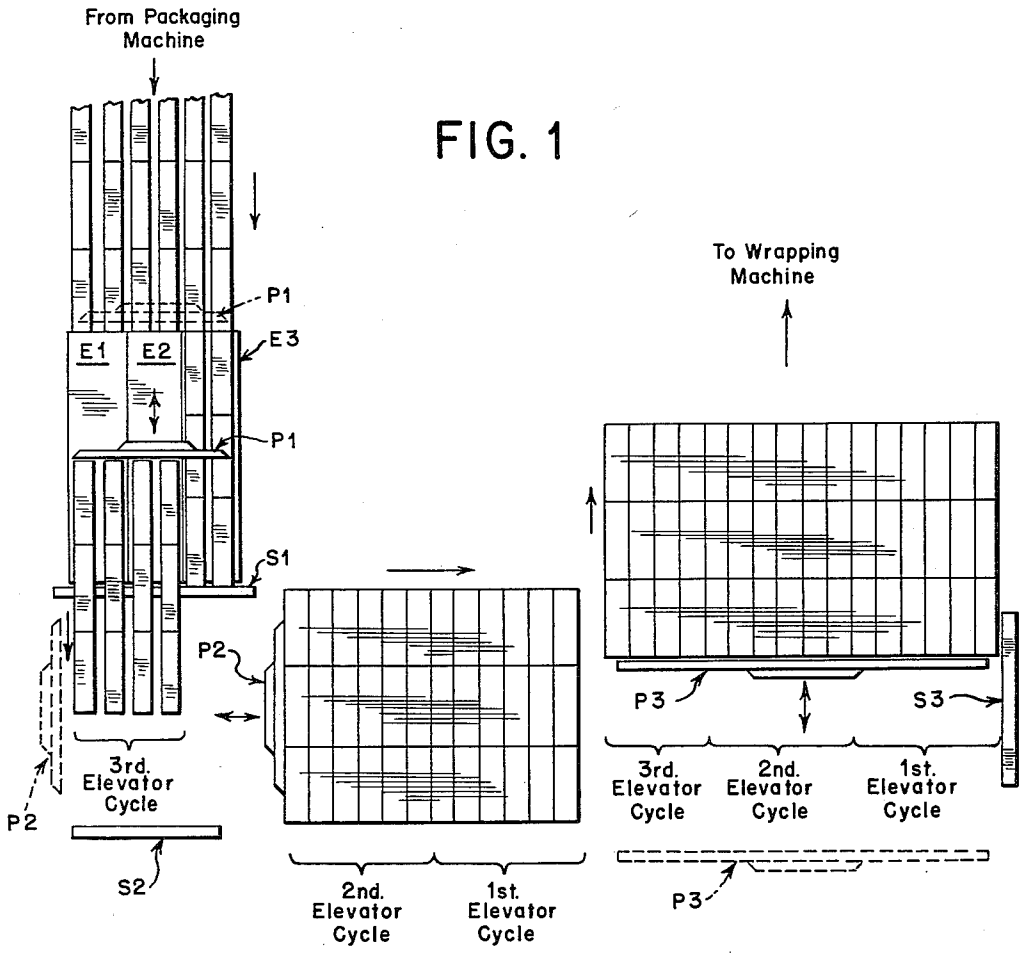
Oct. 15, 1963 G. M. WOODRUFF ETAL 3,107,014

PACKAGE COLLECTING

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FIG. 1



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PACKAGE COLLECTING

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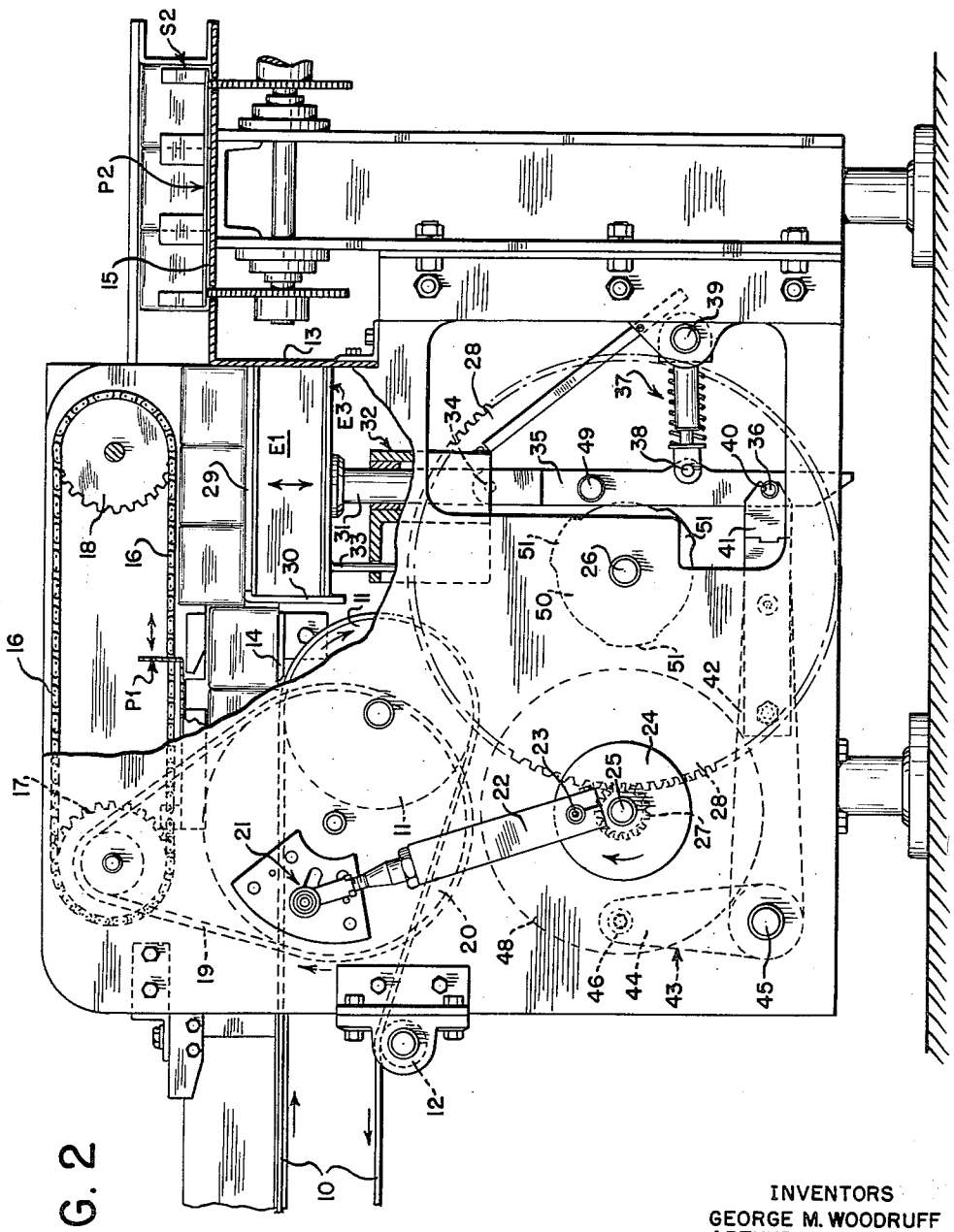


FIG. 2

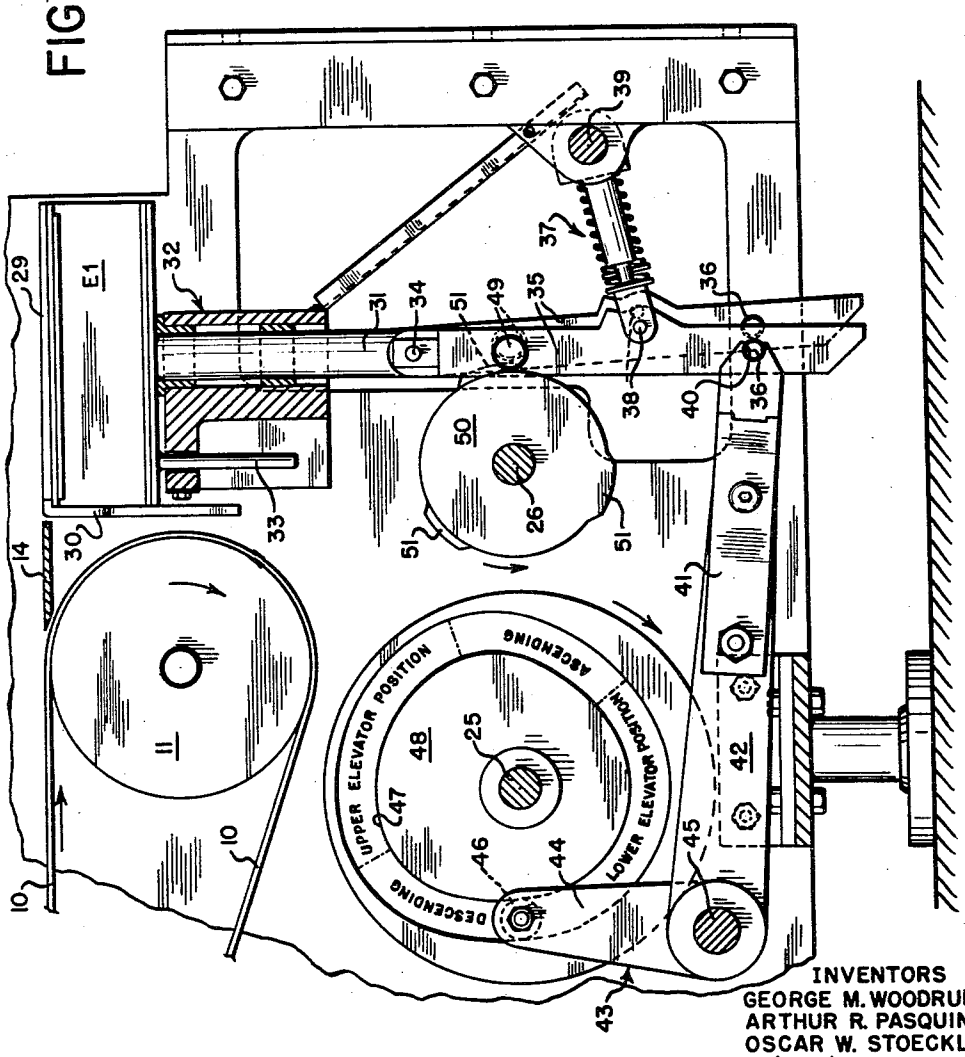
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PACKAGE COLLECTING

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FIG. 3



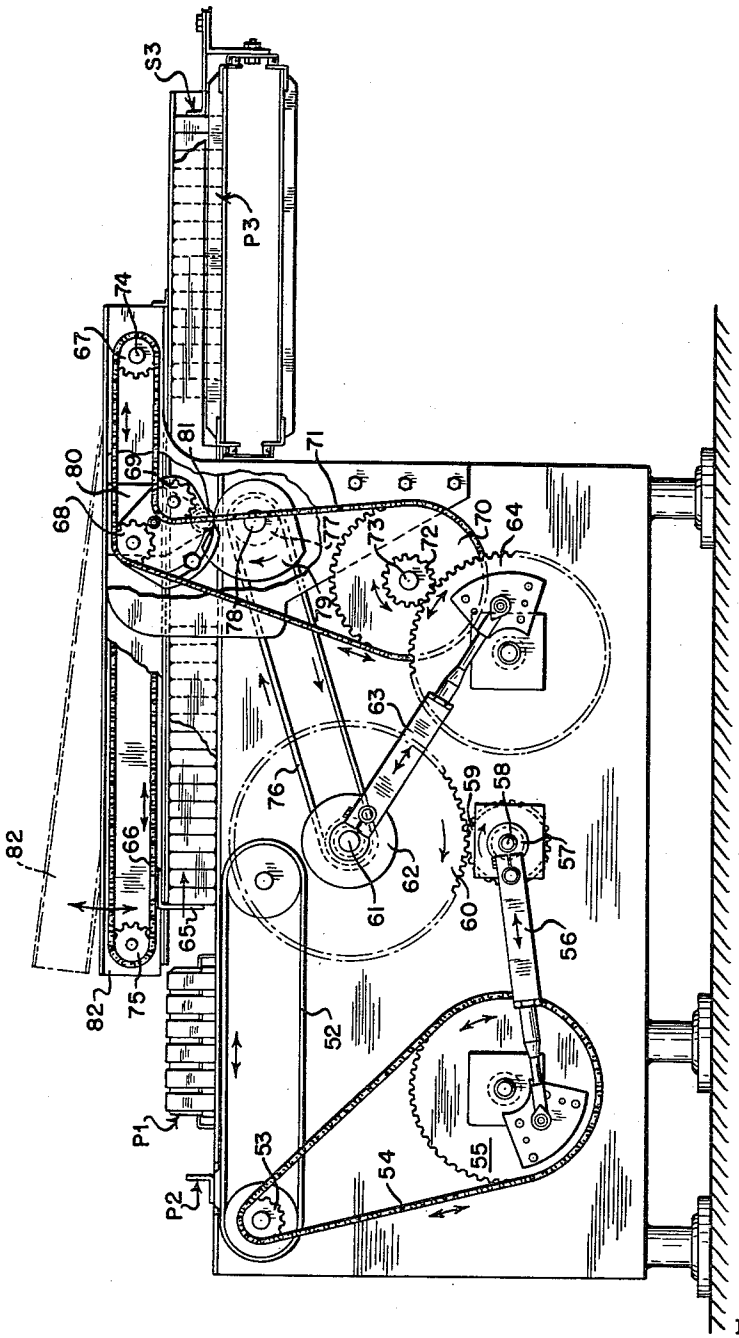
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PACKAGE COLLECTING

Filed Oct. 28, 1960 4 Sheets-Sheet 4

FIG. 4



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3,107,014

PACKAGE COLLECTING

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Filed Oct. 28, 1960, Ser. No. 65,693
9 Claims. (Cl. 214—6)

This invention relates to automatic machinery for feeding and arranging cartons to form a charge thereof containing a preselected number of cartons arranged in a predetermined manner. It has particular utility where the relationship between the number of carton feed lines and the final charge is such that the number of cartons in one of the rows in the charge is not directly divisible by the number of carton feed lines.

It is well known to utilize various types of collecting devices to segregate a specified number of cartons or packages from the feed lines to form a charge and then to transport the charge to a specified location. Such a device is completely satisfactory where one of the rows of the final charge is directly divisible by the number of feed lines; for example, if the final charge has an arrangement of forty-eight cartons arranged in four rows of twelve each and there are six feed lines, segregation of two groups of four cartons from the six feed lines would give a final charge of forty-eight cartons arranged in four rows of twelve each, if the first group is moved in a direction transverse to the direction of travel of the feed lines and the second group is brought in behind it. However, where the number of cartons in each row of the final charge is not directly divisible by the number of feed lines, for example, if the final charge is to contain sixty-four cartons arranged in four rows of sixteen each and there are six feed lines, these prior art devices are completely unsatisfactory. Thus, up until this invention it was necessary to reorganize the arrangement of the final charge or to completely modify the carton forming and filling machinery to overcome the deficiencies in available collecting machinery.

This invention provides great flexibility in the design and operation of package collecting machinery which will organize a final charge of cartons containing any predetermined number of cartons arranged in any preselected manner from cartons emanating from conventional carton forming and filling machinery and passing this final charge to a machine which will package the charge, by wrapping it or placing it in a large carton. Thus, it is now possible, where the number of cartons in either row in the final selected charge is not directly divisible by the number of feeding lines from the carton forming and filling machine, to have automatic high speed operation from carton forming to the packaging of a charge of cartons without material modification or redesign of either the carton forming and filling machine or the charge packaging machine.

This result is accomplished by this invention because of the concept that the final charge of cartons is formed by a plurality of separate groups of cartons and that each group is itself formed by the conjoint action of more than one segregating or selecting mechanism, each of which can be selectively rendered operative or inoperative during each group forming cycle in accordance with a preselected program. Thus, by varying the number of group forming cycles and by varying the number of segregating mechanisms which are rendered inoperative during particular group forming cycles, virtually unlimited flexibility in the size and arrangement of the final charge of cartons is possible.

Accordingly, it is an object of this invention to provide an apparatus for segregating a preselected number of

cartons and arranging them in a predetermined pattern to form one charge of cartons during each complete sequence of operation of the apparatus.

It is also an object of this invention to provide an apparatus in which each charge forming sequence of operation includes more than one carton selecting cycle of operation and which selects and moves a certain number of cartons during at least one such cycle and selects and moves less than said certain number of cartons during at least one other such cycle, the cartons selected and moved during all of such cycles in each sequence of operation combining to form a final carton charge containing a preselected number of cartons arranged in a predetermined manner.

It is a specific object of this invention to provide an apparatus having a plurality of selecting means, in which one or more of the selecting means, such as movable elevators, may be rendered inoperative during one or more carton selecting cycles in accordance with a desired predetermined program, so that each of said cycles can result in the selection of a certain number of cartons or in the selection of less than said certain number of cartons, the specific number of cartons selected during each of said cycles being determined by the number of selecting means which are operative and the number of selecting means which are inoperative during that particular cycle.

According to one aspect of this invention, the apparatus for arranging a selected number of cartons according to a predetermined pattern during each complete sequence of operation includes a plurality of selecting means movable from a first operating location to a second operating location spaced from the first. The cartons are fed in a plurality of rows to the selecting means at the first operating level. Actuating means are provided for each selecting means which serves to move the selecting means between the first and second locations. When the cartons are moved by the selecting means to the second operating location they are moved therefrom to another position. The actuating means are selectively energized according to a preselected program by a control means which serves to actuate all of the selecting means simultaneously during at least one cycle of operation of the selecting means while rendering at least one of the selecting means inoperative during at least one other cycle of operation. Each complete charge forming sequence of operation includes at least two cycles of operation of the selecting means.

According to a specific aspect of the invention, the selection of the cartons from the carton feed rows is accomplished by a plurality of vertically movable elevators which will move between the first and second locations or will remain at the first location during a particular cycle of operation depending on whether the moving means thereof is engaged or disengaged.

The foregoing and other objects, features and advantages hereof will become apparent from the following detailed description of an illustrative embodiment, while the new features of construction and operation which is claimed as the invention will be set forth more particularly in the appended claims. The detailed description refers to the accompanying drawings which form a part hereof and in which:

FIG. 1 is a schematic plan view showing the carton collecting and feeding arrangement of the apparatus of the invention;

FIG. 2 is a side elevational view of the apparatus of the invention which corresponds to a view looking from the left in FIG. 1, with certain parts being shown in cross-section and certain other parts being broken away;

FIG. 3 is a view similar to FIG. 2 showing a portion thereof in enlarged scale with the front plate completely removed and with other parts omitted for clarity; and

FIG. 4 is an end elevational view of the apparatus of the invention which corresponds to a view looking up from the bottom in FIG. 1, with certain parts being broken away.

The illustrative embodiment described hereinafter and shown in the drawings contemplates the collection and movement of a final carton charge which comprises forty-eight cartons arranged in three rows of sixteen cartons each from six carton feed lines. However, it is to be understood that the invention has broad utility for collection and moving many arrangements of different numbers of cartons from different numbers of feed lines.

Referring preliminarily to FIG. 1, which schematically illustrates carton collection and travel through the apparatus of the invention, it will be seen that individual cartons after being formed and filled on a packaging machine are fed into the apparatus of the invention in six laterally separated lines, the lateral separation being controlled by separating means such as guide bars (not illustrated in FIG. 1). They are conveyed to a position overlying the three elevators, E1, E2, E3, in which position the leading edge of the leading carton in each line contacts a stop S1. The top surface of each elevator is of a length such that its trailing edge is located exactly between the trailing edge of the third carton and the leading edge of the fourth carton when the leading edge of the first carton in the row is against stop S-1 and is of a width such that two rows of cartons are located between its side edges. Thus, each elevator is moved vertically so that its top surface moves from its location immediately below the bottom surface of the cartons being fed thereon to a location spaced above the first location and related thereto such that pusher P1, which is adapted to move the cartons from the raised elevators, is above the top surface of the cartons being fed to the elevators.

From the foregoing, it is clear that simultaneous raising of all three elevators from the lower level or location to the upper level or location, after the lead carton in each feed row has its leading edge engaging stop S1, results in the raising of eighteen cartons aranged in six rows of three cartons each to the upper level, where they are moved off of the elevators by pusher P1 to a position where the leading edge of the leading carton in each row engages stop S2. This arrangement of cartons is then moved in a direction transverse to the direction of the original carton feed by pusher P2 which, due to the fact that they are no separating means between the cartons when they are in this position, also serves to push the cartons into a compact group, the group at this stage containing eighteen cartons arranged in three rows of six cartons each. In the embodiment illustrated the first two elevator raising cycles form such a group, the two groups being pushed together by pusher P2 to form an arangement of thirty-six cartons comprising three rows of twelve cartons each.

In order to form a final charge of forty-eight cartons arranged in three rows of sixteen cartons each, it is necessary to add twelve cartons arranged in three rows of four cartons each to the arrangement formed after the completion of the second elevator raising cycle. This can be accomplished by the apparatus of the invention because the elevators may be rendered selectively inoperative during any desired elevator raising cycle. Thus, in order to complete the final charge, one of the elevators, E3 in the embodiment shown, is rendered inoperative during the third elevator raising cycle. This results in the raising, by elevators E1 and E2, of twelve cartons arranged in four rows of three each. The raised cartons are then moved by pusher P1 so that the leading edge of the leading carton in each row engages stop S2, pusher P1 having its lower edge above the upper surface of the cartons located on inoperative elevator E3. The twelve cartons moved by pusher P1 are then moved in a direction transverse to the direction of the original

carton feed, thereby forming a group of twelve cartons arranged in three rows of four cartons each which is compacted and pushed by pusher P2 against the groups formed during the first two elevator raising cycles. The apparatus has now formed the complete charge desired having forty-eight cartons arranged in three rows of sixteen cartons each.

The final charge is then moved (by means not illustrated in FIG. 1) so that the leading edge of the lead carton in each of the three rows contacts stop S3. When the charge reaches this position, it is moved by pusher P3 to a suitable cartoning or wrapping machine. One such wrapping machine which may be used with the apparatus of the invention is illustrated in the co-pending application of Arthur L. Fingerhut, Serial No. 2,177, filed January 13, 1960.

From the above description, it will be obvious to one familiar with the package collecting equipment field that the concept of this invention can be utilized to design apparatus which will form charges containing various numbers of cartons arranged in virtually any selected pattern by utilizing elevators of various sizes, a different number of elevators, more or less elevator raising cycles in each complete charge forming sequence of operation, or by rendering different elevators inoperative at various times during the sequence of operation, or by modifying two or more of these factors.

Reference will now be made to the remaining figures of the drawings which illustrate specific mechanisms and apparatus for accomplishing the operation outlined hereinabove. FIGS. 2 and 3 illustrate the mechanism for feeding the cartons to the elevators and the elevator moving and disengaging mechanisms.

The cartons are fed to the apparatus of the invention by a continuously driven endless belt 10 (only part of which is shown), which is trained around roller 11 at one end and an intermediate guide roll 12. The drive means for this belt may be of any conventional type. The cartons are moved to the right, as shown in FIG. 2, until the leading edge of the lead carton in each row engages stop surface 13. A plate 14 supports cartons between the front end of belt 10 and the elevators.

When the cartons are in position against stop surface 13, three cartons in each row overlie the top surface of the elevators and are in a first or lower location which is on a plane generally aligned with the top surface of belt 10 and plate 14. They are then in a condition to be raised by the elevators to a second or upper location which is on a plane generally aligned with the top surface of a transfer table 15. The cartons on the elevators at this second location are moved to the transfer table by pusher P1 which is carried by an endless chain of belt 16 trained around drive sprocket 17 and sprocket 18. Drive sprocket 17 is reciprocated by a chain or belt 19 which in turn has reciprocatory movement imparted thereto by sprocket or drive wheel 20. Slidingly and pivotally connected, as at 21, to wheel 20 at a point located between its axis and its periphery is a rocker arm 22 which is pivotally connected, as at 23, to a disc or wheel 24 rotatably connected to a shaft 25. Due to the relative locations of the pivoted ends of rocker arm 22 on the respective wheels 20 and 24 and the effective length of rocker arm 22, which may be adjusted if desired, constant rotation of shaft 25 and, therefore, of wheel 24 in one direction imparts a reciprocatory rotational movement to wheel 20 thus reciprocating pusher P1 through the intermediation of sprocket 17 and chain 19. Shaft 25 is caused to rotate in response to rotation of shaft 26 by meshing gears 27 and 28 fixed to shafts 25 and 26, respectively. Shaft 26 may be suitably connected to any conventional drive mechanism (not shown).

The elevator construction and the operating mechanism thereof shown in FIG. 2 and in more detail in FIG. 3, will now be described The elevators (only E1 being shown in FIGS. 2 and 3) include a smooth top surface

29 adapted to receive the cartons from belt 10 and a downwardly extending rear or trailing face 30 which serves as a stop surface, when the elevators are in their raised position, to prevent cartons from passing under the elevators. The elevator is supported by a vertical rod 31 which is slidingly mounted in a bearing assembly, generally designated as 32, so that rod 31 can move vertically. In order to prevent rotary movement of the elevator, guide rod 33 passing through an extension on bearing assembly 32 may be provided. Pivotally connected at 34 to the bottom of rod 31 is one end of a bar 35 which carries an elevator drive pin 36 near its other end. Bar 35 is continuously urged to the left (FIGS. 2 and 3) by a spring mechanism 37 pivotally connected at one end to bar 35 at pivot point 38 and pivotally connected at its other end to the frame of the machine at pivot point 39. Drive pin 36, which preferably extends through bar 35 is engaged on both sides of the bar by slots 40 formed in the ends of a bifurcated extension 41 connected to an arm 42 of a pivoted bell crank 43. An arm 44 of bell crank 43 which is on the other side of pivot shaft 45 from arm 42 carries a cam roller 46 at its free end. Cam roller or follower 46 travels in a cam groove 47 formed in a disc 48 which is connected to shaft 25 for rotation therewith.

As can be readily seen in FIG. 3 from a consideration of the legends placed on the cam groove in the drawings, the rotation of shaft 25 and cam disc 48 causes pivotal movement of bell crank 43 about pivot point 45 through the intermediation of cam roller 46. This pivotal movement of bell crank 43 serves to raise or lower bifurcated extension 41 thereby resulting in the raising or lowering of the elevator due to the action of rod 31, bar 35 and drive pin 36. The speed of ascent and descent of the elevators and the amount of dwell thereof at the upper and lower positions can readily be adjusted by the selection of a wheel having a suitable cam groove formed therein without interfering with the timed drive of the elevators and the pusher P1 due to the fact that they are both operatively connected to shaft 25.

In order to permit the selective disengagement of any of the elevators during any elevator operating cycle, i.e. one complete revolution of cam wheel 48, means are provided for pivoting bar 35 counterclockwise about point 34 against the action of spring 37 so as to remove pin 36 from the slots 40 in extension 41, thereby resulting in non-operation of the selected elevator during that particular lifting operation of bell crank 43. This disengaging mechanism includes a pin or cam follower 49 secured to each of the rods 35 and located between pivot point 34 and drive pin 40. Individual cam wheels 50 (only one of which is visible in the drawings) for each elevator are mounted on shaft 26 for rotation therewith. Each cam wheel 50 has a radial extension or cam surface 51 which engages pin 49 to pivot bar 35 in a counterclockwise direction against the action of spring 37 thereby removing pin 36 from slot 40. According to the specific example of the invention illustrated, shaft 26 makes one complete revolution for every three complete revolutions of shaft 25 and cam wheel 48. As previously described shafts 25 and 26 are drivingly connected through the intermediation of gears 27 and 28 thus resulting in the properly timed operation of pusher P1, the elevators and the elevator disengaging means.

Although, as mentioned above, the drawings illustrate one specific embodiment of the invention, it is clear that the invention has much broader aspects due to its adaptability to many situations by the proper selection and organization of the various elements such as: the number of elevators; the number of cam wheels 50; the location, dwell length and number of cam surfaces 51; the configuration of cam groove 47; the relative speed of rotation of shafts 25 and 26. Thus, the particular mechanisms shown in FIGS. 2 and 3 are useful in collecting and moving charges of cartons having various numbers of cartons therein arranged in different manners.

After the group of cartons formed during each elevating cycle is moved against stop S2 by pusher P1, it is then moved in a direction transverse to the direction of feed into the apparatus by a mechanism best illustrated in FIG. 4. Pusher P2 which is carried by chain or belt 52 reciprocates to compact the cartons and move them to the right (FIG. 4) during the feed part of its cycle. Reciprocating movement is imparted to chain 52 through the intermediation of drive sprocket or wheel 53, chain 54, drive sprocket or wheel 55, rocker arm 56, and member 57 which is mounted on continuously rotating shaft 58 for rotation therewith. The operation of this reciprocating mechanism is the same as that described hereinabove in respect of the drive of pusher P1. Gear 59 which is fixed to shaft 58 meshes with gear 60 on shaft 61 so that rotation of one of the shafts is imparted to the other at the desired relative speed. Also mounted on shaft 61 is a disc or wheel 62 carrying one end of a rocker arm 63. The other end of rocker arm 63 is secured to gear wheel or disc 64 thereby imparting reciprocatory movement to gear wheel 64, which reciprocatory movement is in turn transmitted to a pusher 65 carried by a chain 66 through the intermediation of sprockets 67, 68, 69 and 70, chain 71, and gear 72, in a manner similar to that described hereinabove in respect of the drive for pusher P1. Gear 72 and sprocket 70 are both connected to shaft 73 for rotation therewith while sprocket 67 and the drive sprocket for chain 66 are both connected to shaft 74 for rotation therewith.

Due to the fact that pusher 65 moves an entire charge against stop S3 for movement by pusher P3 and that pusher P2 must form the charge under chain 66 from the different groups advanced by pusher P1, chain 66 and pusher 65 carried thereby as well as sprocket 75 thereof are mounted in a frame assembly 82 which is pivotally mounted on shaft 74 so that it can be moved to a position where the bottom of pusher 65 is above the tops of the cartons being advanced by pusher P2. The mechanism for pivoting the frame assembly in timed relation to the operation of pusher P2 includes a belt or chain 76 which is driven by shaft 61. The other end of belt 76 drivingly engages pulley or sprocket 77 to rotate shaft 78 which in turn causes rotation of cam disc 79, fixed to shaft 78. Mounted on the frame assembly between shaft 74 and sprocket 75 is a supporting plate 80 carrying a cam follower or roller 81 which rides on the cam face of disc 79. Thus, as shaft 78 rotates the camming surface of disc 79 forces roller 81 upwardly thereby pivoting the frame assembly about shaft 74 in a clockwise direction, to its FIG. 4 dotted line position, so that pusher 65 will be above the tops of the cartons during its return stroke. Shaft 61, which serves to drive pusher P1, pusher 65 and to lift frame assembly 82, is suitably connected to the main drive of the apparatus for timed operation of these elements in relation to the operation of the elevators and pusher P1.

While the present invention has been described with particular reference to a specific example, it is not to be limited thereby, but reference is to be had to the appended claims for a definition of its scope.

What is claimed is:

1. In a device for arranging a selected number of cartons according to a predetermined pattern during each complete sequence of operation, comprising a plurality of horizontally disposed platforms movable from a first operating location to a second operating location spaced from said first operating location, means for feeding a plurality of cartons to each of said platforms at said first operating location, individual actuating means for each platform adapted to move its respective platform between said first and second operating locations, means for moving any cartons on any of said platforms positioned at said second operating location during each operating cycle of said actuating means, and individual control means for each of said actuating means for selectively energizing said actuating means during each

cycle according to a preselected program so that during certain cycles of operation all of the platforms are moved simultaneously while during certain other cycles of operation at least one of the actuating means will be rendered inoperative, each complete sequence of operation comprising at least two cycles of operation of said actuating means.

2. In a device for arranging a selected number of cartons according to a predetermined pattern during each complete sequence of operation, comprising a plurality of horizontally disposed platforms movable from a first operating location to a second operating location spaced from said first operating location, means for feeding a plurality of cartons to each of said platforms at said first operating location, individual actuating means for each platform adapted to move its respective platform between said first and second operating locations, means for moving any cartons on any of said platforms positioned at said second operating location during each operating cycle of said actuating means, said moving means being located so as to avoid contact with any cartons at said first operating location, means for energizing said actuating means during each cycle of operation, and individual means for each of said actuating means for selectively disengaging said actuating means from said energizing means, said energizing means and said disengaging means operating according to a preselected program so that during certain cycles of operation all of the selecting means are moved simultaneously while during certain other cycles of operation at least one of the actuating means will be disengaged, each complete sequence of operation comprising at least two cycles of operation of said actuating means.

3. In a device for arranging a selected number of cartons according to a predetermined pattern during each complete sequence of operation, comprising a plurality of elevators movable in a vertical direction between a first operating level and a second operating level spaced from said first operating level a distance greater than the vertical dimension of said cartons, means for feeding a plurality of cartons in a plurality of rows to each of said elevators at said first operating level, individual elevator moving means for each elevator adapted to move its respective elevator between said first and second operating levels, horizontally movable means for pushing cartons off of any elevators at said second operating level during each operating cycle of said elevator moving means, said pushing means being located so as to avoid contact with any cartons at said first operating level, and individual control means for each of said elevator moving means for selectively actuating said elevator moving means during each cycle according to a preselected program so that during certain cycles of operation all of the elevators are moved simultaneously while during at least one other cycle of operation at least one of the elevator moving means will be rendered inoperative, each complete sequence of operation comprising at least two cycles of operation of the elevator moving means.

4. In a device for arranging a selected number of cartons according to a predetermined pattern during each complete sequence of operation, comprising a plurality of elevators movable in a vertical direction between a first operating level and a second operating level, means for feeding a plurality of cartons in a plurality of rows to each of said elevators at said first operating level, individual elevator moving means for each elevator adapted to move its respective elevator between said first and second operating levels, horizontally movable means for pushing cartons off of any elevators at said second operating level during each operating cycle of said elevator moving means, said pushing means being located so as to avoid contact with any cartons at said first operating level, individual means for each of said elevator moving means for actuating said elevator moving means, and individual means for each of said elevator moving means for selectively disengaging said elevator moving means, said actuating means and said disengaging means operating according to a preselected program so that during certain cycles of operation all of the elevators are moved simultaneously while during at least one other cycle of operation at least one of the elevator moving means will be rendered inoperative, each complete sequence of operation comprising at least two cycles of operation of the elevator moving means.

5. The combination of claim 4, in which said elevator moving means includes a vertically movable pivoted elevator rod connected to said elevator; said actuating means includes a pivoted lever normally operatively connected to said elevator rod and means for pivoting said lever to cause reciprocatory vertical movement of said elevator rod; and said disengaging means includes a rotating abutment which pivots said elevator rod away from said lever once during each sequence of operation.

6. The combination of claim 4, in which said elevator moving means includes a vertically movable pivoted elevator rod connected to said elevator and having a drive pin thereon; said actuating means includes a cam wheel which makes one complete revolution for each cycle of operation and a pivoted lever having a cam follower on one side of said pivot which engages said cam so that said lever pivots in response to rotation of said cam, and drive pin engaging means on the other side of said pivot normally operatively connected to said drive pin to move said elevator rod vertically upon pivoting of said lever; and said disengaging means includes a rotating wheel having an abutment thereon which engages said elevator rod between its pivot and said pin once during each sequence of operation so as to pivot said rod away from said drive pin engaging means thereby disengaging the respective actuating means.

7. In a device for arranging a selected number of cartons according to a predetermined pattern during each complete sequence of operation, comprising three elevators vertically movable from a lower operating level to an upper operating level, means for feeding a plurality of cartons in a plurality of rows to each elevator at said lower operating level, individual elevator moving means for each elevator adapted to move its respective elevator between said lower and upper operating levels, horizontally movable means for pushing cartons off of any elevators at said upper operating level during each operating cycle of said elevator moving means, said pushing means being located so as to avoid contact with any cartons on any elevators at said lower operating level, lever means for actuating said elevator moving means during each cycle, and means for selectively disengaging each of said elevator moving means from its respective elevator according to a preselected program, so that during the first two cycles of operation all of the elevators are moved simultaneously while during the third cycle of operation one of the elevator moving means will be rendered inoperative, each complete sequence of operation comprising three cycles of operation of the elevator moving means.

8. The combination of claim 7, and further including stop means at said lower operating level for preventing movement of cartons beyond the leading edge of the elevators, and second stop means at the trailing edge of the elevators and extending below the top surface thereof for preventing movement of cartons at said lower operating level beyond said trailing edge during vertical movement of the elevators.

9. In a device for arranging forty-eight cartons in three rows of sixteen cartons each from a delivery feed in six rows during each complete sequence of operation, comprising three elevators movable from a lower operating level to an upper operating level, each elevator being adapted to support six cartons in two rows of three each, means for feeding two rows of cartons to each

elevator at said lower operating level, individual elevator moving means for each elevator adapted to move its respective elevator between said lower and upper operating levels, horizontally movable means for pushing cartons off of any elevators at said upper operating level during each operating cycle of said elevator moving means, said pushing means being located so as to avoid contact with any cartons at said first operating level, control means for selectively actuating all of said elevator moving means during the first two cycles of operation and for actuating two elevator moving means during the third cycle of operation so that during the first two cycles a group of eighteen cartons arranged in six rows of three each are raised and during the third cycle a group of

twelve cartons arranged in four rows of three each are raised, and conveying means at said upper operating level for receiving cartons moved from said elevators by said pusher means and for moving each group of cartons in a direction transverse to said delivery feed, said conveying means traveling in a carton feed direction after each group of cartons has been pushed off of said elevators by said pushing means.

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