

March 13, 1962

N. T. PIERCE

3,024,944

ARTICLE HANDLING APPARATUS

Filed Aug. 13, 1959

6 Sheets-Sheet 1

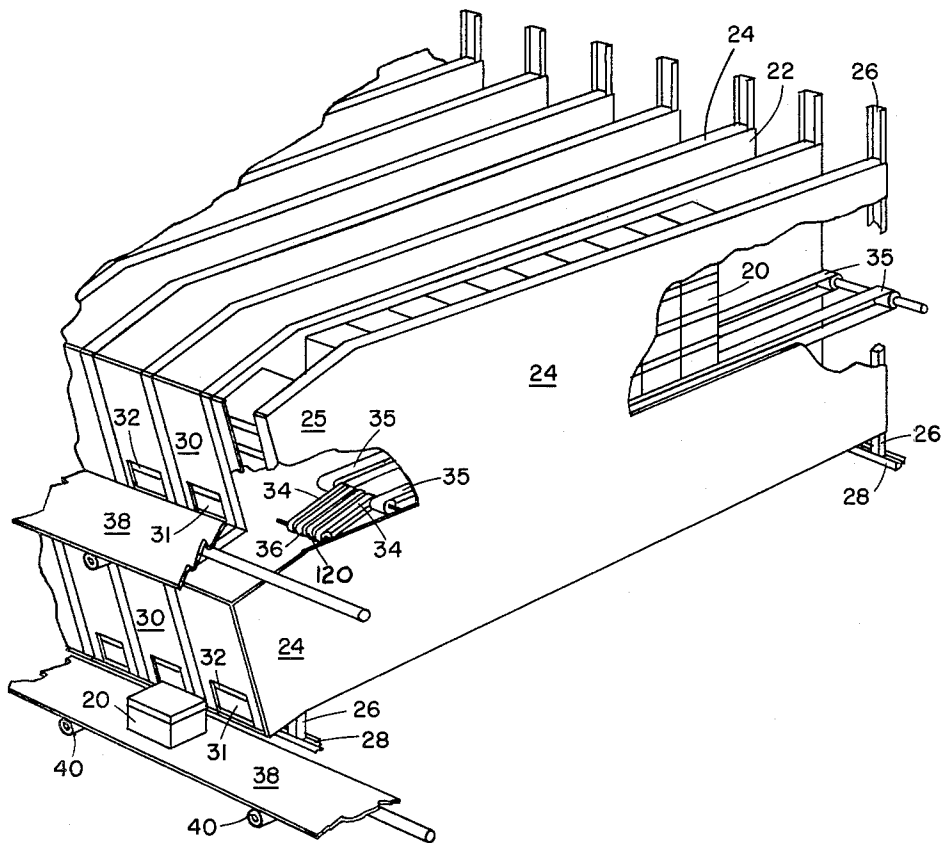


Fig. 1

Norton T. Pierce *INVENTOR.*

BY Bessie A. Lippert
Attorney

March 13, 1962

N. T. PIERCE

3,024,944

ARTICLE HANDLING APPARATUS

Filed Aug. 13, 1959

6 Sheets-Sheet 2

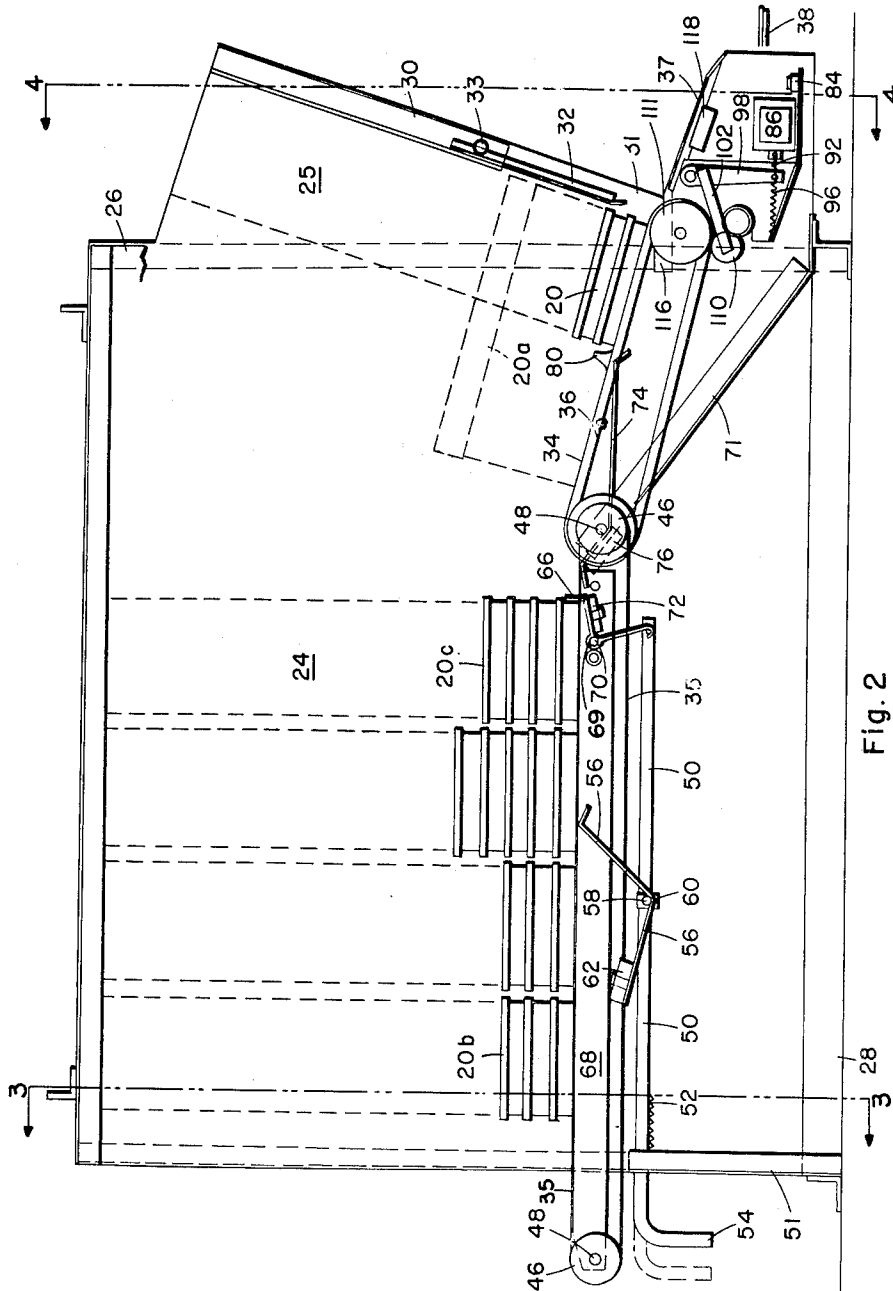


Fig. 2

Norton T. Pierce INVENTOR.

BY

Bernie A. Lyman
Attorney

March 13, 1962

N. T. PIERCE

3,024,944

ARTICLE HANDLING APPARATUS

Filed Aug. 13, 1959

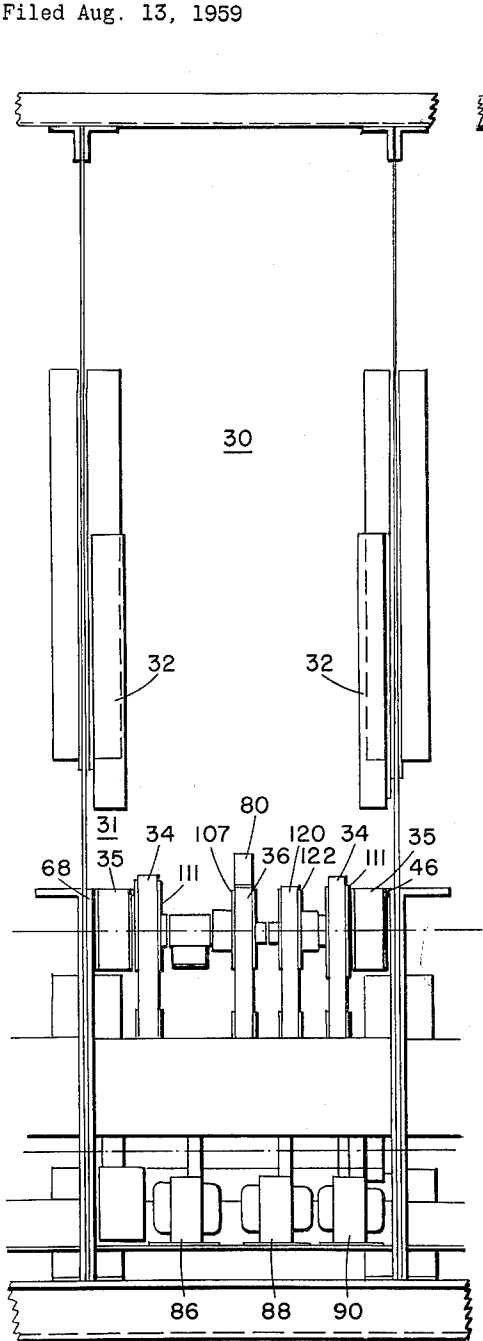


Fig. 4

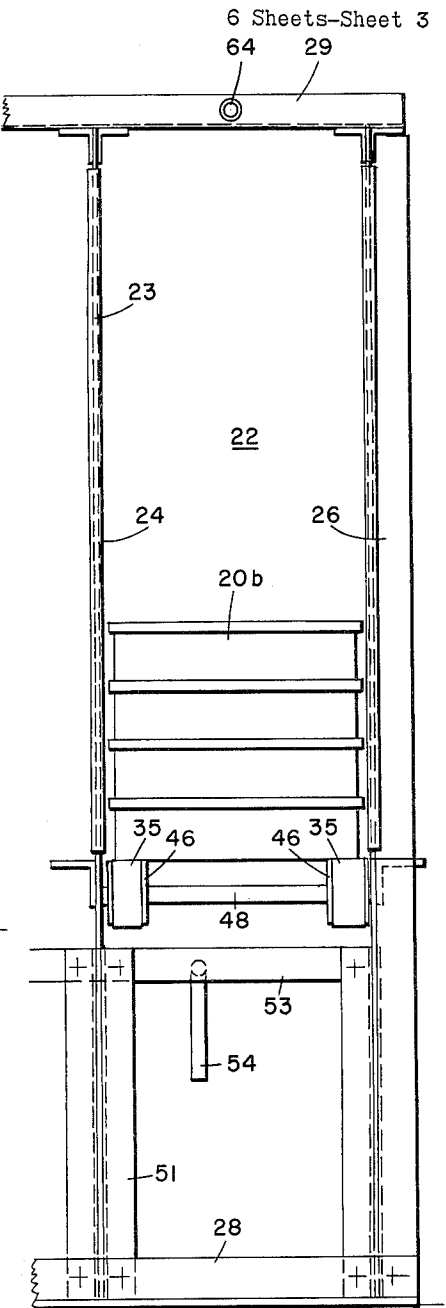


Fig. 3

Norton T. Pierce INVENTOR.

BY *Bernie G. Lippner*
Attorney

March 13, 1962

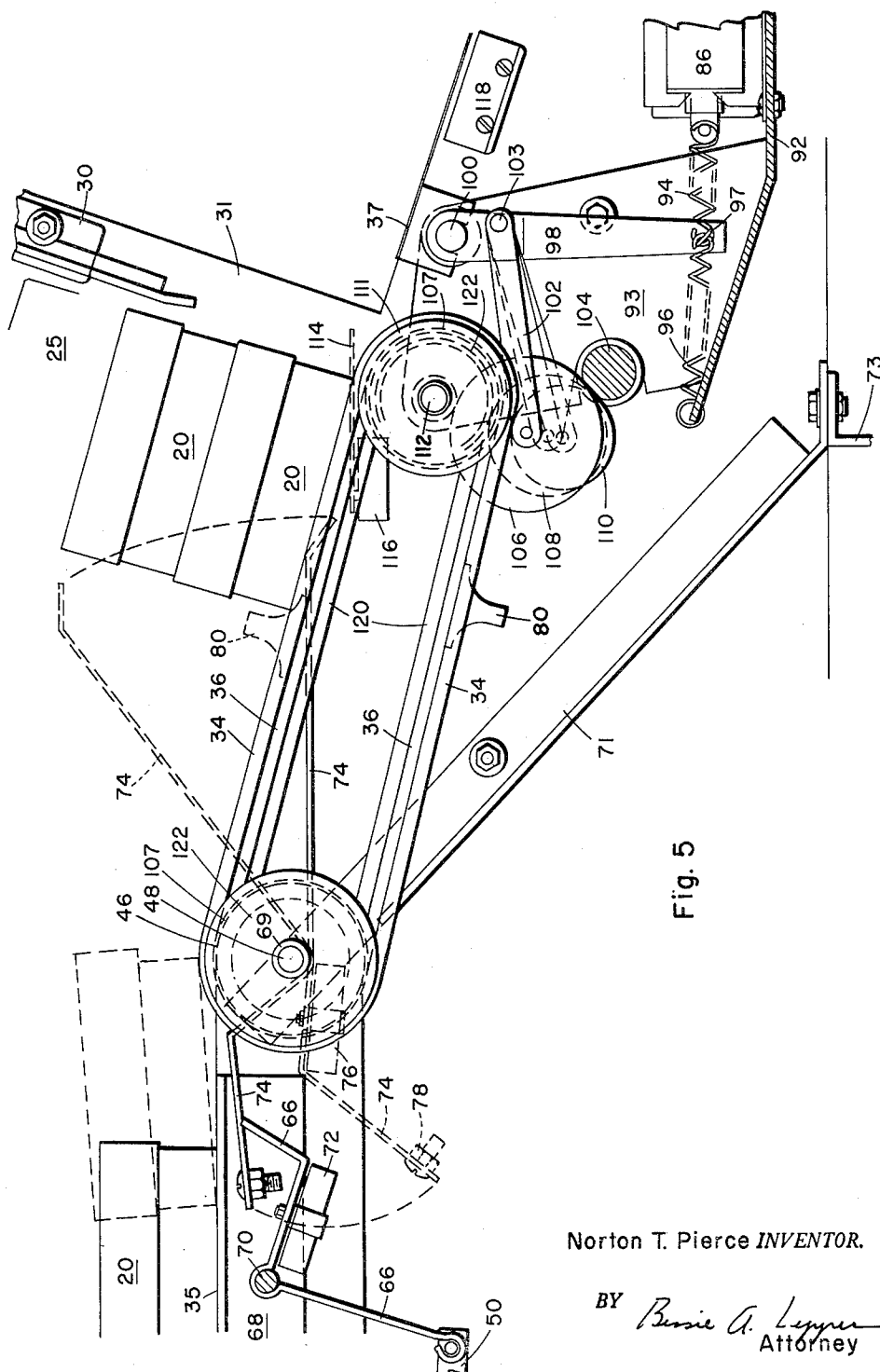
N. T. PIERCE

3,024,944

ARTICLE HANDLING APPARATUS

Filed Aug. 13, 1959

6 Sheets-Sheet 4



March 13, 1962

N. T. PIERCE

3,024,944

ARTICLE HANDLING APPARATUS

Filed Aug. 13, 1959

6 Sheets-Sheet 5

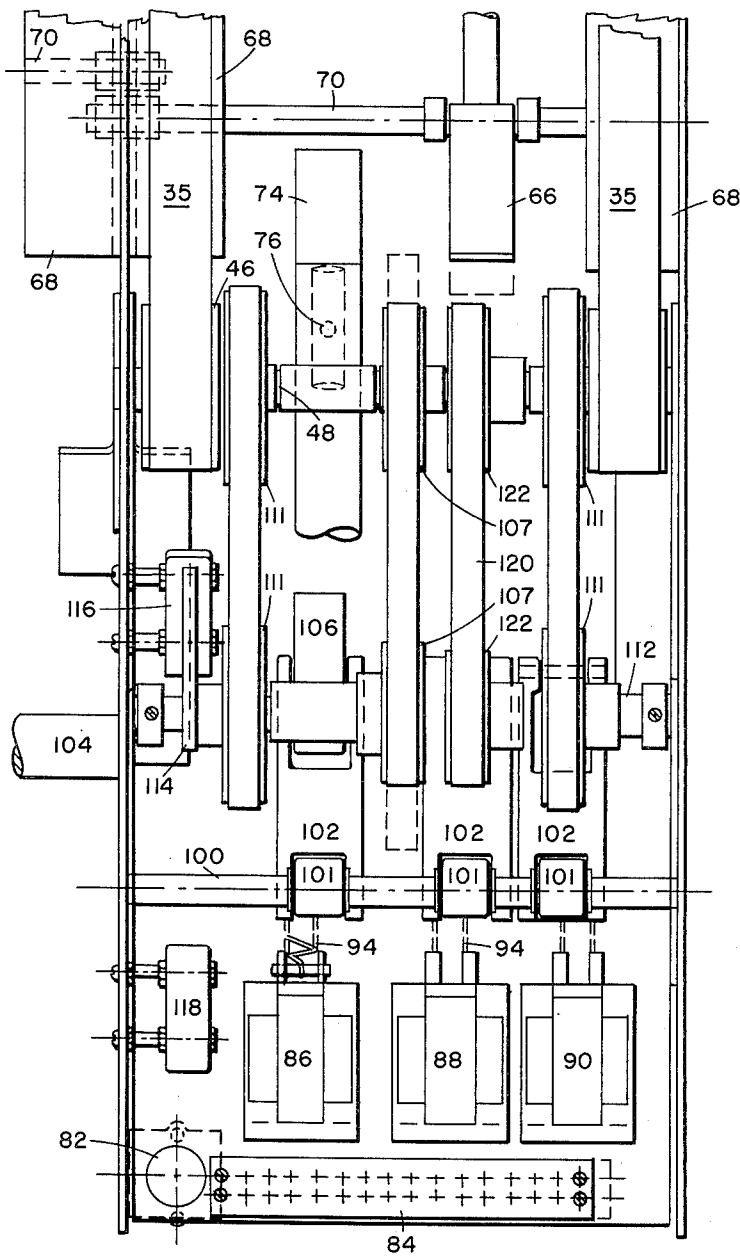


Fig. 6

Norton T. Pierce INVENTOR.

BY

Bernie A. Lyman
Attorney

March 13, 1962

N. T. PIERCE

3,024,944

ARTICLE HANDLING APPARATUS

Filed Aug. 13, 1959

6 Sheets-Sheet 6

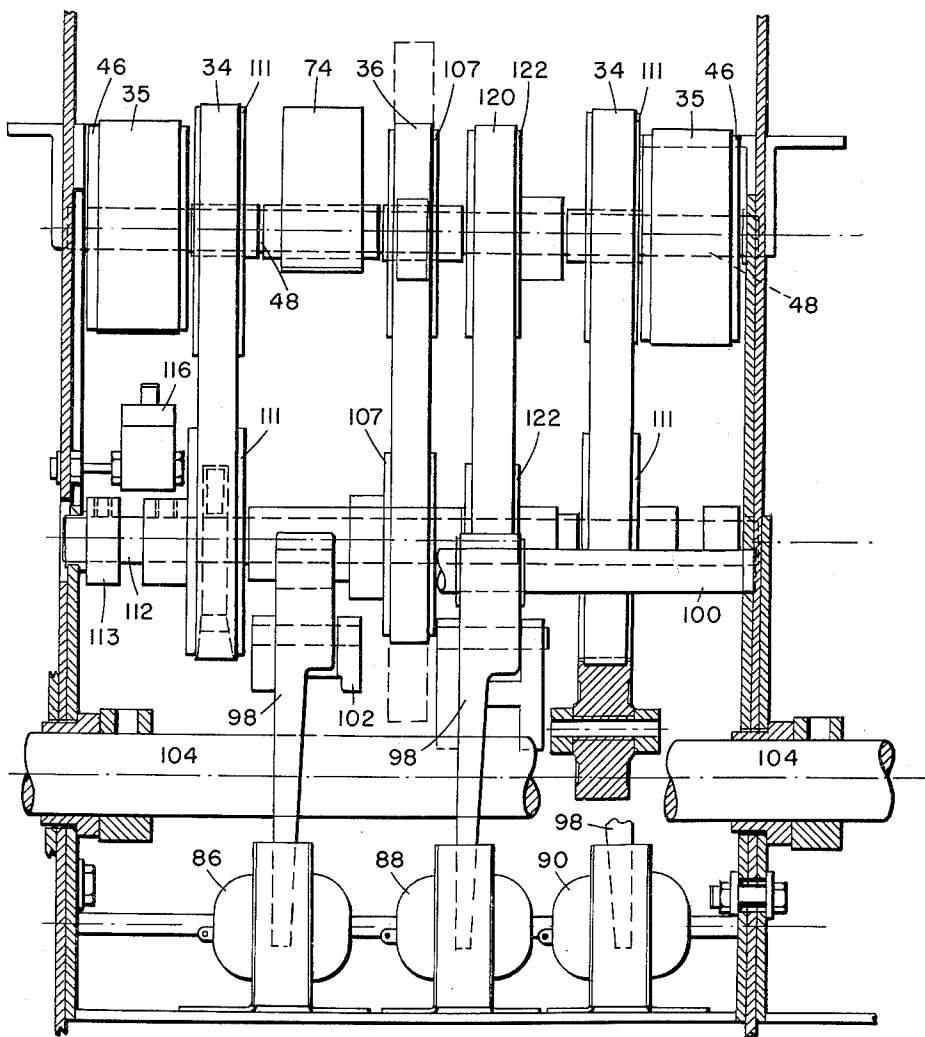


Fig. 7

Norton T. Pierce INVENTOR.

BY *Bernie G. Lippner*
Attorney

1

3,024,944

ARTICLE HANDLING APPARATUS

Norton T. Pierce, Concord, Mass., assignor to Arthur D. Little, Inc., Cambridge, Mass., a corporation of Massachusetts

Filed Aug. 13, 1959, Ser. No. 833,569

11 Claims. (Cl. 221-11)

This invention relates to article handling apparatus and more particularly to apparatus for handling items which are normally handled in boxes in a manner to deliver such boxes rapidly to a predetermined point which may be remote from the point at which they are normally stored.

In handling merchandise which is normally sold in boxes the delivery of orders to a predetermined point may be materially expedited if means and apparatus are available whereby the desired quantity of such boxes can be delivered mechanically and selections made according to size of box, contents therein, or any other box variable.

In handling merchandise contained in boxes it is customary to stack the boxes in a storage warehouse or other like location and to fill orders therefrom by manually selecting the desired quantity of box sizes or box content for delivery to a specified point. It can be appreciated that this is a somewhat tedious and expensive method of selection and delivery. It would therefore be desirable to have an apparatus which would be capable of translating signals, whether given manually or automatically, into the delivery of specified articles.

It is therefore an object of this invention to provide apparatus for the rapid handling and delivering of boxes according to a predetermined or programmed selection, whether the selection depends upon the box size, content or other variable. It is another object of this invention to provide apparatus of this character which is flexible as to design, adaptable to a wide variety of box sizes and capable of handling boxes of any size or shape. It is another object of this invention to provide automatic programmed delivery of boxes from a storage space such as a warehouse. It is another object of this invention to provide apparatus of the aforementioned character which achieves rapid, safe handling of boxed merchandise. These and other objects will become apparent in the detailed description which follows.

According to this invention boxed articles are placed in channels or passageways according to the manner in which they are to be identified or selected. That is, they may be stored according to the size of box or contents of the merchandise within the box, or both. Delivery of the desired quantity and selection of boxes is then achieved by generating signals which actuate mechanisms to transfer boxes first to the delivery end of the passageway, remove the boxes one by one from this delivery end and place them upon any convenient conveyor mechanism which finally conveys the boxes in the selected sequence to a predetermined point which may be remote from the place of storage.

The movement of the boxes to the final conveying means is achieved in what may be considered three distinct steps. The first of these is the step of moving a box or stack of boxes through an essentially horizontal plane within the channel or passageway to a point where the box or stack is temporarily located until it is time for the stack to move up to the next step. The second step may be defined as one of moving the box stack a limited distance on an inclined delivery belt and controlling its position at a foremost location for delivery of the bottom box to a conveyor means. The third step is that of kicking or expelling the bottom box of the stack onto an inclined apron or ramp with sufficient force to move it to any suit-

2

able conveying means which brings it to the predetermined delivery point.

The apparatus of this invention which accomplishes these three steps, and hence achieves the above objects, may be defined as a device adapted to deliver one-by-one a selected number of objects, comprising two parallel walls defining a passageway having a receiving end and a delivery end, the passageway being arranged for passage therethrough of the objects, arranged normally in the form of a series of contiguous stacks, from the receiving end to the delivery end, from which latter end they are discharged; conveyor means defining the bottom of the passageway and adapted to move a plurality of objects or stacks of objects from the receiving end to the delivery end; the conveyor means comprising a first section arranged substantially horizontally at the receiving end, and a second section tilting downwardly at the delivery end whereby to tilt the forward stack of objects out of the vertical and away from the succeeding stacks; retaining means associated with the walls at the delivery end adapted to retain the objects in the tilted stack from falling forward; the retaining means being adjustable with respect to the distance between the lower end thereof and the second section of the conveyor means; means associated with the second section of the conveyor means whereby to deliver the objects one-by-one from the bottom of the forward stack; and means for advancing the first section of said conveyor means, thereby to move the next contiguous stack of objects onto the second section of the conveyor means, as soon as the precedent forward stack of objects has been exhausted.

The apparatus of this invention may be more fully described with reference to the accompanying drawings in which:

FIG. 1 is a perspective view of a typical embodiment of the apparatus;

FIG. 2 is a side-plan view of the apparatus;

FIG. 3 is a cross-sectional view of the apparatus taken along lines 3-3 of FIG. 2 showing the after end in which the stacks of boxes are placed;

FIG. 4 is a cross-sectional view taken along lines 4-4 of FIG. 2 showing the forward end of the apparatus;

FIG. 5 is a side-plan view in detail of the forward end illustrating the mechanism by which the boxes are delivered;

FIG. 6 is a top-plan view of the delivery portion of the apparatus of FIG. 5; and

FIG. 7 is a vertical sectional view of the apparatus.

With reference to FIG. 1, it will be seen that boxes 20 are placed in stacks in a feeding passageway 22 which is defined by walls 24 supported in any suitable manner such as by vertical support 26 and horizontal supports 28.

Defining the forward or delivery end of the passageway 22 is a front stack support 30 which has at the bottom thereof an opening 31, the height of which is adjustable by means of gate 32 to accommodate the passage of boxes of the height currently being delivered through the passageway. The adjustment of the gate 32 will be further described with reference to FIG. 2 below.

The boxes are transported from the after or loading end of the passageway 22 to the forward delivery end by means of an endless transfer belt 35 which may, if desired, be constructed from a surface offering a minimum amount of friction to the boxes resting thereon. Endless transfer belt 35 delivers the stack of boxes to delivery belts 34, and a kick drive belt 36 when actuated as described below, forces the bottom box from the stack through opening 31 onto a movable conveyor belt 38 which may be any convenient type of belt maintained on a suitable support such as rollers 40. Between the opening 31 and the movable conveyor belt 38 there may be

3

an inclined extension or apron ramp 37 as shown in FIG. 2.

Any number of such passageways with accompanying mechanisms may be used and they may, of course, vary in width, depth and length according to the number, size and shape of boxes to be delivered. Furthermore, one passageway or a plurality of adjacent passageways may be placed in a tier arrangement as illustrated in FIG. 1.

In FIGS. 2, 3, and 4 there is shown the apparatus by which boxes either singly or in stacks are moved in essentially a horizontal plane to the point where they are delivered to the inclined delivery portion of the apparatus. The right-hand portion of FIG. 2 is shown in detail in FIG. 5 and discussed below with reference to FIG. 5.

It is the purpose of the mechanism of FIG. 2, up to the inclined delivery section, to transport boxes up to a point where they may be picked up by the delivery belt 34 after the last box in the forwardmost stack has been kicked out onto the conveyor belt 38. The mechanism of FIG. 2 also provides a system which indicates when a stack of boxes in the passageway passes a predetermined point, thus serving as a warning that additional boxes are required at the loading end of the passageway. Finally, the mechanism of FIG. 2 making up that portion of the apparatus responsible for horizontal movement of the boxes provides means by which the boxes or stacks of boxes may be pushed forward to the delivery ramp either manually or automatically.

In FIG. 2 the transfer belt 35 supported by a belt support 68 is driven around forward and after pulleys 46 which are mounted on suitable shafts 48. The actual driving of the transfer belt mechanism is accomplished from a main drive shaft through transfer belt drive as shown in connection with FIG. 5. This transfer belt drive may in turn be manually or automatically actuated and controlled, the manual portion of the control being illustrated in FIG. 2. The automatic moving of the boxes by the forward movement of transfer belt 35 is described below in connection with FIG. 5.

In loading the stacks of boxes at the loading end of the apparatus it is possible to advance stacks of boxes on the transfer belt 35 in one of two ways. First they may be pushed in, the pushing on the end stack serving to advance all the preceding stacks along the transfer belt (while it remains motionless) until the forward stack reaches the position from which it will eventually be picked up by the delivery belt 34. Where this system of loading is used it is preferable to use transfer belts, the surface of which offers little resistance to the boxes being pushed over them. A material exhibiting a minimum surface friction such as a filled Teflon is therefore desirable on the transfer belts, particularly if stacks of boxes are to be pushed manually up to the delivery belt.

Under certain circumstances, however, it may be more desirable to place a stack of boxes on the transfer belts at the loading end and cause the stack to be advanced within the passageway by manually actuating the transfer belts to move them forward a short distance in order that another stack may be loaded in. Thus, if there is considerable friction developed between the box surface and the transfer belt surface, or if the passageway is exceedingly long and pushing the boxes forward is not feasible, the manual actuation of the transport belt is to be desired.

In order to provide for manual actuation of transfer belts 35, the apparatus illustrated in FIG. 2 may be included. This apparatus comprises a latch 66 which is conveniently a thin metal piece pivotally mounted on a pin 70 through sleeve 69 and normally positioned in a downward position so that latch 66 offers no barrier to the passage of boxes. A mercury tilt switch 72 is located on the latch 66 in such a position that when the latch is manually raised, a circuit will be completed to cause the transfer belt drive to be engaged and hence to

4

move a stack of boxes forward. The terminal end of latch 66 is attached to a latch actuator 50 which in turn is equipped with a solenoid return spring 52 (at the loading end) and which terminates in a suitable handle 54 allowing for the necessary manual operation of latch 66. Suitable braces and mounting supports are supplied to support the latch actuator such as back brace 51 and back cross brace 53 (FIG. 3).

In operation, a stack of boxes is placed on the transfer belt at the loading end, as shown at 20b, and then handle 54 is pushed forward to the position shown in solid lines in FIG. 2. This moves latch 66 upwardly and at the same time permits mercury switch 72 to complete the circuit to energize a transfer belt drive solenoid. Energization of the solenoid causes the transfer belts to move forward for as long as the latch is held in the position shown in FIG. 2. At the same time the position of latch 66 prevents any stack of boxes 20c from being transported on the delivery belt prematurely. The transfer belts are free to slip under the stacks already in place.

Gate 32 is adjusted to permit passage of boxes of the size to be delivered. With gate 32 in the position shown, it will accommodate the passage of the height of boxes 20. To accommodate boxes of other sizes, e.g., such as 20a shown in dotted lines, locking member 33 is released, gate 32 is adjusted to provide the desired opening 31, and member 33 is tightened to hold gate 32 in place.

An indicator arm 56 designed to indicate the passing of a terminal stack of boxes beyond a predetermined point is shown in FIG. 2 to be slidably mounted on the latch actuator 50. Mounting is accomplished through pivot pin 58 and horizontal adjustable bar 60, the latter being movable on latch actuator 50 whereby indicator arm 56 may be placed anywhere along the transfer belt 35 depending upon the time or type of indication of box location desired. Although this is a convenient way of mounting indicator arm 56, it may of course be mounted in any suitable manner. Preferably mounting is accomplished so that its position along the passageway may be easily changed.

Attached to the after end of indicator arm 56 is a mercury tilt switch 62 which is connected electrically to a candelabra warning lamp 64 (FIG. 3) placed in the top back horizontal support 29. The connections are such that when tilt switch 62, serving as a counterweight for indicator arm 56, is permitted to swing downwardly a circuit is completed and a signal passes to lamp 64 causing it to flash a warning signal to indicate that the box or stack has passed the set position of indicator arm 56.

Referring now to FIGS. 5, 6 and 7 the apparatus by which the box or stack of boxes is delivered to the delivery belt and the bottom box kicked to the conveying belt is shown in detail. This apparatus is mounted on an inclined plane on suitable frames 71 and brace 73. In order to make the final delivery of the box, it is necessary to exercise control over the delivery of the stacks from the transport belt to the inclined delivery belt. This is accomplished through drive switch arm 74 on which is located a mercury switch 76 and a counter weight 78. When a box or stack of boxes is in the normal feeding position such as shown in FIG. 5, drive switch arm 74 is held in the position indicated by the solid lines. However, when the last box has been kicked out drive switch arm 74 is free to swing upward through an arc indicated by the dotted lines. In its movement through this arc the mercury switch 76 is actuated to complete an electric circuit which actuates a transfer belt drive to push the next stack onto the delivery belt and hence effects the moving of another stack of boxes down the delivery belt into position which permits another box to be kicked out through opening 31. As soon as the next succeeding stack is transferred to delivery belt 34, the drive switch arm 74 is lowered, the switch opens and the transfer belt drive is disengaged.

5

The actual movement of the box through opening 31 is achieved by a kicker 80 which is permanently affixed at one point on the endless kicker belt 36. In FIG. 5 the kicker 80 drawn in solid lines represents its normal position while that shown in dotted lines shows it just prior to the act of kicking out the bottom box of the stack.

Signals for delivery of a box are given to the apparatus through a relay 82 and imparted to the various solenoids through an electrical terminal block 84 (see FIG. 6). The actuation of the kick belt, transfer belt drive and delivery belt are achieved through solenoids 86, 88 and 90, respectively. These solenoids are supported upon a drive box bottom plate 92. Each of the solenoids is of a standard type and each is equipped with an actuating spring 94 and a return spring 96. Each of the springs is in turn anchored at one end by means of an anchoring pin 97 on an arm 98 which in turn is pivotally mounted on a vertical mounting plate 93 through pin 100. Pivotally attached to each arm 98 is yoke 102 through any suitable attaching pin such as 103. Each of the three solenoids 86, 88 and 90 is mounted and operates through springs, an arm and yoke as shown for solenoid 86 in FIG. 5.

All of the belts are driven by main power drive shaft 104 in the manner described below. Associated with yoke 102 of the kick drive solenoid assembly is friction tire 106 which is pulled into engagement with main drive shaft 104 when solenoid 86 is activated by a signal transmitted to the apparatus to deliver a box. Likewise transfer belt drive wheel 108 is associated with transfer belt solenoid 88 and the friction wheel 110 is associated with delivery belt solenoid 90. Suitable pulleys such as 111 for the delivery belt, 107 for the kick belt and 122 for the transfer belt driving mechanism are provided and mounted on a pulley shaft 112 through suitable bearings 113. If a plurality of delivery channels such as the one illustrated in FIG. 6 are to be set up adjacent each other, then the pivot shafts 70 are staggered for the adjacent channels as illustrated in FIG. 6.

Located at the delivery exit is a limit switch 116 which is equipped with actuator arm 114. A second limit switch 118 which is wired in series with limit switch 116 is provided at a point of contact with the apron ramp 37. The primary purpose of limit switch 116 is to momentarily open the circuit to relay 82 to inactivate the kick drive solenoid and allow the kick belt to travel under its own momentum and place the kicker in the normal, inactive position as shown in solid lines in FIG. 5.

Limit switch 118 located on the apron ramp 37 is designed to prevent the kick drive solenoid from being actuated if a box is resting on apron ramp 37. Thus it serves as a means of preventing a box from being kicked out if the preceding one has not been moved onto the conveyor belt. It does this because it is wired in series with relay 82 in a manner to prevent signals from reaching kick drive solenoid 86 when a box rests upon it.

Limit switches 116 and 118 are, as noted above, wired in series. This arrangement is designed to prevent the movement of the delivery belt so long as there is a box in the forwardmost position to be kicked out. Immediately after a box is kicked out actuator arm 114 comes up and it would normally actuate the delivery belt by way of limit switch 116. If, however, another box falls into place, it is desired to prevent any forward movement of the delivery belt. Thus, having limit switches 116 and 118 in series acts as an effective interlock of switch 116 to prevent the delivery belt from operating after each time a box is kicked out. Only when both limit switch 116 and limit switch 118 are energized, can a signal be sent to the delivery belt solenoid.

In order to describe the way in which the apparatus of this invention functions it is convenient to begin such a description with the kicking forward of a box such as the bottom box 20 from the position shown in FIG. 5. It will be seen in this description of the function of the ap-

6

paratus that a signal to kick out a box actuates the mechanisms by which the apparatus works.

Assume a stack of boxes in the position shown in FIG. 5. An electric signal is given to the mechanism associated with a passageway which contains the box desired to be delivered. A signal comes into the system by way of relay 82 through terminal box 84 and is transmitted to kick belt solenoid 86. The signal may be given manually by closing a switch or it may be given by any suitable electric device which may, if desired, program delivery of boxes.

A signaling to relay station 82 activates kick solenoid 86 which in turn exerts force upon actuating spring 94 thus pulling arm 98 forward along with its associated yoke 102. Yoke 102 then pulls the friction tire 106 into engagement with the power drive shaft 104, which as explained above, is the main driving shaft of the apparatus. Shaft 104 is, in turn, driven by any suitable motor not shown. The engagement of friction tire 106 with main power shaft 104 in turn drives the kick drive belt 36 and in doing so brings kicker 80 into position to force the bottom box 20 out through opening 31 onto apron ramp 37. The force at which the box is kicked out is sufficient to propel it down ramp 37 onto a conveyor belt 38. When box 20 has passed through opening 31, limit switch 116 momentarily opens the circuit to relay 82, which in turn inactivates kick drive solenoid 86. Return spring 96 associated with the kick drive solenoid 86 returns arm 98, yoke 102 and hence friction wheel 106 into a disengaged position while the next box in the stack falls into place. The kicker 80 on belt 36, under its own momentum, passes around pulley 107 to come to rest under the inclined plane.

When the last box of the stack has been kicked out through successive activations of the kick drive solenoid 86, it is necessary to bring up another stack of boxes from the transport belt, down the delivery belt and into the forward position for the bottom box of the stack to be kicked out. This is accomplished by means of the drive switch arm 74. When the last box in a stack has been expelled, drive switch arm 74 swings up by virtue of the mercury switch 76 and counterweight 78. As the mercury switch 76 is tilted it completes a circuit which in turn starts up the drive for the transfer belt 35. This is accomplished by the activation of transfer belt solenoid 88 which through an activating spring 94, arm 98 and a yoke 102 causes the transfer belt drive wheel 108 to engage the main drive shaft 104. The transfer drive belt 120 in turn, through pulleys 122, drives shaft 48 and hence pulleys 46 which start up the transfer belt 35. This serves to move all of the stacks on the transfer belt forward until the first stack has been moved sufficiently forward to tilt drive arm 74 into position shown in FIG. 5 and to supply another stack of boxes to the delivery belt 34. The return of drive arm 74 to an essentially horizontal position opens the circuit and permits the return spring 96 associated with transfer belt drive solenoid 88 to disengage drive wheel 108 from main shaft 104.

Finally there is provided a delivery belt drive control which is operated through switch arm 114 which is associated with limit switch 116. When there are no more boxes in position to be kicked out, limit switch 114 travels upwardly by virtue of a spring inside (not shown) limit switch 116.

Limit switch 116 in turn then completes a circuit to activate the delivery drive belt solenoid 90 to carry the first stack of boxes down to the delivery position. This is accomplished through essentially the same type of arrangement, i.e., delivery belt solenoid 90, when activated engages friction wheel 110 with main drive shaft 104 and in turn drives pulley 111 to drive delivery belts 34. As soon as a stack of boxes reaches the delivery position and rests on switch arm 114, limit switch 116 is returned into normal position, the circuit is cut and the delivery belt solenoid 90 inactivated while the mechanism connected

therewith is returned to its disengaged position through the force of return spring 96.

The actual introduction of the boxes into the passageway 24 from the loading end has been described in detail in discussing the alternative methods of accomplishing this, i.e., manually or by activating the transfer belt drive solenoid 88 by means of the latch 66 and its associated mechanisms. The operation of the transfer belt drive solenoid 88 is identical with that described above when that solenoid is activated when drive switch arm 74 swings upward to close mercury tilt switch 76.

It may be seen from the above description of the automatic handling apparatus of this invention that it is possible to deliver items in boxes one by one to a delivery point which may be remote from the location where such items are normally stored. The use of a plurality of such handling apparatus makes possible the delivery of boxes of various sizes, contents and the like in any desired order. Inasmuch as the actual delivery of the individual boxes from the passageways is electrically controlled the automatic handling apparatus of this invention also provides the possibility of programming delivery through suitable electronic equipment making the arrival of the boxes to a delivery point truly automatic.

Modifications of various components of the apparatus of this invention will occur to those skilled in the art and such modifications are contemplated as being within the scope of this invention. It should be understood, therefore, that the foregoing description is for the purpose of illustration only, and that the invention includes all modifications falling within the scope of the appended claims.

I claim:

1. A device adapted to deliver one-by-one a selected number of objects all essentially of the same dimensions, comprising two parallel walls defining a passageway having a receiving end and a delivery end, said passageway being adapted for passage therethrough of said objects arranged in the form of a series of contiguous stacks, from said receiving end to said delivery end, from which latter end they are discharged; conveyor means defining the bottom of said passageway and adapted to move a plurality of said stacks of said objects from said receiving end to said delivery end, said conveyor means comprising a first transfer section arranged substantially horizontally at said receiving end, and a second delivery section tilting downwardly at said delivery end whereby to tilt the forward stack of said objects out of the vertical and away from the succeeding stacks; retaining means associated with said walls at said delivery end adapted to retain the objects in said tilted stack from falling forward, said retaining means always being spaced from said second section a distance greater than once but less than twice the height of one of said objects; means for actuating said second delivery section of said conveyor means whereby to deliver said objects one-by-one from the bottom of said forward stack; and means for advancing said first transfer section of said conveyor means, thereby to move the next contiguous stack of said objects onto said second section of said conveyor means, as soon as the precedent forward stack of said objects has been exhausted.

2. A device adapted to deliver one-by-one a selected number of objects all essentially of the same dimensions, comprising two parallel walls defining a passageway having a receiving end and a delivery end, said passageway being adapted for passage therethrough of said objects arranged in the form of a series of contiguous stacks, from said receiving end to said delivery end, from which latter end they are discharged; conveyor means defining the bottom of said passageway and adapted to move a plurality of said stacks of said objects from said receiving end to said delivery end, said conveyor means comprising a first transfer section arranged substantially horizontally at said receiving end, and a second delivery section inclined downwardly at said delivery end whereby

to tilt the forward stack of said objects out of the vertical and away from the succeeding stacks located on said transfer section; retaining means associated with said walls at said delivery end adapted to retain the objects in said tilted stack from falling forward, said retaining means always being spaced from said second section a distance greater than once but less than twice the height of one of said objects; means for advancing said first transfer section of said conveyor means, thereby to move said succeeding stack of objects in operable contact with said second delivery section, means for actuating said second delivery section to deliver said succeeding stack from said transfer section to contact said retaining means and to become said forward stack in position for delivery; and means for kicking out the bottom object of said forward stack positioned against said retaining means.

3. A device adapted to deliver one-by-one a selected number of boxes all essentially of the same dimensions, comprising two parallel walls defining a passageway having a receiving end and a delivery end, said passageway being adapted for passage therethrough of said boxes arranged in the form of a series of contiguous stacks, said passageway comprising a substantially horizontal portion extending from said receiving end, and a downwardly inclined portion at said delivery end; endless transfer belt means defining the bottom of said horizontal portion; endless delivery belt means defining the bottom of said downwardly inclined portion and in operational relationship with said transfer belt means and arranged to transfer said boxes directly from said transfer belt means to said delivery belt means; retaining means associated with said walls at said delivery end adapted to retain the objects in the forward stack in delivery position on said delivery belt means from falling forward, said retaining means always being spaced from said delivery belt means a distance greater than once but less than twice the height of one of said boxes; kicking means associated with said inclined portion for forceably expelling the bottom box from said forward stack in said delivery position; transfer belt drive means for actuating said transfer belt means to position a succeeding stack of boxes in operational relationship with said delivery belt means; delivery belt drive means for actuating said delivery belt means for moving said succeeding stack into said delivery position when all the boxes in said forward stack are expelled; and kick drive means for actuating said kicking means.

4. A device adapted to deliver one-by-one a selected number of boxes all essentially of the same dimensions, comprising two parallel walls defining a passageway having a receiving end and a delivery end, said passageway being adapted for passage therethrough of said boxes arranged in the form of a series of contiguous stacks, said passageway comprising a substantially horizontal portion extending from said receiving end, and a downwardly inclined portion at said delivery end; endless transfer belt means defining the bottom of said horizontal portion; endless delivery belt means defining the bottom of said downwardly inclined portion and in operational relationship with said transfer belt means and arranged to transfer said boxes directly from said transfer belt means to said delivery belt means; retaining means associated with said walls at said delivery end adapted to retain the objects in the forward stack in delivery position on said delivery belt means from falling forward, said retaining means always being spaced from said delivery belt means a distance greater than once but less than twice the height of one of said boxes; kicking means associated with said inclined portion for forceably expelling the bottom box from said forward stack in said delivery position; transfer belt drive means for actuating said transfer belt means to position a succeeding stack of boxes in operational relationship with said delivery belt means; delivery belt drive means for actuating said delivery belt means for moving said succeeding stack into said delivery position

when all the boxes in said forward stack are expelled; kick drive means for actuating said kicking means; apron ramp means adjoining and being an extension of said inclined portion of said passageway; and conveyor means adapted to convey said boxes expelled from said passageway by said kicking means.

5. Device in accordance with claim 4 further characterized by having switch means associated with said apron ramp means whereby said kick drive means remains disengaged if a box rests on said apron ramp means.

6. A device adapted to deliver one-by-one a selected number of boxes all essentially of the same dimensions, comprising two parallel walls defining a passageway having a receiving end and a delivery end, said passageway being adapted for passage therethrough of said boxes arranged in the form of a series of contiguous stacks, said passageway comprising a substantially horizontal portion extending from said receiving end, and a downwardly inclined portion at said delivery end; endless transfer belt means defining the bottom of said horizontal portion; endless delivery belt means defining the bottom of said downwardly inclined portion and in operational relationship with said transfer belt means and arranged to transfer said boxes directly from said transfer belt means to said delivery belt means; warning means associated with said transfer belt means and adjustable with respect to its location in relation to said transfer belt means whereby an indication is automatically given when the last of said contiguous stacks has passed a predetermined point in said passageway; retaining means associated with said walls at said delivery end adapted to retain the objects in the forward stack in delivery position on said delivery belt means from falling forward, said retaining means always being spaced from said delivery belt means a distance greater than once but less than twice the height of one of said boxes; with said inclined portion for forceably expelling the bottom box from said forward stack in said delivery position; transfer belt drive means for actuating said transfer belt means to position a succeeding stack of boxes in operational relationship with said delivery belt means; delivery belt drive means for actuating said delivery belt means for moving said succeeding stack into said delivery position when all the boxes in said forward stack are expelled; and kick drive means for actuating said kicking means.

7. A device adapted to deliver one-by-one a selected number of boxes all essentially of the same dimensions, comprising two parallel walls defining a passageway having a receiving end and a delivery end, said passageway being adapted for passage therethrough of said boxes arranged in the form of a series of contiguous stacks, said passageway comprising a substantially horizontal portion extending from said receiving end, and a downwardly inclined portion at said delivery end; endless transfer belt means defining the bottom of said horizontal portion; endless delivery belt means defining the bottom of said downwardly inclined portion and in operational relationship with said transfer belt means and arranged to transfer said boxes directly from said transfer belt means to said delivery belt means; retaining means associated with said walls at said delivery end adapted to retain the objects in the forward stack in delivery position on said delivery belt means from falling forward, said retaining means always being spaced from said delivery belt means a distance greater than once but less than twice the height of one of said boxes; kicking means associated with said inclined portion for forceably expelling the bottom box from said forward stack in said delivery position; transfer belt drive means for actuating said transfer belt means to position a succeeding stack of boxes in operational relationship with said delivery belt means; manually operable means associated with said transfer belt drive means whereby said transfer belt means may be moved to advance stacks of said boxes introduced at said delivery end to abut preceding stacks; latch means associated with said manually operable means to retain said

succeeding stack of boxes in said operational relationship with said delivery belt; delivery belt drive means for actuating said delivery belt means for moving said succeeding stack into said delivery position when all the boxes in said forward stack are expelled; and kick drive means for actuating said kicking means.

8. A device adapted to deliver one-by-one a selected number of boxes all essentially of the same dimensions, comprising two parallel walls defining a passageway having a receiving end and a delivery end, said passageway being adapted for passage therethrough of said boxes arranged in the form of a series of contiguous stacks, said passageway comprising a substantially horizontal portion extending from said receiving end, and a downwardly inclined portion at said delivery end; endless transfer belt means defining the bottom of said horizontal portion; endless delivery belt means defining the bottom of said downwardly inclined portion and in operational relationship with said transfer belt means and arranged to transfer said boxes directly from said transfer belt means to said delivery belt means; retaining means associated with said walls at said delivery end adapted to retain the objects in the forward stack in delivery position on said delivery belt means from falling forward, said retaining means being adjustable with respect to the distance between the lower end thereof and said delivery belt means; kicking means associated with said inclined portion for forceably expelling the bottom box from said forward stack in said delivery position; transfer belt drive means for actuating said transfer belt means to position a succeeding stack of boxes in operational relationship with said delivery belt means; delivery belt drive means for actuating said delivery belt means for moving said succeeding stack into said delivery position when all the boxes in said forward stack are expelled; kick drive means for actuating said kicking means; drive switch arm means associated with said delivery belt means and adapted to furnish a signal to said transfer belt drive means when the last box in said forward stack has been expelled whereby said transfer belt means advances the next succeeding stack into said operational relationship with said delivery belt means, and actuator arm means located at said delivery point and adapted to actuate said delivery belt drive means to deliver said succeeding stack from said transfer belt means to said delivery point when the last box in said forward stack has been expelled.

9. Device in accordance with claim 8 further characterized by having warning means associated with said transfer belt means and adjustable with respect to its location in relation to said transfer means whereby an indication is automatically given when the last of said contiguous stacks has passed a predetermined point in said passageway.

10. Device in accordance with claim 8 further characterized by having manually operable means associated with said transfer belt drive means whereby said transfer belt means may be moved to advance stacks of said boxes introduced at said delivery end to abut preceding stacks; and latch means associated with said manually operable means to retain said succeeding stack of boxes in said operational relationship with said delivery belt.

11. Automatic handling apparatus adapted to deliver in predetermined sequence a selection of objects of a plurality of different varieties from a plurality of adjacent passageways each of which handles one variety of said objects, each of said passageways being defined by two parallel walls and being adapted for passage therethrough of said objects arranged in the form of a series of contiguous stacks, said passageway comprising a substantially horizontal portion extending from said receiving end, and a downwardly inclined portion at said delivery end; endless transfer belt means defining the bottom of said horizontal portion; endless delivery belt means defining the bottom of said downwardly inclined portion and in operational relationship with said transfer belt means and arranged to transfer said boxes directly from

11

said transfer belt means to said delivery belt means; retaining means associated with said walls at said delivery end adapted to retain the objects in the forward stack in delivery position on said delivery belt means from falling forward, said retaining means being adjustable with respect to the distance between the lower end thereof and said delivery belt means; kicking means associated with said inclined portion for forceably expelling the bottom box from said forward stack in said delivery position; transfer belt drive means for actuating said transfer belt means to position a succeeding stack of boxes in operational relationship with said delivery belt means; delivery belt drive means for actuating said delivery means for moving said succeeding stack into said delivery position when all the boxes in said forward stack are expelled;

5

10

15

12

conveyor means adapted to convey said objects expelled from said passageway by said kicking means; kick drive means for operating said kicking means; and means for actuating said kick means associated with each of said passageways in accordance with said predetermined sequence whereby said selection of objects is delivered by said conveyor means.

References Cited in the file of this patent

UNITED STATES PATENTS

2,200,708	Towne et al. -----	May 14, 1940
2,379,501	Steiner et al. -----	July 3, 1945
2,635,768	Currie -----	Apr. 21, 1953
2,735,578	Woodruff -----	Feb. 21, 1956
2,769,570	Adams -----	Nov. 6, 1956