**EUROPEAN PATENT SPECIFICATION**

**On-line sorting for an inserter system**

Online-sortierer für Kuvertiersysteme

Tri en ligne pour système d’insertion

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Description

[0001] The invention disclosed herein relates generally to inserting systems, and more particularly, to apparatus for processing the output of inserting equipment. In particular, the invention relates to an inserter based system for automated sorting of mailpieces in accordance with predetermined postal discount requirements, comprising:

- an inserter for assembling the mailpieces;
- a sorter coupled to said inserter, said sorter including a plurality of sorting bins;
- a sorter controller; and
- means for communicating mailpiece data and configuration data to said sorter controller, said sorter controller being arranged to control the sorting of mailpieces received from said inserter into sort groups according to postal discount requirements.

Such an inserter-based system is disclosed in WO-A-93/18480, with particular reference to Figures 7 and 9.

[0002] Reference is also made to DE-B-1234629, which discloses an apparatus for changing mailpieces from a horizontal alignment to a vertical alignment.

[0003] High volume mailers receive discounts in postal rates for meeting certain criteria established by a postal service. Generally, such criteria relate to a reduction in the postal service's handling of the mail from the mailers. The United States Postal Service ("USPS") offers several levels of discounts to mailers. The level of discount typically is based on the number of criteria met by the mailer. For example, in order to maximize such postage discounts, the USPS requires that high volume mailers presort the mailpieces, apply a Zip+4 bar code to each mailpiece, and package their mail into trays with each tray tagged in accordance with the Domestic Mail Manual. Previously, the sorting and traying processes required to qualify for postal discounts have not been performed on an inserter system because inserters having such capability have not existed. Large volume mailers have performed the sorting process on conventional off-line sorting equipment; however, the traying process has been done manually. Smaller volume mailers may perform both the sorting and traying processes manually. In any event, the traying process has or necessity been done manually because up to now an automated traying process did not exist.

[0004] It is well known to couple conventional stacking equipment to the end of an inserter. Generally, such stacking equipment is used to perform a basic stacking of mailpieces assembled by the inserter.

[0005] Although off-line sorting with conventional sorting equipment has worked well, basic problems exist which are typically associated with off-line processing versus on-line processing. For example, the integrity of the sorting performed by conventional sort-

[0006] It is an aim of the present invention to provide an inserter based system for automated sorting of mailpieces that can interface directly with an inserter system for obtaining certain levels of postal discounts.

[0007] It is an alternative aim of the present invention to provide an inserter based system that includes sorting capability that meets postal service requirements for postal discounts.

[0008] The present invention provides a system as initially defined and characterised in that said sorting bins are on-edge sorting bins, said sorter controller is included in said sorter and a scanner in said inserter is arranged to scan codes printed on the mailpieces, said mailpiece data communicating means comprising an inserter controller of said inserted arranged to send data obtained from said scanned codes to said sorter controller, said sorter controller being arranged to use data from said scanned codes for sorting the mailpieces to designated sort bins.

[0009] According to a preferred embodiment, the system comprises a conventional inserter that outputs mailpieces to an on-edge, multi-bin sorter/stacker by way of a turn-up and alignment device and vertical transport. The turn-up and alignment device receives the mailpieces in a top edge, registered, horizontal orientation and deposits the mailpieces in a vertical orientation with its bottom edge registered against a fixed surface. The on-edge, multi-bin sorter/stacker, which sorts and stacks substantial quantities of mail in a vertical, on-edge orientation, includes a deck having a deck surface with a low coefficient of friction is tilted at a specific angle to balance forces applied to the mailpieces being stacked regardless of the size and weight of the mailpieces.

[0010] The sorter may further include a sort tag printer for printing a sort tag when the sort controller determines that a stack of mailpieces in one of the stacking bins qualifies for a postal discount. The sorter further includes a scanner for scanning codes printed on the mailpieces. The sort controller uses data from the scanned codes in the sorting of the mailpieces to designated sort bins.

[0011] The present invention will be better understood upon consideration of the following detailed description, taken in conjunction with accompanying drawings, in which like reference characters refer to like parts throughout, and in which:

Fig. 1 is a block diagram of an inserter system including an on-line sorting module in accordance
preferably elastically extensible. Belt 24 is wrapped around lower entrance pulley 32 and upstream exit pulley 30. Belt 22 is wrapped around upper entrance pulley 28 and downstream exit pulley 26, whereby belts 22 and 24 complete a 90 degree twist from their respective entrance pulley to their respective exit pulley such that belts 22 and 24 each has a contiguous span for approximately the entire 90 degree twist against which a corresponding span of the other belt applies a normal force. Turn-up and alignment module 20 further includes a contour wire guide 62 shaped to guide a portion of the flat article that is extending beyond the grip of the first and second belts through the ninety degree twist. A lower entrance roller 40 is adjacent lower entrance pulley 32 and rotates on the same horizontal axis as lower pulley 32. There are a plurality of idler rollers 46 and 48 biased against lower entrance roller 40 and lower idler pulley 32.

[0015] A more detailed description of turn-up and alignment module 20 and the transporting of the mailpieces from the inserter to sorter/stacker 110 is disclosed in U.K. Patent Application No. 9423048.9, filed on even date herewith, and hereby incorporated by reference. The text and drawings of E-121 are filed herewith as Appendix A.

[0016] Referring now to Figs. 4 and 5, sorter/stacker 110 includes a plurality of bins, generally designated 120, and a vertical transport, generally designated 122. A controller 12 of inserter 8 communicates with a controller 111 of sorter 110 whereby sorter 110 sorts the mailpieces according to requirements for postal discounts.

[0013] Referring now to Fig. 2, a series of modules are connected to perform on-line sorting of mailpieces output from an inserter or other mail finishing equipment. A top-edge alignment module 10 is connected to the output end of an inserter (not shown in Fig. 2). Module 10 receives mailpieces from the inserter in a horizontal orientation, maintains top-edge registration of the mailpieces and delivers the mailpieces to a turn-up and alignment module 20 that is coupled to the output end of alignment module 10. Turn-up and alignment module 20 is adjustably positioned to obtain bottom-edge registration of the mailpieces while turning the mailpieces 90 degrees to a vertical orientation. Coupled to the exit of turn-up and alignment module 20 is a fixed-position vertical transport 30 that transports the mailpieces to a drum transport 100. Drum transport 100 is a vertical transport that moves the mailpieces along a U-shaped path to a sorter/stacker module 110.

[0014] Referring now to Fig. 3, turn-up and alignment module 20 includes a pair of entrance pulleys 28 and 32, each of which has an offset crown and rotates on a stationary horizontal axis, and a pair of exit pulleys 26 and 30, each of which has a centerline crown. Entrance pulleys 28 and 32 are located longitudinally and vertically apart from one another such that one of the entrance pulleys 32 functions as lower entrance pulley and the other entrance pulley 28 functions as an upper entrance pulley, with upper entrance pulley 28 being located downstream from lower entrance pulley 32. Exit pulleys 26 and 30 rotate on respective fixed vertical axes. Exit pulley 26 is located downstream from exit pulley 30. Turn-up and alignment module 20 further includes a pair of endless belts 22 and 24 which are preferably elastically extensible. Belt 24 is wrapped around lower entrance pulley 32 and upstream exit pulley 30. Belt 22 is wrapped around upper entrance pulley 28 and downstream exit pulley 26, whereby belts 22 and 24 complete a 90 degree twist from their respective entrance pulley to their respective exit pulley such that belts 22 and 24 each has a contiguous span for approximately the entire 90 degree twist against which a corresponding span of the other belt applies a normal force. Turn-up and alignment module 20 further includes a contour wire guide 62 shaped to guide a portion of the flat article that is extending beyond the grip of the first and second belts through the ninety degree twist. A lower entrance roller 40 is adjacent lower entrance pulley 32 and rotates on the same horizontal axis as lower pulley 32. There are a plurality of idler rollers 46 and 48 biased against lower entrance roller 40 and lower idler pulley 32.

[0012] In describing the present invention, reference is made to the drawings, wherein there is seen in Fig. 1 a block diagram of an inserter system, which includes an on-line sorting function. The illustrated system comprises an inserter 8 that outputs mailpieces to a turn-up and alignment device 20 that turns the mailpieces on edge, bottom edge aligned. The inserter 8 includes a scanner 22. Vertical transports 30 and 100 transport the mailpieces to an on-edge sorter/stacker 110. A controller 12 of inserter 8 communicates with a controller 111 of sorter 110 whereby sorter 110 sorts the mailpieces according to requirements for postal discounts.

[0011] The illustrated system comprises a controller 12 that monitors the performance of a module 20, and when a module 20 fails, the controller 12 selects a second module 20 to replace the first module 20. The controller 12 includes a processor 134, a memory 135, a read-only memory (ROM) 136, a random access memory (RAM) 137, and an input/output interface 138. The processor 134 communicates with the memory 135, the read-only memory 136, and the random access memory 137 through an address bus 139 and data bus 140. The processor 134 also communicates with the input/output interface 138 through an input/output bus 141. The input/output interface 138 communicates with the module 20 through an input/output bus 141. The processor 134 receives a control signal from a control system for controlling the transport of mailpieces to an on-edge sorter/stacker 110. A controller 111 of sorter 110 whereby sorter 110 sorts the mailpieces according to requirements for postal discounts.

[0010] Fig. 1; and

Fig. 5 is a top view of the on-line sorting module of Fig. 1;

Fig. 4 is a perspective view of bins in the on-line sorting module of Fig. 1;

Fig. 3 is a top view of a turn-up and alignment transport of the transports in Fig. 2;

Fig. 2 is a perspective view of the on-line sorting module of Fig. 1;

Fig. 1; and

Fig. 6 is a flow chart of the sorting process.
tions 150 and 152 include conventional drive and idler pulleys around which endless elastic belts are stretched. Gates 146 are located between inner belt sections 150, adjacent to the inner reach of outer belt sections 152 and extend parallel to the transport path of vertical transport system 122. Gates 146 pivot at one end about a vertical axis. Each of gates 146 includes a rectangular open section 145 in the non pivoting end through outer belt 152 travels when gate 146 pivots thereto. Outer belt section 152 is shown with multiple belts. In an alternate embodiment (not shown) a single outer belt transport is used in place of multiple outer belt sections 152. The single belt transport includes strategically placed idler pulleys that deflect the mail path to provide lateral force between the belts.

[0018] Low abrasive strips 160 are longitudinally fastened to the surface of base plate 124. As described below, strips 160 must have a low coefficient of friction. In the preferred embodiment of the present invention, strips 160 are made of Delrin AF, manufactured by DuPont of Wilmington, Delaware. Strips 160 act as the deck of bins 120 as envelopes are stacked into bins 120. Strips 162 of Delrin are also fastened to guide surface 142 to facilitate the registration of an incoming envelope.

[0019] With the structure having been disclosed, the operation of sorter/stacker 110 is set forth. An envelope is conveyed to sorter/stacker 110 from the upstream modules 10, 20, 30 and 100. As the envelope is transported on edge by vertical transport system 122, the control system for the sorter/stacker causes a gate 146 of a bin 120 to deflect momentarily toward the adjacent outer belt. This causes the envelope to deflect off gate 146 and follow guide plate 140. The lead edge of the envelope hits the previously stacked envelope (or paddle 132 if the bin is empty) and urge roller 144 urges the envelope between guide surface 142 and the previously stacked envelope until the lead edge of the envelope hits registration wall 126.

[0020] Sorter/stacker 110 does not need a mechanism to perform the traditional "stack advance" function. Instead, the entire stacker bin is angulated at a specific angle. This allows gravity to act on the stack of mailpieces being accumulated in the stacker bin and advance the stack as additional pieces enter. There are certain very specific conditions which allow such stacking device to be successful while stacking a great variety of different types of envelopes to stack lengths of 22 inches or greater.

[0021] Registration wall 126 is laterally adjustable to handle different size envelopes. The manner by which the vertical registration wall 126 is adjusted can be as simple or as complex as is desired. In the preferred embodiment of the present invention, a simple method to make the registration surface adjustable is to provide multiple sets of lateral slots 170 through which the registration surface can be laterally positioned and secured in a conventional manner. Slots 170 have a length sufficient for registration wall to be positioned over an entire range of desirable positions. An alternate embodiment provides multiple sets of discrete holes that facilitate an easy adjustment of registration wall 126 to several discrete positions for desired "trail edge lengths" of envelopes processed. An alternate and more elaborate means of adjusting the "trail edge lengths" of envelopes in their respective stacker bins is to provide, in addition to slots 170 of the preferred embodiment, a "lead-screw type" of mechanism to offer an easy operator adjustment and infinitely variable placement of the registration wall across all envelope lengths.

[0022] Referring now to Fig. 6, a sorting algorithm performed by the sorter/stacker controller 111 is shown. On the basis of information received from inserter controller 12, sorting bins 120 are configured and assigned for sort designation at step 100A. The source for mailpiece data code or file is identified at 102. The mailpiece processing begins at 104 when a mailpiece is scanned. In the preferred embodiment of the present invention, mailpiece information is generally tracked with each mailpiece as it is assembled and processed in the inserter, such that the mailpiece can be sorted with the need for further scanning at sorter/stacker 110. However, the scanning at sorter/stacker 110 serves to improve the integrity of the sorting process by verifying the mailpiece is indeed the mailpiece expected based on the information received from inserter controller 12.

[0023] At 106, the sort designation is determined. At 108, the stack size of the bin into which the mailpiece is to be sorted is checked. If the bin is full, then, at step 110A the bin is turned off-line, i.e., unavailable for further sorting, and a sort destination tag is printed for the stack in the bin. At 112, controller 11 determines if an alternate sort bin is available. If there is one, at 114 the alternate sort bin is designated as a current sort bin. At 116, the mailpiece is stacked in the sort bin. If the bin stack size was less than full at 108, then at 116 the mailpiece is stacked in the sort bin and the processing moves on to the next mailpiece at 104. If no alternate sort bin is available at 112, the mailpiece is sent to a residual bin at 118.

[0024] It has been found that the described system provides sorting capability in an inserter based system that previously did not have such capability. The scanner in sorter/stacker 110 not only improves the sorting integrity for inserters that pass mailpiece information to controller 111 of sorter/stacker 110, but also allows sorter/stacker 110 to be used with inserters that do not have the capability to track a mailpiece through the inserter system.

Claims

1. An inserter based system for automated sorting of mailpieces in accordance with predetermined postal discount requirements, comprising:
an inserter (8) for assembling the mailpieces;
a sorter (110) coupled to said inserter, said sorter including a plurality of sorting bins (120);
a sorter controller (111); and
means for communicating mailpiece data and configuration data to said sorter controller, said sorter controller (111) being arranged to control the sorting of mailpieces received from said inserter (8) into sort groups according to postal discount requirements; characterised in that said sorting bins (120) are on-edge sorting bins, said sorter controller is included in said sorter and a scanner (22) in said inserter is arranged to scan codes printed on the mailpieces, said mailpiece data communicating means comprising an inserter controller (12) of said inserter arranged to send data obtained from said scanned codes to said sorter controller, said sorter controller being arranged to use data from said scanned codes for sorting the mailpieces to designated sort bins.

2. The system of claim 1 further comprising a turn-up and alignment device (20) and a vertical transport (30 or 100) located between said inserter and said sorter, said turn-up and alignment device (20) being arranged to turn the mailpieces from a horizontal alignment out of said inserter to a vertical alignment and said vertical transport being arranged to transport the mailpieces on-edge to said sorter (110).

3. The system of claim 1 or 2 wherein said sorter further includes a sort tag printer for printing a sort tag when said sort controller determines that a stack of mailpieces in one of the stacking bins qualifies for a postal discount.

4. The system of claim 1, 2 or 3 wherein said sorter further includes a scanner (22) for scanning codes printed on the mailpieces, said sorter controller being arranged to use data from said scanned codes in the sorting of the mailpieces to designated sort bins.

Patentansprüche

1. Ein auf einer Einfügeeinheit basierendes System für ein automatisiertes Sortieren von Poststücken gemäß vorbestimmter PostgebührennachlässeAnforderungen, wobei das System folgendes aufweist:
eine Einfügeeinheit (8) zum Sammeln der Poststücke;
eine Sortiereinheit (110), die mit der Einfügeeinheit gekoppelt ist, wobei die Sortiereinheit eine Vielzahl von Sortierbehältern (120) enthält;
eine Sortiereinheits-Steuerung (111); und
eine Einrichtung zum Kommunizieren von Poststükken und von Konfigurationsdaten zu der Sortiereinheits-Steuerung, wobei die Sortiereinheits-Steuerung (111) zum Steuern des Sortierens von Poststücken, die von der Einfügeeinheit (8) empfangen werden, in Sortiergruppen gemäß PostgebührennachlässeAnforderungen aufgebaut ist;
dadurch gekennzeichnet, daß die Sortierbehälter (120) Sortierbehälter am Rand sind, die Sortiersteuerung in der Sortiereinheit enthalten ist und ein Scanner (22) in der Einfügeeinheit angeordnet ist, um auf den Poststücken gedruckte Codes abzutasten, wobei die Poststükken-Kommunikationseinrichtung eine Einfügeeinheits-Steuerung (12) der Einfügeeinheit aufweist, die zum Senden von von den abgetasteten Codes erhaltenen Daten zu der Sortiereinheits-Steuerung angeordnet ist, wobei die Sortiereinheits-Steuerung zum Verwenden von Daten von den abgetasteten Codes zum Sortieren der Poststücken zu bestimmen Sortierbehältern aufgebaut ist.

2. System nach Anspruch 1, das weiterhin eine Wende- und Ausrichtungsvorrichtung (20) und eine vertikale Transporteinheit (30 oder 100) aufweist, die zwischen der Einfügeeinheit und der Sortiereinheit angeordnet sind, wobei die Wende- und Ausrichtungsvorrichtung (20) angeordnet ist, um die Poststücken von einer horizontalen Ausrichtung aus der Einfügeeinheit zu der vertikalen Ausrichtung zu wenden, und wobei die vertikale Transporteinheit angeordnet ist, um die Poststücke am Rand zu der Sortiereinheit (110) zu transportieren.

3. System nach Anspruch 1 oder 2, wobei die Sortier einheit weiterhin einen Sortiereinheitskennungs drucker enthält, um eine Sortierkennung zu drucken, wenn die Sortiereinheits-Steuerung bestimmt, daß ein Stapel von Poststücken in einem der Stapelbehälter sich für einen Postgebührennachlaß qualifiziert.

4. System nach Anspruch 1, 2 oder 3, wobei die Sortiereinheit weiterhin einen Scanner (22) zum Abtasten von Codes enthält, die auf den Poststücken gedruckt sind, wobei die Sortiereinheits-Steuerung angeordnet ist, um Daten von den abgetasteten Codes beim Sortieren der Poststücke zu bestimmten Sortierbehältern zu verwenden.

Revendications

1. Système basé sur un dispositif d'insertion pour le tri automatique d'objets postaux selon des exigences de remises postales prédéterminées, comprenant:
un dispositif d'insertion (8) pour assembler les objets postaux ;
une trieuse (110) couplée audit dispositif d'insertion, ladite trieuse comportant une pluralité de paniers de tri (120) ;
un contrôleur de trieuse (111) ; et
des moyens pour communiquer des données d'objets postaux et des données de configuration audit contrôleur de trieuse, ledit contrôleur de trieuse (111) étant agencé de manière à contrôler le tri des objets postaux reçus provenant dudit dispositif d'insertion (8) dans des groupes de tri selon des exigences de remises postales ;
caractérisé en ce que lesdits paniers de tri (120) sont des paniers de tri vertical, ledit contrôleur de trieuse est inclus dans ladite trieuse et un dispositif de balayage (22) situé dans ledit dispositif d'insertion est agencé de manière à balayer des codes imprimés sur les objets postaux, lesdits moyens de communication de données d'objets postaux comprenant un contrôleur de dispositif d'insertion (12) dudit dispositif d'insertion, agencé de manière à envoyer des données obtenues à partir desdits codes balayés vers ledit contrôleur de trieuse, ledit contrôleur de trieuse étant agencé de manière à utiliser les données provenant desdits codes balayés pour trier les objets postaux vers des paniers de tri désignés.

2. Système selon la revendication 1, comprenant en outre un dispositif de retournement et d'alignement (20) et un dispositif de transport vertical (30 ou 100) situé entre ledit dispositif d'insertion et ladite trieuse, ledit dispositif de retournement et d'alignement (20) étant agencé de manière à retourner les objets postaux à partir d'un alignement horizontal en dehors dudit dispositif d'insertion vers un alignement vertical et ledit dispositif de transport vertical étant agencé de manière à transporter les objets postaux verticalement vers ladite trieuse (110).

3. Système selon la revendication 1 ou 2, dans lequel ladite trieuse comporte en outre une imprimante de marque de tri pour imprimer une marque de tri lorsque ledit contrôleur de trieuse détermine qu'une pile d'objets postaux dans l'un des paniers d'empilement a droit à une remise postale.

4. Système selon la revendication 1, 2 ou 3, dans lequel ladite trieuse comporte en outre un dispositif de balayage (22) pour balayer des codes imprimés sur les objets postaux, ledit contrôleur de trieuse étant agencé pour utiliser des données provenant desdits codes balayés dans le tri des objets postaux vers des paniers de tri désignés.
FIG. 1