ABSTRACT: A recirculation limit system particularly adapted for utilization in conjunction with recirculating conveyors which, conventionally, recirculate articles carrying a specific address code until such time as they can be diverted to the proper destination. In accordance with the principles of this disclosure, the articles are permitted to recirculate past the various destination diversion gates two times and are then diverted to a reject area. This is accomplished by placing a reject code on the containers or articles after their initial pass by the destination diverters and then diverting them on to a reject conveyor in accordance with the reject code if they are not diverted to a destination on their second pass by the destination diverters.
RECRYCLATION LIMIT SYSTEM FOR CONVEYORS

BACKGROUND OF THE INVENTION

This invention relates to recirculating conveyor systems and, more particularly, to such systems embodying a novel means for limiting the number of times a particular article may be recirculated within the system prior to being diverted to a reject area.

It is conventional in the material-handling field to provide a recirculating conveyor system wherein articles are conveyed between their initial introduction into a given conveyor system and their diversion therefore to a specific destination. The destination of the article, ordinarily, is coded in some fashion either upon the article itself or upon a carrier therefor and specific destination diversion means activated in accordance with that code as the articles are recirculated. If the articles are not diverted during their initial pass by the diversion means associated with their particular destination, theoretically, they merely recirculate until such time as the proper diversion is accomplished, the recirculation feature compensating, of course, for momentary malfunctions of the diversion means, destinations which are filled to capacity and the like.

A marked tendency has existed in the past for the recirculating conveyor in some systems to become virtually filled with constantly recirculating articles, thus preventing the introduction of new articles thereinto. This tendency has been promoted, primarily, either by slightly improper address codes on the article or prolonged malfunctions at one or more of the destination diversion means. In such a situation, as will be readily apparent to those skilled in the art, the improperly addressed or coded article or the article destined for a particular malfunctioning diversion means merely recirculates around the closed loop time and again. When enough of such articles build up, of course, the efficacy of the entire system is severely reduced and/or completely negated since there is no room on the recirculating loop for the introduction of new articles which, in fact, may be properly addressed and/or destined for operating diversion means.

SUMMARY OF THE INVENTION

It is an object of this invention, therefore, to provide a novel recirculation limit system for conveyors of the type described.

It is an object of this invention, more particularly, to provide a system wherein a particular article will be permitted to recirculate in the recirculation system only a specified number of times, thereafter being directed out of the recirculating system into a reject area.

It is an object of this invention, thus, to provide a system adapted for utilization in conjunction with recirculating conveyors which will permit optimum usage of the automatic characteristics of the system despite minor technical problems with addressing systems, diversion means and the like.

These objects are accomplished, briefly, in a closed-loop recirculating conveyor system for sorting articles having destination codes thereon including a closed-loop conveyor, an article input conveyor communicating with the closed-loop conveyor, at least two article output conveyors communicating a closed-loop conveyor and a destination-diverting means for diverting articles from the closed-loop conveyor onto said output conveyors in accordance with the destination code thereon. The instant system utilizes a reject conveyor communicating with the closed-loop conveyor, means being provided adjacent the closed-loop conveyor for affixing a reject code to each of the articles which have passed each of the article output conveyors and have not been diverted therefrom by the destination-diverting means. Reject-diverting means are provided for diverting the articles which have the reject code affixed thereto onto said reject conveyor after they have passed each of said outputs a predetermined number of times.
Similar difficulty has been experienced with prior art systems of this type when, for one reason or another, the destination address upon the particular article is not "readable" by the destination sensor or sensors being utilized.

In this latter situation, of course, no diversion is even attempted and the improperly addressed article will circulate indefinitely unless it is removed manually. Again, in this situation, a tendency exists for numerous such articles to build up on the recirculating loop impairing markedly the efficacy of the system by preventing the introduction of new articles from the conveyor 11 thereon.

The preferred embodiment herein disclosed of the instant invention obviates this difficulty by the provision of a reject conveyor 26 which communicates with the closed-loop conveyor 20 by means of a reject diverting means or gate 27. Articles which are diverted onto the reject conveyor 26 by the reject diverter 27 are routed to a reject area 28 where they may be manually sorted without hindering the operation of the remainder of the system. Diversion onto the reject conveyor 26 is accomplished by means of a reject label applicator 30 and a reject label sensor 31, the latter unit operating the reject diverter 27 in response to sensing of an article with a reject code applied thereto.

Reject label applicator 30 is positioned, as illustrated, downstream (or in the direction of travel 40 of the article along recirculating conveyor 20) from the input conveyor 11 junction 12 and the output conveyor diversion gates 23. An article passing onto the recirculating conveyor 20, thus, passes initially the various output or destination diversion gates 23 and then the reject label applicator 30. The reject label or code applicator 30 is designed and positioned with respect to and/or in conjunction with the recirculating conveyor 20 such that it will automatically place a reject code in a prescribed location on all articles passing thereby. Such a code may, for example, be a piece of retroreflective tape spaced a prescribed distance from the lead edge of the article in question. The position should be chosen, of course, so as not to interfere with the destination address codes which were placed upon the articles in another part of the system nor with the reading thereof by the address sensor or sensors 21.

The article with the reject code applied thereto is then routed past the address sensors 21 one final time. In the event that destination diversion is not achieved at one of the gates 23 during the article's second pass through the system, the reject code which has been applied thereto by applicator 30 is sensed by reject code sensor 31 and diversion gate 27 activated to divert the article in question onto the reject conveyor 26. The article then is routed to the reject area 28 where it is disposed of manually or otherwise.

The instant invention, thus, permits the article to pass by the diversion gates 23 and their associated code sensors 21 on two separate occasions. If diversion is not accomplished the second time through, the article is diverted into the reject area, preventing the undesirable buildup of constantly recirculating articles noted on the closed-loop or recirculating conveyor 20. The function is achieved through the means of relatively simple, well-known code applicator, code-sensing and conveyor diversion means and can be incorporated into either new or existing systems with little difficulty.

The preferred embodiment of this invention discloses a system wherein articles are permitted to pass by the diversion gates to the marshalling areas two times. Should it be desirable to increase or decrease the number of "chances" for diversion, it is necessary merely to relocate the position of the reject label applicator and/or provide means for coding the article in accordance with the number of revolutions it has made through the system. If, for example, it were desirable to permit the article to pass by the diversion gates three times prior to being routed onto the reject conveyor 26, a first code could be placed on the article after having passed the destination diverters 23 initially and a second code placed on the articles in response to the presence of the first code after a second pass. In such a situation, of course, the diverter 27 would be activated upon the sensing by the reject code sensor 31 of the second code and, thus, without altering the position of the various components the articles in question would recirculate past the destination diverters 23 three separate times before being diverted onto the reject conveyor 26.

While a preferred embodiment of this invention has been described in detail, it will be readily apparent to those skilled in the art that other embodiments may be conceived and fabricated without departing from the spirit thereof. Such other embodiments are to be deemed as included within the scope of the following claims unless these claims, by their language, expressly state otherwise.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. In a closed-loop recirculating conveyor system for sorting articles having destination codes associated therewith including a closed-loop conveyor; an article input conveyor communicating with said closed-loop conveyor; at least two article output conveyors communicating with said closed-loop conveyor, and destination diverting means for diverting articles from said closed-loop conveyor onto said output conveyors in accordance with the destination codes associated therewith, the improvement comprising: a reject conveyor communicating with said closed-loop conveyor; means adjacent said closed-loop conveyor for affixing a reject code to each of said articles which have passed each of said article output conveyors and have not been diverted thereonto by said destination-diverting means; and, reject-diverting means for diverting the articles which have said reject code affixed thereto onto said reject conveyor after it has passed each of said outputs a predetermined number of times.

2. The apparatus as set forth in claim 1 wherein said articles pass said affixing means initially after they have passed said reject-diverting means.

3. The apparatus as set forth in claim 2 wherein said reject diverting means is positioned between the last said of said destination diverting means and said affixing means.

4. The apparatus as set forth in claim 1 wherein said articles pass said affixing means initially after they pass said destination-diverting means.