

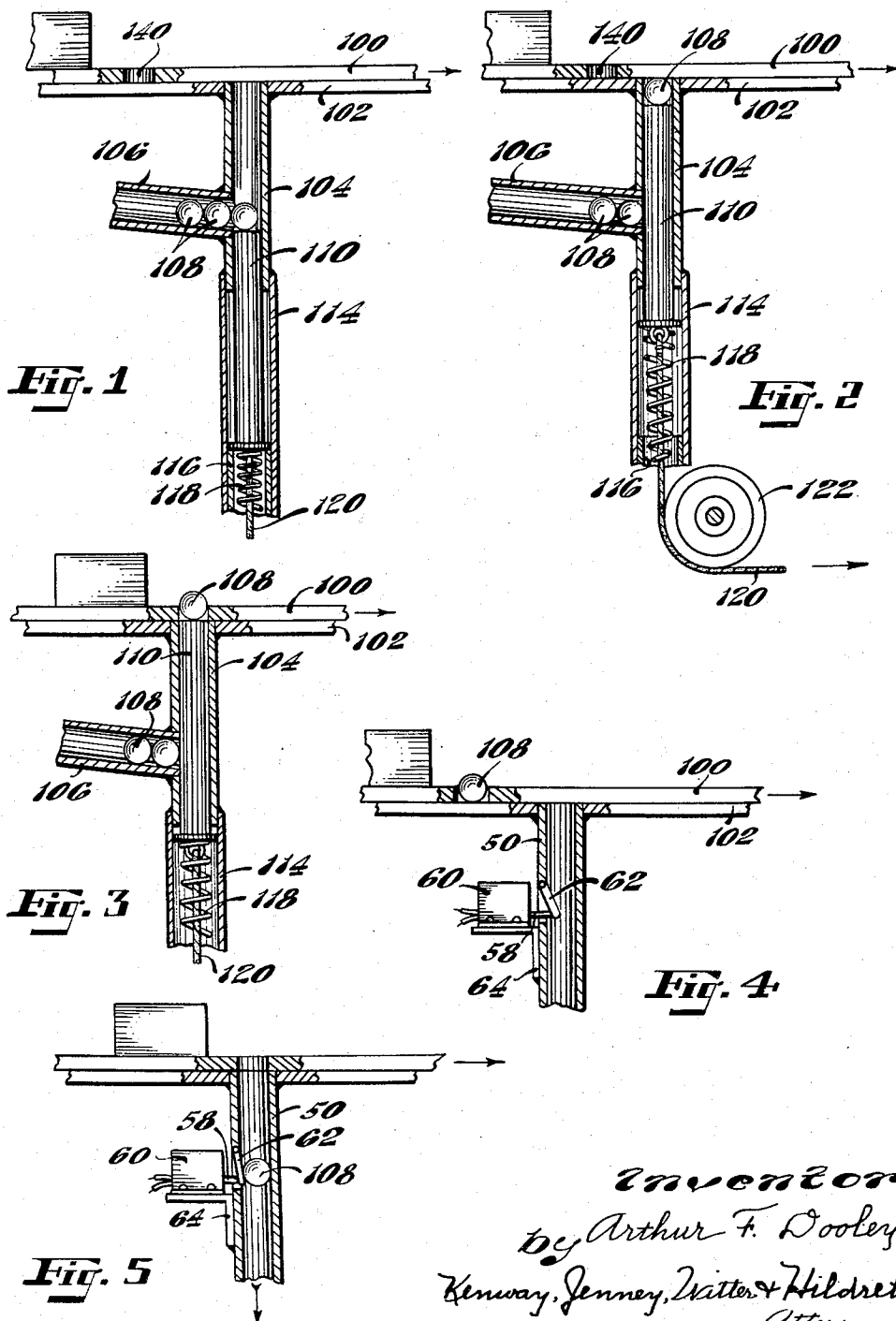
Jan. 19, 1954

A. F. DOOLEY
SORTING SYSTEM

2,666,537

Filed May 24, 1951

4 Sheets-Sheet 1



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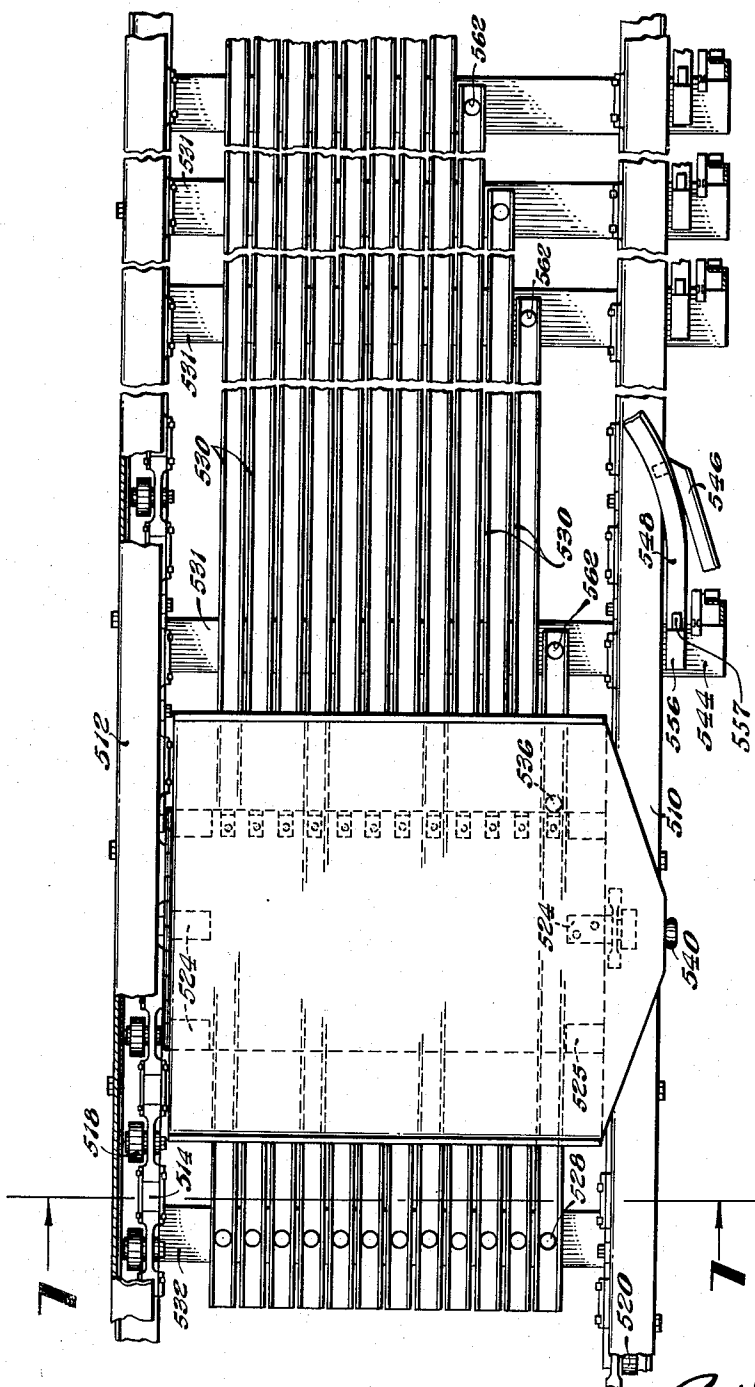


Fig. E

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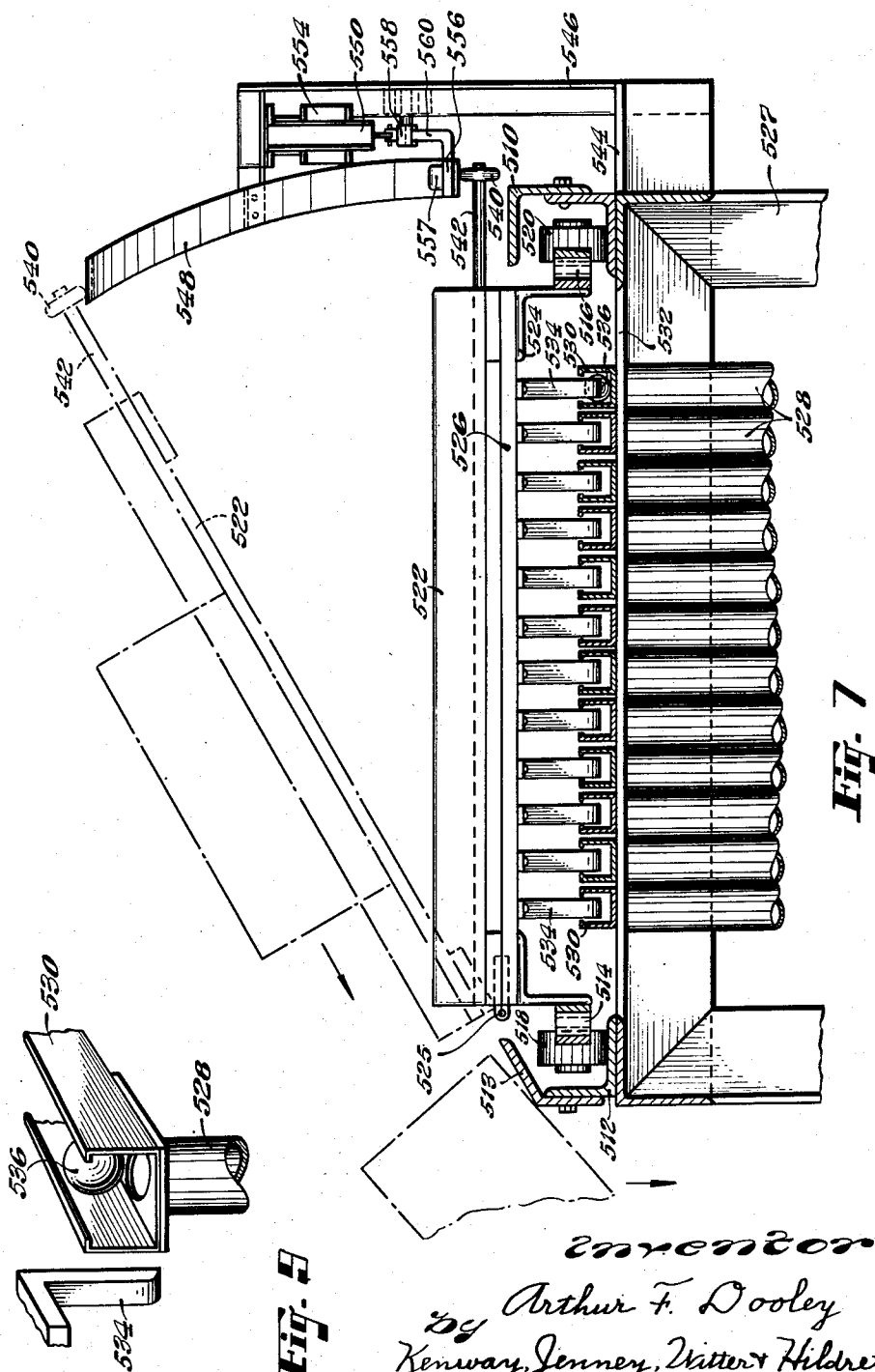
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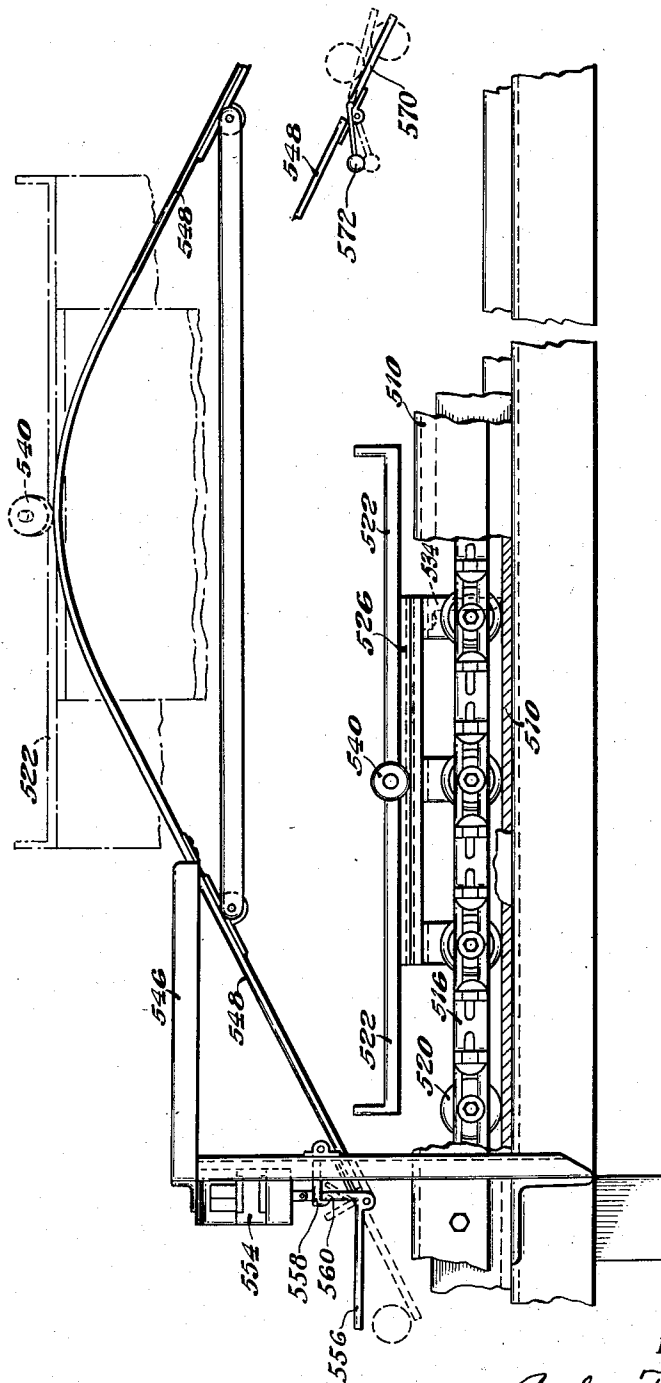


Fig. 4

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UNITED STATES PATENT OFFICE

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SORTING SYSTEM

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2 Claims. (Cl. 214—11)

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My invention relates to sorting and encompasses a conveyor system equipped to discharge selected objects at predetermined stations in accordance with a code or pre-arranged plan.

Although the system of my invention is capable of use in a wide variety of industrial environments, I shall describe it as it is employed to sort retail store packages into various delivery zone groups.

In large stores it is customary to send wrapped packages into a delivery room upon a long conveyor belt along which stand a number of sorters whose duty it is to read the addresses or route code numbers on the packages and remove them from the belt at stations representing the different routes followed by the delivery trucks. It will be seen that the sorter at the first station must scan 100% of the packages in order to pick out those few bearing addresses in his zone. The last sorter theoretically has only to remove all packages arriving at his station, although in practice packages for other stations reach him as the result of errors of the previous sorters. Such a system requires a large number of persons for work of a tedious kind.

The most important object of my invention is to provide a practical automatic sorting conveyor.

Another object of the invention is to reduce the cost of delivering merchandise by eliminating non-productive man hours wasted by sorters in scanning packages not pertinent to their activity.

Another object of the invention is to increase the speed and efficiency with which large numbers of objects may be separated into discrete groups or classes.

An important feature of my invention resides in the combination of a conveyor belt having a series of groups of holes, a plurality of means for removing objects from the belt, and actuating fingers mounted beneath the belt in spaced laterally offset relation, each actuating finger being effective to operate one of said object-removing means in response to excitation by a ball dropped from one of the holes in the belt. A plate supports the upper run of the belt and is provided with holes over each of the actuating fingers. The result is that a sorter at the head of the belt may scan the addresses of the incoming packages and then drop a ball into that one of the group of holes by the package which will ride over the desired finger. The ball then rides in the belt hole and upon the plate until it drops through the hole in the plate, operates the actuating finger and effects removal of the package at the pre-selected station.

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Another important feature of my invention resides in a plurality of trays hingedly mounted upon a traveling conveyor beneath which is disposed a plurality of channels, each channel terminating at a different point opposite mechanism for tilting the tray to discharge its contents. Beneath each tray there depends a series of wipers each of which works in one of the channels, there being means for inserting balls in selected ones of the channels so that the wipers will move the balls along the channels until they drop into receiving tubes containing mechanism for actuating the tray tilting systems.

This application is a continuation-in-part of my copending application Ser. No. 111,471, filed August 20, 1949.

These and other objects and features of the invention will be best understood and appreciated from the following detailed description of preferred embodiments selected for purposes of illustration and shown in the accompanying drawings, in which:

Figs. 1-3 are views in vertical cross-section through a ball-loading device associated with a conveyor belt,

Figs. 4 and 5 are views in vertical cross-section through the switch control device effective to operate the mechanism for removing packages at one selected station,

Fig. 6 is a plan view of a modified form of the invention,

Fig. 7 is a view in transverse cross-section through the embodiment shown in Fig. 6,

Fig. 8 is a view partly in side elevation and partly in longitudinal cross section through the device shown in Fig. 6, and

Fig. 9 is a view in perspective showing the relationship of the wiper, the channel and the ball.

Before proceeding to a detailed description of the several parts I shall first discuss in general the organization of the important instrumentalities and functions of the system of my invention. For this purpose reference may be made to Figs. 6-9 wherein a complete unit is shown assembled about a long conveyor consisting of a pair of chains 514 and 516 mounted to run through a long straight reach. At the head end of the conveyor there is provided a plate 532 extending transversely across the conveyor and provided with a series of vertical tubes 528, the upper end of each of which terminates within an elongated channel member 530. As shown in Fig. 6, each of the channels 530 is a different length, and there is at the far end of each channel 530 a second vertical tube 562. Spanning the chains 514

and 516 at close intervals is a series of trays 522 hinged at one side to permit tilting thereof as shown in the broken lines of Fig. 7. Opposite the hinge each tray 522 carries a short shaft 542 terminating in a roller 540. There is provided at one side of the conveyor a plurality of arcuate tracks 548, each of which is provided near one end with a tilting track section 556 controlled by a solenoid 554. The track section 556 is normally latched in horizontal position to avoid the oncoming rollers 540 but is unlatched by the solenoid 554 so that it pivots down to meet a roller and direct it to follow along the track 548, in the course of which movement the tray 522 is tilted sharply so that a package disposed thereon will slide from the tray. Beneath each tray 522 there is a transverse plate 526 from which depends a transverse row of wipers 534 each of which is arranged to enter and traverse one of the channels 532. When a ball is caused to move from one of the vertical tubes 528 into one of the channels 530, the appropriate wiper of the oncoming tray will push the ball along the channel 530 until it drops into one of the receiving tubes 562. When the ball drops into the receiving tube it actuates a trip switch to energize the solenoid 554 of the unloading station opposite the end of the channel 530. Thus when a package is placed upon a tray the operator may select its discharge point by causing a ball to be deposited into the appropriate one of the channels 530.

Coming now to the details of the preferred embodiments illustrated, I shall first discuss the mechanism for loading the balls into the selected holes.

In Figs. 1-3 I have shown one convenient mechanism for loading balls into the conveyor belt 100 which is, of course, of any desired length and width and preferably made of rubberized canvas or the like. The belt is provided with a series of spaced rows or groups of through-and-through holes, the holes in each group extending transversely across the belt. In its upper run the belt travels over the surface of a continuous steel supporting plate 102. The length of the belt and the number of holes in each group is determined by the number of discharge stations included in the system.

At the head or entering end of the system the plate 202 is provided with a group of holes in each of which is set a vertical metal tube 104. The tubes may be arranged in any convenient pattern provided no two are longitudinally aligned with respect to the direction of movement of the belt 100. Let into the side of each tube 104 is a downwardly inclined magazine tube 106 of the same diameter as the tube 104 and designed to accommodate a supply of steel balls 108. Sliding in each tube is a cylindrical plunger 110 having an exterior flange 112 at its lower end, which works in an oversize tube 114 telescoped over the tube 104, and retractable downwardly until it meets a stop 116. In its lowermost position the plunger uncovers the end of the magazine tube 106 and permits one ball to roll out on top of the plunger. A compression spring 118 is seated in the tube 114 and serves to force the plunger upwardly. Fig. 1 shows a ball 108 in position on the plunger, the upper end of the tube 104 then being closed by the belt 100; the hole 140 has not yet reached loading position. In Fig. 2 the plunger has been released and the ball 108 carried up into contact with the moving belt. In Fig. 3 the hole 140 has come into registry with the end of the tube 104 and the ball has

been thrust up into the hole. To prevent the balls 108 from popping through the belt holes, the plungers may be magnetized sufficiently to hold the balls in place until the onwardly moving belt sweeps them along over the plate 102.

To actuate the plungers 110 I provide cables 120 secured to the lower ends of the plungers and carried down around pulleys 122. The other ends of the cables are secured to pivotally mounted levers (not shown) arranged in keyboard fashion at the side of the head of the belt run.

An operator located at the head of the belt adjacent the keyboard will scan the addresses or route numbers on the packages as they pass him on the moving belt. Then it is only necessary to operate the lever (which may be marked appropriately) to place a ball in the proper one of the holes 140. The holes may be located ahead or behind the package carrying space, and the spacing of the packages will of course be determined by their size.

Adjacent each discharge station the plate 102 is provided with a hole for a vertical tube 50 in the side of which is an aperture into which projects the arm 58 of a microswitch 60 supported on the side of the tube 50 by means of an angle bracket 64. Pivotally mounted in the wall of the tube 50 is a finger or shutter 62 normally inclined into the hollow tube 50 and in contact with the switch arm 58. As the packages travel along with the belt 100 the balls 108 begin to drop in their proper tubes 50. If at any one station no ball drops into the tube 50, that station is not activated. On the other hand, if a ball does drop into the tube, the package discharging mechanism is actuated to remove the package from the belt at that station. A succession of packages may be consecutively removed at one station or distributed among a number of them, all according to the location of the balls 108 in the successive spaced groups of holes 140.

The embodiment of the invention illustrated in Figs. 6-9 has been described in general outline. In detail, it includes, as best shown in Figs. 6 and 7, a pair of side channel irons each formed of two angle irons. At one side of the belt the channel 510 is in the shape of a U turned on its side while the opposite channel 512 has an inclined upper surface 513 which acts as a chute for packages being unloaded. In the channel 512 there travels a chain 514 supported at intervals by rollers 518 which move along the channel 512, while at the other side of the apparatus there is a chain 516 supported on a series of rollers 520 which move within the channel 510. At intervals there is provided a plurality of trays 522 supported on tabs 524 secured to the chains 514 and 516. At the side of the apparatus adjacent the chain 514 the tray 522 is hinged to the tabs 524 as shown at 525. On the opposite side the tray merely rests upon the tabs 524. Beneath each tray 522 there is a transverse plate 526 secured to the tabs 524 and supporting a row of downwardly depending wipers or fingers 534 each of which enters an elongated channel iron 530. The channel irons 530 are supported at intervals by transverse supports 531 and each channel is of a different length. The whole structure is supported above the floor by suitable supports as suggested at 527 in Fig. 7.

At the head of the conveyor there is a transverse bar 532 which provides support for a plurality of vertical tubes 528 the upper ends of which terminate in the channels 530, as clearly shown in Fig. 9. The vertical tubes 528 are of

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the same type as those shown at 104 in Figs. 1-3 and they are associated with the same kind of ball loading mechanism operated by a keyboard so that the operator may cause a ball 536 to be deposited in any selected one of the channels 530.

As the trays and chains are moved, the wipers traverse the length of the channels 530 and a ball in any one of the channels will be pushed along it by the appropriate wiper 534 until it reaches the end of the channel. At the end of each channel there is a vertical receiving tube 562 which is precisely similar to the tubes 50 shown in Figs. 4 and 5 and which is provided with a switch tripping finger 62 operating a switch 60.

Approximately opposite each one of the receiving tubes 562 there is a package discharging station including a vertical standard 546 supporting an arcuate track 548 and also a vertically mounted solenoid 554. At the head end of the arcuate track 548 there is a short pivotally mounted track section 556 normally held in horizontal position by a latch 558 engaging a projecting stop 560 on the track section 556. In the horizontal position the track section 556 clears the rollers 540 projecting outwardly from the successive trays 522. However, when the solenoid 554 is energized the latch is released to permit the track section 556 to pivot downwardly in position to encounter the oncoming roller 540 and thereby cause it to travel up the inclined track 548 and then back down again. During this operation the tray 522 is pivoted upwardly about the hinges 525 to the position shown in the broken lines in Fig. 7. The inclination of the tray 522 is sufficient to cause any package placed thereon to slide off into a receiving chute (not shown). As the roller 540 travels up the pivoting track section 556 it encounters an upwardly inclined finger 557 and forces the track 556 to return to its latched horizontal position wherein the latch 558 again engages the stop 560 so that the track section 556 is held in elevated position until such time as the solenoid 554 is again energized. At the rear end of the track 548 is another pivoted track section 570 with which is integrally formed a counterweight 572 so dimensioned as normally to hold the track section 570 in horizontally elevated position. When the roller 540 travels down the rear portion of the track 548, it rolls onto the pivoting section 570 which is then lowered by the weight of the roller and tray so that the roller travels down it and back to its normal horizontal position. After the roller leaves the far end of the pivoting section 570, the counterweight is effective to restore this section to horizontal elevated position.

In summation, it will be evident that I have invented a sorting conveyor which is never stopped, thus facilitating rapid and efficient operation. Moreover since each object to be sorted is accompanied by one of the balls appropriately placed, the operation of the package removing mechanism is independent of the speed of the belt. If for some reason the belt is stopped

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while packages are upon it, no harm is done since the packages will be discharged at the proper location when the belt is again started up. When it is considered that in connection with ordinary conveyors used for sorting purposes by large retail establishments, for example, as many as thirty-one persons are employed in scanning the oncoming packages and removing them at the various stations, the importance of my invention will readily be understood. Heretofore one sorting operator has been able to serve one or two routes, whereas in my system a single operator can serve six or eight routes, moving periodically from one to another to remove accumulated packages from the receiving chutes and place them into the delivery bins.

Although I have illustrated systems in which all objects are discharged on the same side of the conveyor belt, it is quite feasible, by obvious modifications, to secure discharge on both sides. Also it will be apparent that the balls may be loaded by hand in the conveyor belt if for any reason such procedure is preferred.

It should be noted that the conveyor systems herein shown and described may be operated without the balls as conventional package sorting conveyors.

Having thus disclosed my invention what I claim as new and desire to secure by Letters Patent of the United States is:

1. A sorting apparatus comprising a package conveyor, a plurality of package removers disposed at spaced intervals along the conveyor, a plurality of members forming longitudinal channels disposed beneath the conveyor, objects adapted to be moved along said channels, a plurality of rows of downwardly extending wipers secured at spaced intervals to said conveyor and disposed so that the wipers move in said channels, and independent means for actuating each package remover, each actuating means being disposed adjacent one of said removers and beneath said conveyor, each of said actuating means being responsive to one of said objects caused to move along one of said channels by one of said wipers.

2. A sorting apparatus comprising a plurality of members forming parallel channels of different lengths, objects adapted to be moved along said channels, a conveyor arranged to move longitudinally over said channels, a plurality of independent package removing devices disposed at spaced intervals along said conveyor, a plurality of rows of downwardly extending wipers secured to said conveyor and disposed to move in said channels, and means associated with each package removing device for the actuation thereof, said actuating means being disposed at the end of one of said channels for operation by one of said objects moved along the channel by the associated wiper.

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No references cited.