracting the brake to inoperative position against the action of its spring. Such a solenoid may be connected with the motor circuit so that during operation of the motor the brake is disengaged and upon opening of the electrical circuit to the motor, the solenoid will be deenergized and the brake actuated to stop the mechanism promptly without coasting or over-run.

Pre-assembler

The pre-assembler shown generally at 20 in Fig. 1 is disclosed in greater detail in Figs. 10 to 12 inclusive. As shown in Fig. 10, two of the initial conveyers, designated generally as 16 and 18, are arranged to feed products W and K into this pre-assembler, so that certain of these products may be combined in a pre-determined relative sequence and may then be carried forward by the intermediate conveyor, generally designated as 23, to the final assembly station 21. The third line of unit packages containing product C is designated generally as 25 and it will be seen from Fig. 10 that this line by-passes the pre-assembler 20 and is not involved in the operation of the latter.

For the sake of compactness, however, this third line 25 has been shown with certain of its driving mechanism supported by the main frame of pre-assembler 20. Thus, in Fig. 10 the line 25 is carried initially by means of a conveyor belt 142 of ordinary type, and this belt passes over a driving roller 143 fastened to a shaft 144. A similar belt 145 substantially adjacent and parallel to the end of belt 142 serves to carry the packages of product C the remaining distance to the final assembly station. Belt 145 is driven in turn by a pulley 146 carried by shaft 147. Suitable guide plates 148 and 149 serve to form a channel or pathway to carry the packages of product C from belt 142 laterally to belt 145 by reason of the pressure exerted by the additional packages on belt 142 which are still in driving contact with that belt.

Initial conveyor 16 for packages of product W likewise comprises an ordinary conveyor belt 151 which is driven and supported by a pulley 152 carried on shaft 153. With reference to initial conveyor 18, a similar belt 154 driven by pulley 155, also mounted on shaft 153, serves to bring packages of product K up to the pre-assembler.

At the pre-assembly station itself there is a suitable supporting platform 156, on each edge of which products W and K are deposited in parallel lines 17 and 19 by conveyers 16 and 18. Stop plates 157 and 158 serve to limit the forward motion of packages of products W and K, and as soon as the lines of packages are consolidated against these stops, it will be apparent that the conveyor belts will continue to move but will slide beneath the bottoms of packages W and K without moving said packages further. Suitable guide plates such as 159, 160, and 161 may be provided to maintain the unit packages in their original lines and prevent them from moving accidentally into the pre-assembly station. Additional guide plates 162 and 163 serve to form an exit channel through which the as-

sembled packages will be carried by the intermediate conveyor belt 164. The line of packages carried by belt 164 constitutes the intermediate conveyor line generally designated as 23 in Figs.

1 to 7. Belt 164 of this intermediate conveyor passes over the supporting plate 156 of the pre-assembler and is driven by pulley 165 on shaft 166. Top guides 170 (Fig. 1) prevent tilting.

The object of the pre-assembler is to transfer certain selected packages of products W and K from their respective initial conveyor lines 16 and 18 and move the selected packages laterally onto the intermediate conveyor belt 164 for transportation in definite predetermined order to the final assembler. In order to accomplish this lateral shifting or transfer of the desired packages in the proper sequence, the following mechanism has been provided.

Transfer mechanism for pre-assembler

With reference to line 19 and product K, a shifter or pusher plate 167 having a lateral stop or guide flange 168 is fastened to a supporting bracket 169. Bracket 169 is fastened in turn by means of bolts 171 to a reciprocating plate 172. By providing slots in supporting bracket 169, the relative position of the pusher plate 167 may be adjusted within certain limits to accommodate different sizes of packages.

Reciprocating plate 172 is carried in turn by the lateral guide 173 which consists of a slotted member positioned transversely to the line 19. The plate is free to reciprocate in the guide 173, in the desired direction.

A driving link 174 is pivotally fastened at 175 to the reciprocating plate 172 as indicated particularly in Fig. 11. The other end of driving link 174 is pivoted at 176 to the end of one arm 177 of a suitable lever designated generally as 178. This lever 178 is pivoted at 179 to the frame of the machine.

A second arm 181 on lever 178 extends in the opposite direction from arm 177 and is pivotally connected at 182 to a driving link 183. This second driving link 183 is in turn pivoted at 184 to a second reciprocating plate 185. Plate 185 is slidably mounted in transverse guide member 190 and carries a supporting bracket 186. Bracket 186 is fastened to the plate by bolts 187, in an adjustable manner, as described above in connection with bracket 169.

Supporting bracket 186 in turn carries another shifter or pusher plate 188 for cooperation with packages W in line 17. Plate 188 has a lateral flange 189 serving as a guide and stop for packages W during actuation of pusher 188.

It will be apparent from Figs. 10 and 11 that movement of lever 178 in first one direction and then the other will cause simultaneous reciprocation of pusher plates 167 and 188 from the position of Fig. 10 to the position of Fig. 11 and then back again to the position of Fig. 10. During the movement of the parts from the position of Fig. 10 to the position of Fig. 11, the desired packages of products W and K will be pushed laterally onto the belt 164 of intermediate conveyor 23. This lateral shifting of the packages may be facilitated by provision of a depressed central area on supporting plate 156 so that the top surface of belt 164 is no higher than the bottoms of unit packages W and K, while said packages are at the edges of plate 156.

In the construction shown, the pusher plate 167 has a width corresponding to one of the unit

packages. Therefore, one package of product K will be moved onto the intermediate conveyer.

On the other hand, pusher plate 188 has a width equivalent to two unit packages and, therefore, two packages of product W will be moved onto the belt. In this case, the packages of product W will be in advance of the product K.

At this point it will be recalled that in the specific arrangement shown, the final assembler of Figs. 1 to 9 is designed to receive groups of three packages from conveyer 23, with a package of product W in advance followed by a package of product K and then an additional package of product W. Obviously the pre-assembler could be designed to push two separated packages of product W onto intermediate belt 164 and a single package of product K in between the packages of product W. However, it has been considered simpler to construct the pre-assembler as shown and place two packages of product W in advance of one package of product K. Then when the machine is first operated, the single leading package of product W will be removed from the intermediate conveyer 23 and the packages will thereafter be in the desired order for handling by the final assembler.

Driving mechanism for pre-assembler

The necessary actuation of lever 178 is achieved as follows: A lever arm 191 (shown in Figs. 10 to 12) is operably connected to lever 178 so that movement of lever arm 191 will cause corresponding movement of lever 178. Arm 191 is provided with a slot 192 in which a driving pin 193 (see Fig. 12) is adapted to engage. Pin 193 in turn is carried by one end 194 of a suitable connecting link 195. The other end 196 of this connecting link is pivoted at 197 to an operating lever 198.

The operating lever 198 is pivoted at its other end to a shaft 199 carried in supporting brackets 201 on the main frame of the pre-assembler. The mechanism for actuating this arm 198 is similar to that employed for the operating levers in the final assembler. Thus, a cam follower 202 is mounted on the operating lever 198 and is adapted to engage the peripheral surface of a cam 203. Cam 203 in this instance has only two surfaces, namely a portion 204 of larger radius and a portion 205 of lesser radius. The respective portions each constitute roughly one-half the circumference of the cam. This cam 203 is carried on a shaft 206 suitably mounted in the frame of the machine. Engagement of the cam follower 202 with the surfaces of cam 203 is insured by means of spring 207, one end of which is fastened to pin 208 on operating lever 198. The other end of the spring is fastened to one of the frame members 209. Thus, it will be apparent that rotation of cam 203 will move the operating arm 198 back and forth so that the pusher plates 167 and 188 alternately assume the positions of Figs. 10 and 11. The numerals 10 and 11 have been placed on cam surfaces 204 and 205 respectively, in Fig. 12, to indicate that with portion 10 of the cam engaging the cam follower 202, the parts will be in the position of Fig. 10, and with portion 11 of cam 203 engaging cam follower 202, the parts will be in the position of Fig. 11.

In order to drive shaft 206 and cam 203 a pulley 211 is rigidly fastened to the shaft. Pulley 211 is connected by belt 212 to a drive pulley 213 on auxiliary shaft 214. Shaft 214 is mounted in suitable journals on the frame, in any desired

manner. Shaft 214 also includes a driven pulley 215 firmly connected thereto. This driven pulley is connected by a further belt 216 to the driving pulley 217 on a suitable electric motor 218. It will be understood that any equivalent driving connection between a suitable source of power and the cam shaft 206 may be used. For example, gears might be used, as in the final assembler. Since the motor and cam shaft are adapted to revolve continuously, any one of these shafts may be further connected to the drive shafts 144, 147, 153, and 166 of the various conveyers. Such connections have been omitted for the sake of clearness.

Automatic stop mechanism for pre-assembler

In order to stop the operation of the pre-assembler in the event that an adequate number of packages have accumulated on intermediate conveyer 23, a locking lever 219 has been provided. This lever is similar in construction to locking lever 102 of the final assembler and operates in the same manner. Thus, the lever 219 is pivoted at 221 to the machine frame and is provided at one end with a latching hook 222 which may be moved into the path of operating lever 198 under certain conditions. The other end 223 of locking lever 219 is connected to the plunger of a solenoid 224 and to a suitable spring (not shown) similar to spring 109 of Fig. 9. The spring serves to hold the locking lever so that latch 222 is normally clear of the path of operating lever 198. Actuation of the solenoid rotates the locking lever against the action of the spring so that latch 222 will move into position to block the movement of lever 198 and prevent that lever from moving under the action of spring 207, when the low portion 205 of cam 203 approaches cam follower 202.

Should the solenoid be actuated while cam follower 202 is in engagement with the lower portion 205 of cam 203, it will be apparent that the raised portion 204 of the cam will subsequently force lever 198 back past latch hook 222 and into the position of Fig. 12. The latch hook will then prevent further movement of lever 198 until the solenoid is deenergized. Such return movement of lever 198 past the latch is facilitated by provision of the usual tapered end on latch hook 222 as shown, for example, in Fig. 13.

Automatic control circuit

The automatic control circuit, by which solenoids 108 and 224 are actuated to stop the operation of the transfer mechanism on the final assembler and the pre-assembler, respectively, will now be described.

As shown in Fig. 1 a number of pivoted mercury or equivalent switches are mounted above certain portions of the conveyer lines. Thus mercury switch 225 is pivoted above intermediate conveyer 23 and this switch is provided with a depending finger or arm 220 adapted to be engaged by the tops of the packages carried by the intermediate conveyer. The location of switch 225 is sufficiently far in advance of the final assembler to insure the presence of an adequate supply of unit packages for satisfactory operation of the final assembler. The switch is so arranged that when there are no packages beneath arm 220, as will be the case when there is a somewhat inadequate supply of packages at the final assembler, the switch 225 will be open. As soon as sufficient packages have accumulated so that at least one package will remain in posi-

tion beneath arm 220, such package will hold the switch 225 in closed position. A similar switch 226 is mounted for a corresponding purpose on conveyer 25.

Additional switches 227 and 228 are similarly mounted on initial conveyers 16 and 18, respectively, far enough in advance of the pre-assembler 20 to insure the presence of an adequate supply of unit packages at that station. Switches 225, 226, 227 and 228 are all connected in series, as shown in Fig. 13. The circuit from these switches includes a wire 230 connecting one end of the series of switches to a suitable relay 231 of known type. Further wires 235 and 236 connect relay 231 to one terminal 237 of the current supply. The remaining terminal 238 of the current supply is connected by wires 241, 242 and 243 to the other end of the series of switches, i. e., to switch 228. Thus it will be apparent that relay 231 will be energized only if all four of the above-mentioned switches have been actuated to their "on" positions, or, in other words, only if there is a supply of packages at each of the corresponding locations in the conveyer system. Thus, when there are enough packages at all points on the conveyers, the relay 231 will be energized and will maintain an open circuit condition between terminals 233 and 234 of the solenoid circuit.

Should any one of the four switches become open, due to the absence of packages at that point, relay 231 would be deenergized and would permit bridging contact 232 to complete the circuit across terminals 233 and 234. Thus this deenergization of relay 231 would complete the electrical circuit to solenoid 108 via wires 236, 235, 244, 245, and 241. Actuation of the solenoid, as previously explained, will move the locking lever 102 so that latch 104 moves into the path of operating lever 88 and prevents further operation of the final assembler plates until the supply of packages is again adequate. As soon as the supply is replenished, all of the above four mercury switches will again close, relay 231 will be re-energized, and the circuit through solenoid 108 will be broken to permit spring 109 to move latch 104 out of engagement with operating lever 88. The parts are shown in Fig. 13 with all four switches 225, 226, 227 and 228 open, and the solenoid 108 energized to hold lever 102 in locking position.

One additional mercury switch 229 is mounted a short distance beyond pre-assembler 20 above intermediate conveyer 23. This switch is similar to those previously mentioned and is designed to stop the operation of the pre-assembler when the packages accumulate on intermediate conveyer 23 to a point where there is no room for receipt of additional packages from the pre-assembler.

To accomplish this purpose, switch 229 is connected at one end by wires 246, 242, and 241 with line terminal 238. The other side of the switch is connected by wire 247 to a time delay relay 248. This relay is connected, in turn, by wires 249, 252 and 236 to line terminal 237. The time delay relay is designed to operate a switch 251 in the event that mercury switch 229 remains closed for more than a predetermined minimum time. This minimum time is chosen as the time normally required for passage of the three packages delivered by the pre-assembler to the intermediate conveyer 23. Thus, if the final assembler is in full operation so that packages are used by it just as rapidly as they are received from the intermediate conveyer and pre-assembler, it will be un-

necessary to stop the pre-assembler, and switch 229 will not remain in closed position long enough at any one time to actuate the time delay relay 248.

If, however, the final assembler is stopped, and the unit packages accumulate on the intermediate conveyer 23 so that switch 229 is held closed for a substantial period of time, then time delay relay 248 will actuate switch 251 to close said switch and complete the circuit through solenoid 224. This circuit will be completed through the solenoid by wires 236, 252, 253, 254, and 241. Operation of solenoid 224, just as in the case of solenoid 108, will cause movement of locking lever 219 so that latch 222 will block the path of operating lever 198 and will prevent further operation of the transfer plates on the pre-assembler. As soon as the final assembler resumes operation so that switch 229 again opens, the relay 248 will be de-energized to open switch 251 and de-energize the solenoid. The return spring will then move latch 222 of locking lever 219 out of engagement with operating lever 198 and permit further operation of the pre-assembler.

In Fig. 13, switch 229 is shown in open position. The solenoid is consequently de-energized, so that latch 222 does not prevent normal operation of the pre-assembler.

It will be apparent from the foregoing description that a novel method and apparatus have been provided for efficient assembly of unit packages in a desired predetermined order and for loading of such packages into a final shipping carton or display container. It is also clear that by suitable modification in the relative size and/or position of the various reciprocating transfer or pusher plates of this apparatus, any desired relative arrangement of the different products may be obtained.

The present invention is accordingly not limited to the specific methods of selection, structural features or relative arrangements disclosed, but is intended to cover such changes and modifications as are readily apparent to those persons skilled in the art and which fall within the spirit and scope of the following claims.

I claim:

1. The method of filling cartons with unit packages of different products, which comprises providing a carton having external indicia showing predetermined relative positions of the different products within the carton with at least two packages of one product shown as separated by at least one intermediate package of another product, feeding selected packages of the respective products to an assembly area, assembling the selected packages in said definite predetermined relative positions in which at least two packages of one product are separated by at least one intermediate package of another product, and moving the assembled packages into said carton without change in said relative positions.

2. The method of filling cartons with unit packages of different products, which comprises providing a carton having external indicia showing predetermined relative positions of the different products within the carton with at least two packages of one product shown as separated by at least one intermediate package of another product, feeding the packages of the respective products in groups adjacent to an assembly area, transferring selected packages of each product from their respective groups into the assembly area in said definite predetermined relative positions in which at least two packages of one product are separated by at least one intermedi-

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ate package of another product, and moving the assembled packages into the carton without change in said relative position.

3. The method of filling cartons with unit packages of three different products, A, B and C respectively, which comprises feeding packages of product A in a first row at one side of an assembly area; feeding packages of products B and C in a second row at the opposite side of said assembly area, with the packages in said second row arranged in successive groups of three, in the order B—C—B; transferring one of said groups from the second row into said area; transferring two packages from said first row into said area with one package of product A at each end of said one group; transferring a second group from the second row into said area adjacent the first group and between said end packages; transferring two additional packages from said first row into said area with one additional package of product A at each end of said groups and adjacent said first package of product A, thereby forming in the assembly area two identical adjacent lines of five packages each, in the order A—B—C—B—A; and moving said assembled lines of packages into a carton, without change in their relative positions.

4. A selective assembling apparatus comprising a first conveyer feeding packages of a first product adjacent an assembly station, a second conveyer feeding packages of a different product adjacent said station, a first shifter for moving at least one selected package of said first product into said station, and a second shifter for moving a different number of selected packages of said different product into said station in a predetermined position which is longitudinally displaced relative to the point at which the first package is moved into the station.

5. A selective assembling apparatus comprising two conveyers for feeding packages to an assembly station in two separate rows with packages of different products in the respective rows, a first shifter of predetermined width mounted for movement across one row to engage and shift at least one selected package of the first product into said station, a second shifter of different width mounted for movement across the second row to engage and shift a different number of selected packages of the second product into said area in predetermined longitudinally spaced positions relative to said first selected package, and means for moving said selected packages away from said area without change in their relative longitudinal positions.

6. A selective assembling apparatus comprising two conveyers for feeding packages to an assembly station in two separate rows with packages of different products in the respective rows, a first shifter having longitudinally spaced portions mounted for movement across one row to engage and shift two selected separated packages into said station, and a second shifter mounted for movement across the second row to engage and shift at least one selected package into said station between said first two selected packages.

7. A selective assembling apparatus according to claim 6, in which said second shifter engages and shifts three selected packages into said station.

8. A selective assembling and carton filling apparatus comprising conveyers for feeding packages to an assembly station in two separate rows, a first shifter mounted for movement across one row to engage and shift at least one selected

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package from said row into said station, a second shifter mounted for movement across the second row to engage and shift at least one selected package from said second row into said station in predetermined position relative to said first selected package, a positioning guide at said station for a carton to be filled, and a loading plunger mounted for movement across said station to engage said assembled selected packages and move them to said guide and carton without change in their predetermined relative longitudinal positions.

9. A selective assembling and carton filling apparatus as in claim 8, in which said second shifter engages and shifts a different number of selected packages from said second row.

10. A selective assembling and carton filling apparatus as in claim 9, in which said first shifter engages and shifts two separated packages from said first row into said station, and said second shifter engages and shifts three adjacent packages from said second row into said station between said separated packages.

11. A selective assembling and carton filling apparatus as in claim 10, including driving mechanism for moving said shifters and said loading plunger in timed sequence, said shifters being moved through two complete cycles for each complete cycle of movement of the loading plunger.

12. A selective assembling and carton filling apparatus comprising an assembly station, conveyers for feeding packages to said station in two parallel separated rows at opposite sides of said station, a first pusher movable transversely across one of said rows and said station, a second pusher movable transversely across the second row and said station, supporting means for said pushers, driving mechanism connected to said pushers for reciprocating them back and forth across said rows and station, said first pusher shifting at least one selected package from said first row into said station when said first pusher is reciprocated, said second pusher shifting at least one selected package from said second row into said station in predetermined position relative to said first selected package when said second slide is reciprocated, a loading plunger mounted for reciprocating movement across said station parallel to said rows for engaging said assembled selected packages and moving them from said station to a carton to be filled, without change in their predetermined relative positions, and operating mechanism connected to said plunger for reciprocation thereof in timed sequence after assembly of said selected packages.

13. A selective assembling and carton filling apparatus as in claim 12, in which said pusher driving mechanism includes first and second crank levers pivotally mounted at said station, said first crank lever having one arm operatively connected to said first pusher and said second crank lever having an arm operatively connected to said second pusher, and a connecting link pivoted to another arm of each crank lever, the relative location of the crank arms and pivots producing simultaneous movement of said cranks and pushers in opposite directions.

14. The method of filling cartons with unit packages of different products, A, B and C respectively, which comprises: feeding packages of product A in a first row at one side of an assembly area; feeding packages of products B and C in a second row at the opposite side of the assembly area with the packages arranged in

groups containing at least one package of each of products B and C; transferring one of said groups from the second row into said area; transferring at least one package of A from the first row into said area in predetermined relative position at one end of said one group; transferring a second group from the second row into said area adjacent the first group; transferring at least one additional package of A from the first row into said area at one end of said groups and adjacent said one package of A, thereby forming in the assembly area two identical adjacent lines, each containing a package of each product in predetermined relative positions; and moving the assembled packages into a carton while maintaining their relative positions.

15. The method of filling cartons with unit packages of different products, A, B and C respectively, which comprises: feeding packages of product A in a first row adjacent an assembly area; feeding packages of products B and C in a second row adjacent the assembly area with the packages arranged in groups containing at least one package of each of products B and C; transferring one of said groups from the second row into said area; transferring at least one package of A from the first row into said area in predetermined relative position adjacent said one group; and moving the assembled packages into a carton while maintaining their relative positions.

16. The method of assembling packages of different products, which comprises feeding the products in separate longitudinal rows at opposite sides of an assembly area with each product included in only one such row, shifting at least one package from one row into the area, simultaneously shifting a different number of packages from the other row into the area at a predetermined position which is longitudinally displaced relative to the packages shifted from said one row, and moving the shifted packages out of the area while maintaining their predetermined relative longitudinal positions.

17. The method of assembling packages of different products, which comprises feeding the products in separate longitudinal rows at opposite sides of an assembly area with a given product included in only one such row, shifting at least one package from one row into the area, shifting at least one package from the other row into the area at a predetermined position which is longitudinally displaced relative to the packages shifted from said one row, and moving the shifted packages out of the area while maintaining their predetermined relative longitudinal positions.

18. A selective assembling and carton filling apparatus comprising conveyers for feeding packages adjacent an assembly station in two separate rows, a first shifter mounted for movement across one row to engage and shift at least one selected package from said row into said station, a second shifter mounted for movement across the second row to engage and shift at least one selected package from said second row into said station in a predetermined position which is longitudinally displaced relative to said first selected package in a direction at right angles to the direction of movement of one of the shifters, a positioning guide at said station for a carton to be filled, and a loading plunger mounted for movement across said station to engage said assembled selected packages and move them past said guide and into said carton without change

in their predetermined relative longitudinal positions.

19. A selective assembling and carton filling apparatus comprising conveyers for feeding packages adjacent an assembly station in two parallel separated rows at opposite sides of said station, a first pusher movable transversely across one of said rows and said station, a second pusher movable transversely across the second row and said station, supporting means for said pushers, driving mechanism connected to said pushers for reciprocating them back and forth across said rows and station, said first pusher shifting at least one selected package from said first row into said station when said first pusher is reciprocated, said second pusher shifting at least one selected package from said second row into said station in a predetermined position which is longitudinally displaced relative to said first selected package when said second pusher is reciprocated, a loading plunger mounted for reciprocating movement across said station parallel to said rows for engaging said assembled selected packages and moving them from said station to a carton to be filled, without change in their predetermined relative longitudinal positions, and operating mechanism connected to said plunger for reciprocation thereof in timed sequence after assembly of said selected packages.

20. A selective assembling apparatus comprising means feeding packages in two parallel rows at opposite sides of an assembly station, first shifter means having spaced portions for engaging and shifting at least two spaced packages from the first row into the station without disturbing the remaining packages in the first row between said spaced packages, and second shifter means for engaging and shifting a selected number of packages from the second row into the station between the spaced packages from the first row, the spaced portions of said first shifter means being separated by a distance corresponding to the space occupied by at least one more package than said selected number of packages from the second row.

21. A selective assembling apparatus comprising a conveyor for feeding packages in a row adjacent an assembly station, and a shifter having separate portions spaced from each other longitudinally of the row a distance greater than the size of an individual package, said shifter being mounted for movement across the row to engage and shift at least two separated packages into said station while leaving at least one intermediate unshifted package in the row.

22. Apparatus according to claim 21 having a guide between the row and station engaging the packages between said separate portions and holding them against transverse movement during operation of the shifter across the row.

23. The method of filling cartons with unit packages of different products, A and B respectively, which comprises providing a carton having external indicia showing predetermined relative locations of packages of A and B to be contained therein; feeding packages of products A and B adjacent an assembly area; assembling said predetermined number of packages of A and B in said area in the same relative positions with respect to each other as shown by the carton indicia; and transferring the assembled packages of A and B into the carton while maintaining said relative positions and thereby placing the packages within the carton in the relative locations shown by the carton indicia.

24. The method of filling cartons with unit packages of different products, A and B respectively, which comprises providing a carton having external indicia showing predetermined numbers and relative locations of packages A and B to be contained therein; feeding packages of product A in a first group adjacent an assembly area; feeding packages of product B in a second group adjacent said area; transferring the predetermined number of packages of A from the first group into the area; transferring the predetermined number of packages of B from the second group into the area in the same relative positions with respect to the other packages as shown by the carton indicia; and transferring the assembled packages of A and B into the carton while maintaining said relative positions and thereby placing the packages within the carton in the relative locations shown by the carton indicia.

25. The method of filling cartons according to claim 24 in which the predetermined number of

packages of A is different from the predetermined number of packages of product B.

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