An article conveyor for turning articles such as envelopes over as they are being conveyed for processing as by an article addressing machine. The conveyor has an inclined ramp on which an upper edge portion of the articles ride, a lower guide to support and control the articles lower edge as the article rides up the ramp, and a pair of conveyor belts operable with each of the ramp and guide to move the articles through the conveyor. A substantially vertical discharge roller pair eject the articles, which are on edge, into a hopper, the hopper being provided with a side wall guide to assure continued turning of the articles by gravity from a substantially vertical discharge position to a substantially horizontal feeding position in the hopper. To permit operation of the conveyor with the hopper feeder and avoid misfeeding or jamming at the feeder hopper, an interposer is provided which when actuated interrupts the article free fall until the hopper is clear.

11 Claims, 6 Drawing Figures
ARTICLE TURNOVER CONVEYOR

This invention relates to an article conveyor, and more particularly to an improved article turnover conveyor.

Commercial mailing rooms may use an inserter to automatically insert items such as advertisements into envelopes and then seal the envelopes in preparation for addressing and mailing thereof. However, many inserters discharge the sealed envelopes flap side up. Conventionally, however, the mailing address and postage stamp or meter are placed on the opposite face of the envelope and this requires that the envelopes be turned over prior to application of the address and postage stamp thereto. Although the envelopes may be turned over by hand, this may not be feasible, either from an economic or operational point of view. And since commercial mailing rooms normally have automatic addressing machines as well as postage meter or stamp applicator machines, efficient operation of these machines may also be compromised by the requirement that envelopes from the inserter be hand turned before being delivered to the addressing machine supply hopper.

It is a principal object of the present invention to provide a new and improved article turnover conveyor.

It is a further object of the present invention to provide an apparatus for turning articles such as envelopes from a flap side up to flap side down position for further processing thereof.

It is an object of the present invention to provide an improved article supply transport for use with an article labeling machine adapted to accept articles that are wrong side up and re-orient the articles to a right side up position prior to delivery to the labeling machine.

It is an object of the present invention to provide an article conveyor adapted to turn articles to an upright slightly overcenter position to enable gravity to complete the turnover cycle.

It is an object of the present invention to provide a turnover conveyor for envelopes and the like adapted to turn the envelopes past a point of no return following which the envelopes fall by gravity onto their other side.

It is an object of the present invention to provide an article turnover conveyor system incorporating selectively operable means to forestall completion of the article turnover.

This invention relates to a combined article conveyor and turnover apparatus comprising the combination of: article transport means, the article transport means being adapted to receive articles in a wrong side up position; and article guide means adapted to turn the articles to a substantially upright position as the articles move through the apparatus under the impetus of the transport means whereby turnover of the articles may be completed by gravity following discharge of the articles by the transport means, the article guide means including a first ramp-like member on which an upper portion of the articles is adapted to ride as the articles move through the apparatus, and a second chute-like member for supporting the lower pivot edge of the articles as the articles move through the apparatus, the chute member extending from a position spaced alongside the ramp member adjacent the inlet to the transport means to a position below the ramp member adjacent the transport means discharge so that the articles are guided through a substantially 90° arc as the articles move through the apparatus.

Other objects and advantages will be apparent from the ensuing description and drawings in which:

FIG. 1 is a side view showing the turnover conveyor of the present invention disposed between the discharge side of an article inserter and the article supply hopper of an automatic addressing machine;

FIG. 2 is a top view of the turnover conveyor shown in FIG. 1;

FIG. 3 is an isometric view of the turnover conveyor shown in FIG. 1;

FIG. 4 is a cross sectional view taken along lines 4—4 of FIG. 1;

FIG. 5 is a cross sectional view taken along lines 5—5 of FIG. 1; and

FIG. 6 is a schematic view showing the path of movement of an article through the turnover conveyor shown in FIG. 1.

Referring to the drawings, there is shown the turnover conveyor, designated generally by the numeral 10, of the present invention. As will appear, turnover conveyor 10 serves to turn articles such as envelopes 12 from a flap side up position over to a flap side down position for further processing thereof. In the exemplary arrangement shown in FIG. 1, the article source comprises an inserter 5 of the type which discharges envelopes 12 flap side up. Since the address information and postage stamp are applied to the opposite side, envelopes 12 must be turned over before further processing as by addressing machine 7 can be effected. The turnover conveyor 10 of the present invention, which is adapted to operatively connect the output of inserter 5 with the article supply hopper 8 of addressing machine 7, serves while transporting the envelopes 12 from inserter 5 to hopper 8 to turn envelopes 12 over in preparation for addressing thereof.

Turnover conveyor 10 includes a base 15, provided with suitable means (not shown) to permit conveyor 10 to be operatively connected between the output side of inserter 5 and feeder hopper 8 of addressing machine 7.

Base 15 has a pair of upstanding brackets 16 adjacent the inlet thereto, brackets 16 serving to journal support shaft 18 of article transport 19.

A substantially horizontal mounting plate 21 is provided on base 15 adjacent the conveyor discharge end, plate 21 cooperating with a parallel mounting plate 22 thereabove to journal the second support shaft 23 of article transport 19. As can be seen, the article transport support shaft 18 is substantially horizontal while shaft 23 thereof is substantially vertical. In addition, plates 21, 22 support shaft 26 for belt transport pinch rolls 27, 27', and shafts 29, 30 for discharge pinch roll pair 33, 34 respectively.

Support shaft 18 of article transport 19 is driven through suitable power transmission means from conveyor drive motor 36. Shaft 23 of article transport 19 drives pinch roll support shafts 26, 29, and 30 through drive belt 38.

Article transport 19 consists of a pair of flexible belts 40, 41 supported by pulleys 44, 44' and 45, 45' respectively. Pulleys 44, 45 are mounted on shaft 18 while pulleys 44', 45' are mounted on shaft 23. The conveyor belts 40, 41 may comprise any suitable belt design and material, rubber O-ring type belts being preferred.
Pinch rolls 27, 27' are disposed diametrically opposite the pulleys 44', 45' respectively and cooperate with the belts 40, 41 riding therein to form a nip through which envelopes 12 pass enroute to discharge pinch rolls 33, 34 downstream thereof. The pinch rolls 33, 34 each comprise a roll pair in operative relation to one another to form a discharge nip through which envelopes 12 are discharged from conveyor 10. In the exemplary arrangement shown, the substantially upright envelopes 12 are discharged by conveyor 10 into feeder hopper 8 of addressing machine 7. There the articles fall by gravity onto their flap side to complete the article turnover cycle as will appear herein.

Conveyor belts 40, 41 are arranged so that the driving run 40' of belt 40 contacts envelopes 12 near the lower pivot edge thereof while the driving run 41' of belt 41 contacts envelopes 12 near the upper edge thereof. It will be understood that the relative spacing between the driving runs of belts 40, 41 is determined by the width of the articles being handled, it being necessary that the driving run 41' of belt 41 be 45° above the envelope centerline to provide, in cooperation with belt 40 the requisite turning action as the envelopes move through conveyor 10.

Envelope edge guide 50, consisting of a longitudinally extending part of generally L-shape cross-section, is disposed alongside the driving run 40' of conveyor belt 40. Edge guide 50 serves, in cooperation with ramp 60, to route the envelopes 12 through conveyor 10 while holding the envelopes 12 in contact with the conveyor belt run 40' throughout the operating length of conveyor 10. To accommodate turning movement of envelopes 12 from the substantially horizontal position in which envelopes 12 enter conveyor 10 to the upright position in which envelopes 12 leave conveyor 10, edge guide 50 is gradually twisted through an angle of approximately 90°. As a result, leg 51 of edge guide 50 serves as a base for supporting envelopes 12 at the conveyor inlet with leg 52 serving as an envelope side edge guide. At the conveyor discharge, these positions are reversed with leg 52 serving as a base for envelopes 12 and leg 51 as the side edge guide for routing, in cooperation with ramp 60, the upright articles into the nip formed by conveyor belts 40, 41 and opposing pinch rolls 27, 27'.

Ramp 60 comprises an upwardly inclined rod-like part extending alongside the driving run 41' of belt 41. Ramp 60 extends from the conveyor inlet to a point adjacent pinch roll 27', the leading end 61 thereof being at substantially the same level or slightly above the surface of leg 51 of edge guide 50. Ramp end 61 together with guide 50 provide a pair of spaced base surfaces for supporting the envelopes 12 entering conveyor 10. The opposite end 62 of ramp 60 is approximately level with pulley 45' of conveyor belt 41. Preferably, end 61 of ramp 60 is extended with the terminal portion being turned downward at 63 to facilitate entry of envelopes 12 into conveyor 10.

Envelopes 12 are discharged from pinch roll pair 33, 34 of conveyor 10 into hopper 8 in a generally upright position, although the envelopes, due to the turning motion imparted by a discharge nip 45' of conveyor 10, tend to continue over to a flat flap side down position in feeder hopper 8. To assure completion of envelope turnover, a ramp-like projection 69 is provided on the interior wall of hopper side 71 as will appear.

The addressing machine feeder hopper 8 has a reciprocable vacuum assisted shuttle 67 at the base 66 thereof adapted to feed one envelope at a time forward under a control gate 68 to the article transport 9. Control gate 68 has a lower edge spaced slightly above the plane of feeder shuttle 67 to limit feeding of envelopes 12 by shuttle 67 to one article at a time. At the same time, the inside wall 68' of control gate 68 serves as a stop for the envelopes 12 discharged from conveyor 10 into hopper 8.

An upstanding rear guide member 70 is disposed across the inlet to the feeder hopper 8. The inside end of guide member 70 is spaced from side member 71 to form in cooperation with member 71 a generally vertical slot-like passage 72 through which envelopes 12 pass into hopper 8. Preferably, the end of side member 71 is turned outwardly at 71' to facilitate passage of envelopes 12 therethrough. Rear guide member 70 is spaced from control gate 68 by a distance slightly greater than the length of envelopes 12, member 70 serving to limit any tendency for envelopes 12 to bounce back on contact of the envelopes with the control gate wall 68'. In addition, hopper 8 has a second side member 74 along the outside edge of base 66. Suitable means (not shown) are provided to permit members 70, 71 and 74 to be adjusted for different size envelopes. To sustain continued turning of envelopes 12 under the influence of gravity as the envelopes move into hopper 8, ramp-like projection 69 is provided on the inside wall of side member 71 adjacent the downstream end thereof.

Feeder shuttle 67 moves forward and back on base 66, forward movement of shuttle 67 serving to carry the envelope thereon ahead under control gate 68 to article transport 9 while backward movement thereof serves to return the shuttle 67 to the feed start position. To avoid premature contact of envelopes 12 with feeder shuttle 67 and possible misfeeding or jamming of the envelopes, an interposer 75 is provided. Interposer 75 consists of a rod-like abutment supported on the side member 74 of hopper 8 for selective movement into hopper 8 and into the path of free fall of envelopes 12. A solenoid operator 76 is provided, solenoid 76 serving when energized, to drive interposer 75 forward into hopper 8 and prevent the envelopes from settling flap side down on shuttle 67. When deenergized, suitable spring means (not shown) serves to retract interposer 75.

Control switch 77 for solenoid 76 may be supported adjacent shuttle 67 with the operating arm 77' therefor in the path of movement of shuttle 67. The position of switch arm 77' is such that when shuttle 67 is at the forward or discharge end of its stroke, switch 77 energizes, through suitable circuitry (not shown) solenoid 76 to move interposer 75 forward to the envelope intercepting position. In the event an envelope is discharged by conveyor 10 into hopper 8 at the time interposer 75 prevents the envelope from falling into contact with the shuttle. On subsequent retraction of shuttle 67, solenoid 76 is deenergized and interposer 75 retracted to permit the envelope 20 to complete the turning action.

In operation, turnover conveyor 10 is disposed between the discharge of inserter 5 and hopper 8 of addressing machine 7. With reference to FIG. 6, envelopes 12 leave inserter 5 flap side up in a substan-
Envelopes 12 are carried along edge guide 50 and ramp 60 by the moving conveyor belts 40, 41. As envelopes 12 move through conveyor 10, the envelope upper portion rides up the inclined ramp 60 so that the envelope gradually turns to an upright position. The twisted configuration of edge guide 50 assists in this turning action. At the same time, guide 50 serves to support the envelope as the envelope approaches and passes into an approximately vertical position. The upright envelopes pass between the nip formed by belts 40, 41 and pinch rolls 27, 27' and through pinch roll pair 33, 34 into hopper 8 of addressing machine 7.

Wherein the invention has been described with reference to the structure disclosed, it is not confined to the details set forth; but is intended to cover such modifications or changes as may come within the scope of the following claims.

What is claimed is:

1. In a combined article conveyor and turnover apparatus, the combination of:
   a. article transport means, said article transport means being adapted to receive substantially planar articles in a wrong side up position; and
   b. article guide means adapted to turn the articles to a substantially upright position as said articles move through said apparatus under the impetus of said transport means whereby turnover of said articles may be completed by gravity following discharge of said articles by said transport means, said article guide means including
      a first ramp-like member on which an upper portion of said articles is adapted to ride as said articles move through said apparatus, and
      a second chute-like member for supporting the lower pivot edge of the articles as said articles move through said apparatus, said chute member extending from a position spaced alongside said ramp member adjacent the inlet to said transport means to a position below said ramp member adjacent said transport means discharge and twisted through an angle of approximately 90° so that said articles are guided through a substantially 90° arc as said articles move through said apparatus.

2. The apparatus according to claim 1 in which said transport means includes a conveyor belt pair extending along the article supporting surfaces of said guide means ramp and chute members respectively and cooperate therewith to move articles therealong through said apparatus.

3. The apparatus according to claim 1 in which said transport means includes discharge pinch roll means through which said articles are discharged, the axis of rotation of said pinch roll means being substantially vertical, and second guide means downstream of said pinch roll means adapted to assure continued turning movement of said articles by gravity to a right side up position.

4. The apparatus according to claim 1 including means temporarily interposable into the turnover path of said articles to prevent completion of said article turnover by gravity.

5. The apparatus according to claim 4 including article feeder means for feeding said articles, said feeder means having an inlet for receiving articles to be fed, said apparatus being adapted to discharge said articles into said feeder means inlet; and control means for operating said interposer means in response to a predetermined condition of said feeder means.

6. In an article addressing system including an article addressing machine for addressing articles, the addressing machine having a hopper for holding a supply of articles to be addressed and feeder means for advancing in seriatum the bottommost article from said hopper to the addressing machine, the combination of: article transport means, said transport means discharging articles to be labeled into said hopper; means defining an upwardly inclined article turnover ramp for supporting an upper edge portion of said articles as said articles are fed toward said hopper by said transport means; means defining a lower edge article guide alongside said ramp means for supporting the lower edge of said articles as said articles are carried up said ramp means by said transport means; said article edge guide means being spaced alongside said ramp means at the inlet to said article transport means and substantially vertically below said ramp means at the outlet of said article transport means whereby to cooperate with said ramp means to turn said articles to a substantially upright position prior to discharge of said articles into said hopper, so that said articles are gravity turned over to a substantially flat feeding position in said hopper.

7. The article addressing system according to claim 6 in which said hopper includes upstanding gate means at the discharge side thereof for discharge said articles, into said hopper and against said gate means, and means adapted to sustain continued turning movement of said articles as said articles move into said hopper and against said gate means.

8. The article addressing system according to claim 7 including means responsive to said article feeder means.
to temporarily prevent completion of said article turnover and operative contact of said articles with said feeder means.

9. Apparatus according to claim 6 wherein said transfer means includes a conveyor belt pair extending along the article supporting surfaces of said ramp and edge guide cooperating therewith to turn said articles to a substantially upright position prior to discharge thereof into said hopper.

10. Apparatus according to claim 6 wherein said edge guide comprises an L-shaped channel twisted through an angle of approximately 90°.

11. Apparatus according to claim 10 wherein said conveyor belt pair is twisted through an angle of substantially 90°.
UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Inventor(s) Donald W. Watson

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

(73) Assignee: Xerox Corporation

Signed and sealed this 4th day of June 1974.

(SEAL)
Attest:

EDWARD M. FLETCHER, JR. C. MARSHALL DANN
Attesting Officer Commissioner of Patents