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R. COUCHMAN, JR., ET AL

2,609,947

PACKAGE DISTRIBUTION SYSTEM

Filed Aug. 1, 1950

2 SHEETS—SHEET 1

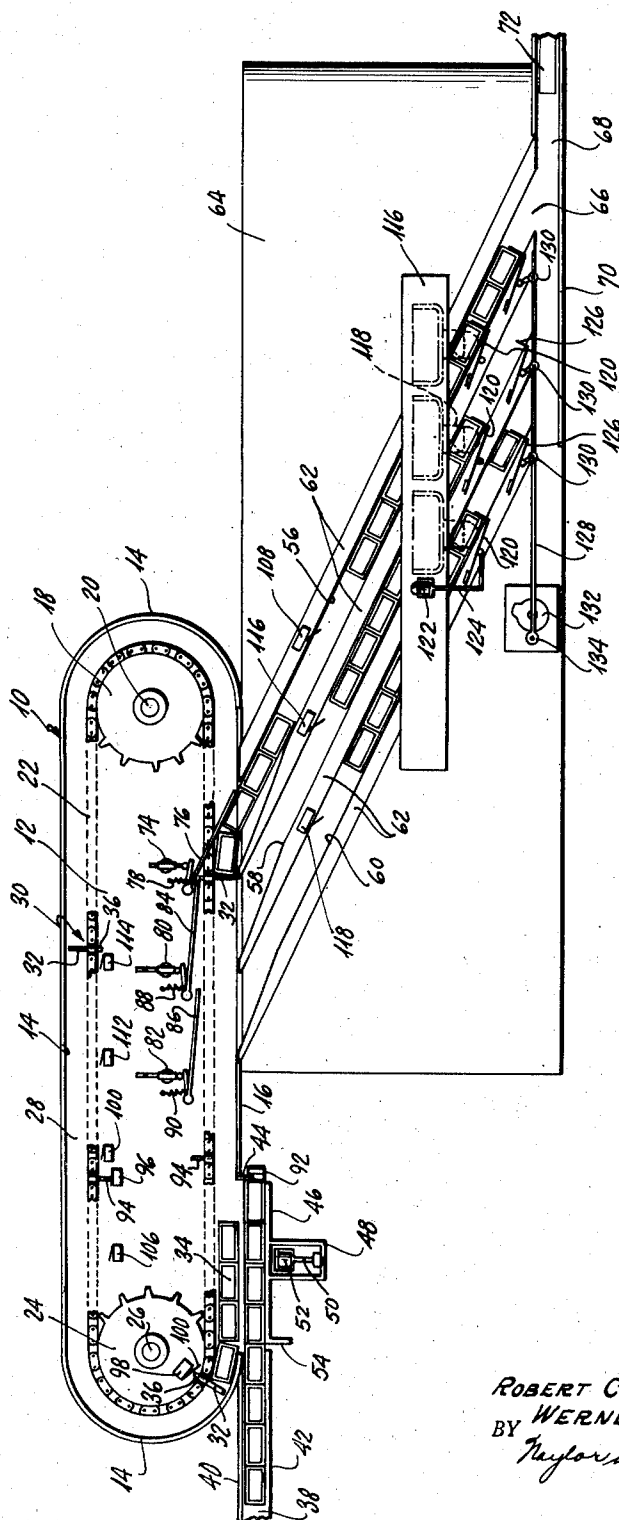


FIG. 1

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2 SHEETS—SHEET 2

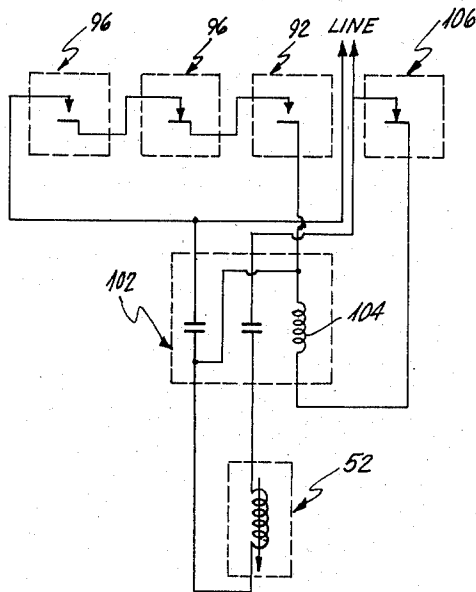


FIG. 1

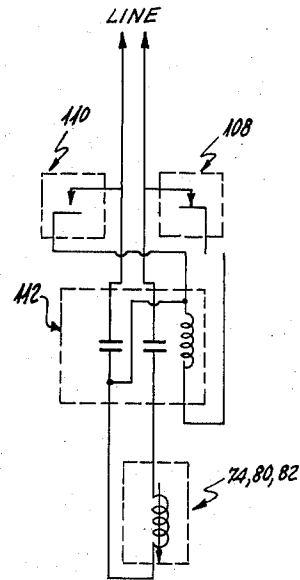


FIG. 2

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PACKAGE DISTRIBUTION SYSTEM

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6 Claims. (Cl. 214-16)

1

This invention relates to a material handling system, and more particularly to a distribution system for packages, or the like, adapted to receive packages from a single line of supply and distribute them into two or more supply lines.

In summary, the distribution system of the invention comprises a closed path conveyor constituting a package supply reservoir, one or more package receiving chutes angularly disposed to the closed path conveyor, control means including package sensing means associated with the chutes operable to selectively divert packages or groups of packages to the chutes when the package supply within the chutes becomes depleted in a predetermined degree, or recycle the packages past the inlet ends of the chutes on the closed path conveyor until such time as the requisite depletion of the packages within the chutes takes place, and package feeder means for the closed path conveyor operable under the control of package sensing means associated with the conveyor to feed packages thereto to maintain the package supply reservoir at the minimum level needed for the supply of the chutes. Additionally, the distribution system may include means for joining together the plurality of package supply lines carried by the chutes so that a single line of packages eventually leaves the system, and the preferred means for achieving this package supply line integration is a conveyor belt movable in parallel relation to the closed path conveyor and thus in angularly disposed relation to the one or more chutes embodied in the system, with the outer edge of this conveyor belt extending beyond the outlet ends of the chutes so that the packages upon issuance from the outlet ends of the chute will be carried forwardly on the belt at a greater rate of travel than was imparted to them by the belt when the packages resided within the chutes.

Various objects and advantages of the invention will be apparent from the following description taken in conjunction with the drawings forming part of this specification, and in which:

Figure 1 is a semi-schematic plan view of the distribution system of the invention;

Figure 2 is a diagrammatic representation of the electrical control circuit for the diversion of packages from the closed path conveyor to a chute; and

Figure 3 is a diagrammatic representation of the electrical circuit for the control of the supply of packages to the closed path or package reservoir conveyor.

Referring to the drawings for more details of the invention, the distribution system comprises

2

a closed path conveyor indicated generally at 10 composed of a flat surface plate 12 peripherally enclosed at the two ends and one side thereof by a guide rail section 14 and partially enclosed at the remaining side thereof by guide rail section 16. A driven sprocket 18 mounted on shaft 20 extending through plate 12 is in driving engagement with a chain drive element 22, while an idler sprocket 24 mounted on shaft 26 extending through plate 12 is likewise in engagement with the chain drive element 22. The chain belt 22 and guide rail sections 14 and 16 define a package guideway 28. Secured at preferably equi-spaced intervals to the chain 22 is a plurality of pins 30 having portions 32 extending across the guideway 28 and serving as pusher arms for groups of packages 34, and having portions 36 for a purpose hereinafter described.

Package feeder or supply means for the closed path conveyor 10 comprise a conveyor belt 38 adapted to move the packages 34 between guide rails 40 and 42 against a stop member, such as the flange 44 carried by guide rail section 16, to position a fixed number of packages, as for example 4, in front of a pusher bar 46. The pusher bar 46 is provided with a bracket 48 to which there is connected the armature 50 of solenoid 52. When the solenoid 52 is energized at a time and in a manner hereinafter described, the pusher bar 46 is moved across the conveyor belt 38 to push the group of four packages in alignment therewith on to the guideway 28 in the path of one of the package pusher arms 32. When the pusher bar 46 is urged toward the guideway 28 in this manner, the flange 54, forming a portion of the pusher bar, blocks the path of travel of the remaining packages on the belt 38 so that the packages cannot be moved forwardly on belt 38 until the pusher bar is retracted to its normal position.

Package receiving means for the closed path conveyor 10 are comprised of a plurality of chutes, such as indicated at 56, 58 and 60, defined by horizontally disposed guide rails 62 angularly disposed with respect to the adjacent side of the closed path guideway 28. A relatively wide conveyor belt 64 is preferably utilized as the supporting member for packages disposed within the chutes and as the means for moving the packages forwardly within the chutes toward the discharge ends 66 thereof. The belt 64 preferably extends laterally beyond the discharge ends 66 of the chutes to form, in effect, a single path guideway 68 defined by guide rail sections 70 and 72 for the packages issuing from the chutes.

Each of the chutes has associated therewith

means for selectively diverting groups of packages 34 into the chute. For this purpose, chute 56 is provided with a solenoid 74 operable upon energization in a manner hereinafter described to force pivotally mounted crank arm 76 across guideway 28 into parallelism with the inside edge of the far guide rail 62 of chute 56. When solenoid 74 is de-energized, spring 78 serves to pivotally retract the crank lever arm 76 from its position of blocking relation across the guideway 28. In similar manner, chutes 58 and 60 are provided with, respectively, solenoids 80 and 82 and pivotally mounted crank lever arms 84 and 86. Springs 88 and 90 are provided for the crank lever arms 84 and 86.

The control system for the package feeder solenoid 52 is shown in Figure 3. This system is operable to energize the solenoid 52 only when the following conditions obtained: When a full complement or group of packages 34 is located in the path of pusher bar 46; when the package carrier spaces on guideways 28, as defined by the spacing between pusher arms 32, are in a predetermined package receiving location with respect to the pusher arm 46; and when the package receiving space oppositely disposed to pusher arm 46 does not contain a group of packages. The first conditioning of the control circuit of Figure 3 for operation of solenoid 52 occurs when normally opened micro-switch 92 carried at flange 44 of guide rail section 16 is closed by the packages carried by conveyor belt 38, thus indicating that a full complement or group of packages is located in front of pusher bar 46. The second conditioning of the control circuit for operation of solenoid 52 occurs when one of the pins 94 carried by chain drive 22 closes normally open micro-switch 96, thus indicating that if the packages located in front of pusher bar 46 were moved on to guideway 28 they would be located as a group in front of one of the package pusher arms 32. The third conditioning of the control circuit occurs when normally closed micro-switch 98, which is opened by engagement of packages with its switch arm 100, returns to the closed position, thus indicating that the pocket or space on the guideway opposite the pusher arm is empty of packages. Solenoid 52 is, therefore, energized when micro-switches 92, 96 and 98, which are connected in series with each other and through relay 102 with solenoid 52, are in the closed position. As previously described, the energization of solenoid 52 causes pusher arm 46 to move a group of packages on to guideway 28 in the path of one of the package pusher arms 32, and while this occurs flange 54 of pusher bar 46 blocks the path of travel of the remaining packages on conveyor belt 38. Pusher bar 46 remains in its package charging position until the coil 104 of holding relay 102 is disconnected from the current supply line by the opening of normally closed micro-switch 106. Micro-switch 106 is opened by finger 94 which serves to previously close micro-switch 96.

Each of the package chutes 56, 58 and 60 is provided with a separate control circuit, such as that shown in Figure 2, for the operation of its respective solenoid and crank lever arm package feed means. Taking chute 56 as an example, solenoid 74 will be energized only when the following two conditions are obtained: When the chute 56 is capable of receiving an additional group of packages 34; and when the group of packages within a closed path conveyor pocket arrives in a pre-determined position with respect to mouth of chute 56. When the last package with-

in chute 56 has moved out of engagement with the switch arm of normally closed micro-switch 108, the latter is in the closed position, thereby conditioning the solenoid 74 for energization when normally open micro-switch 110 is closed by lug 36 carried by chain drive 22. Upon the closing of micro-switch 110, the solenoid 74 is operated by the relay 112 of the control circuit of Figure 2, thereby causing the crank lever arm 76 to be pivoted outwardly into the path of the group of packages designated for chute 56 to divert this group of packages into the chute. The closing of the control relay circuit for solenoid 74 causes the solenoid to be held in operated position under the control of micro-switch 118. When the first package of the incoming group for chute 56 strikes the switch arm of micro-switch 108, the switch is opened and solenoid 74 is de-energized. When this occurs, the last package of the group of packages diverted into the chute by crank lever arm 76 has entered the chute. Upon de-energization of solenoid 74, spring 78 retracts crank lever arm 76 to its position of rest. Micro-switches 112 and 114 are the counterparts of micro-switch 110 for solenoids 80 and 82, respectively, while micro-switches 116 and 118 are the counterparts of micro-switch 108 for solenoids 80 and 82, respectively.

The distribution system of the invention, as above described, is particularly adapted for use where it is desired that a single supply line of packages be sub-divided to provide a plurality of lines so that the plurality of lines may be led beneath a bank of scales, or the like, for a metering of material into the boxes. Thus, in the distribution system shown in Figure 1, there is also included a support frame for a plurality of scales 118, there being a scale for each of the chutes shown, adapted to feed a predetermined amount of material from a single shaker or material source, not shown, into each of the boxes in each of the chutes. For this purpose, each of the chutes is provided with a package delay gate 120 adapted to arrest a box in material receiving relation beneath a scale, it being understood that the automatic control system for the scales may include gate control means, such as the solenoid 122, adapted upon completion of the feeding of material into the box or package to actuate the crank lever arm 124 and thereby retract the associated chute gate 120 to continue their movement toward the mouths of the chutes.

In order that the packages may issue from each of the chutes and be carried along in spaced relation on the outlet guideway 68, additional chute gates 126 may be provided, and rod and lever control means 128 and 130 may be utilized to simultaneously retract the outlet chute gates 126 to allow simultaneous issuance of packages from the plurality of chutes. Actuating means for the rod 128 in the form of a rotatable cam member 132 adapted to be in engagement with roller 134 carried by rod 128 may be used to obtain the proper timed reciprocating movement of rod 123 for chute opening and closing purposes.

From the foregoing description of the distribution system of the invention, it will be obvious that any number of package chutes may be utilized, as well as any corresponding number of package group receiving packets for the closed path conveyor 10, and that the pusher bar 46 may be adapted to handle a group of packages of any desired number. The controlling factor is, of course, that the rate of delivery of packages on input conveyor belt 38 and the rate of travel

of chain belt 22 must be sufficiently great to accommodate the package demands on the number of chutes used. In this connection, it will be noted that the distribution system embodies a single movable element in the form of conveyor belt 64 adapted to both move a large number of packages simultaneously at a relatively low speed and adapted to move the combined output of packages from all of the supply lines or chutes at an increased rate of travel.

While a preferred embodiment of the invention has been shown and described, it is to be understood that all substantial equivalents of said embodiment are within the scope of the invention.

What I claim as new and desire to secure by Letters Patent is:

1. A package distribution system comprising a conveyor having means for cyclically moving spaced groups of packages in a closed path, a chute in package receiving relation to said conveyor, package feeder means for said conveyor operable to deliver groups of packages to said conveyor, a switch arm for said chute movable across the path of travel of the packages carried by the conveyor to divert a group of packages into said chute, control means for said switch arm including sensing means located within said chute operable to actuate the same in response to a predetermined decrease of the number of packages in said chute, sensing means operable to indicate a package under-supply on said conveyor, and control means conditioned by operation of said latter sensing means to actuate said feeder means.

2. A package distribution system comprising a horizontally disposed closed-path guideway for packages, means for moving packages in spaced groups around said guideway comprising a driven belt having a plurality of equi-spaced arms extending transversely of said guideway, with each of said arms being adapted to move a group of packages around said guideway, package feeder means for said guideway operable in response to package sensing means to move a group of packages onto said guideway between two spaced arms, package receiving means for said guideway comprising a chute angularly disposed in package receiving relation to said guideway, and means for diverting a group of packages from said guideway into said chute comprising a switching arm movable into a position angularly across said guideway in response to package sensing means associated with said chute.

3. A package distribution system comprising a horizontally disposed closed path guideway, means for moving packages around said guideway comprising a driven belt having a plurality of equi-spaced pusher arms extending transversely of said guideway, package feeder means for said guideway comprising a conveyor disposed adjacent to said guideway and parallel to a section thereof and a pusher bar movable across said conveyor to transfer packages from said conveyor onto said guideway, package receiving means for said guideway comprising a chute angularly disposed thereto, means for diverting packages from said guideway into said chute comprising a switching arm movable into a position in which it is angularly disposed across said guideway in parallelism with said chute, package sensing means associated with said chute operable to move said switching arm across said guideway in response to the movement past a

predetermined point in said chute of the end package therein and operable to retract said arm to an inoperative position upon the movement into said chute of a predetermined number of packages, and package sensing means associated with said guideway operable to move said pusher bar across said conveyor in response to the absence of packages on said guideway opposite said pusher bar.

4. A package distribution system comprising a horizontally disposed closed path guideway, means for moving packages around said guideway comprising a driven belt having a plurality of equi-spaced pusher arms extending transversely of said guideway, package receiving means for said guideway comprising a plurality of mutually parallel chutes angularly disposed thereto, means for selectively diverting packages into said chutes from said guideway comprising a switching arm for each chute movable into a position in which it is angularly disposed across said guideway in parallelism with its chute and package sensing means associated with each chute and operable to move its related switching arm across said guideway in response to the movement past a predetermined point in the chute of the end package therein and operable to retract said arm to an inoperative position upon the movement into said chute of a predetermined number of packages, and package feeder means operable in response to package sensing means associated with said guideway to maintain a supply of packages on said guideway.

5. A package distribution system comprising a horizontally disposed closed path conveyor constituting a package supply reservoir of a recycling type, a plurality of mutually parallel chutes angularly disposed in package receiving relation to said conveyor, means operable in response to package sensing means associated with said chutes to selectively divert a predetermined number of packages into any of said chutes in response to a package under-supply therein, and means operable in response to package sensing means associated with said conveyor to feed packages on to said conveyor in predetermined positions in response to a package under-supply thereon.

6. A package distribution system as set forth in claim 5 wherein said chutes are horizontally disposed, and conveyor means serving to support the packages within said chutes and move them forwardly therein comprising a movable belt angularly disposed in underlying relation to said chutes and having its outer edge disposed beyond the discharge ends of said chutes, whereby packages issuing from the discharge ends of the chutes are carried forward on the belt at a greater rate of travel than the rate of travel of packages within the chutes.

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