

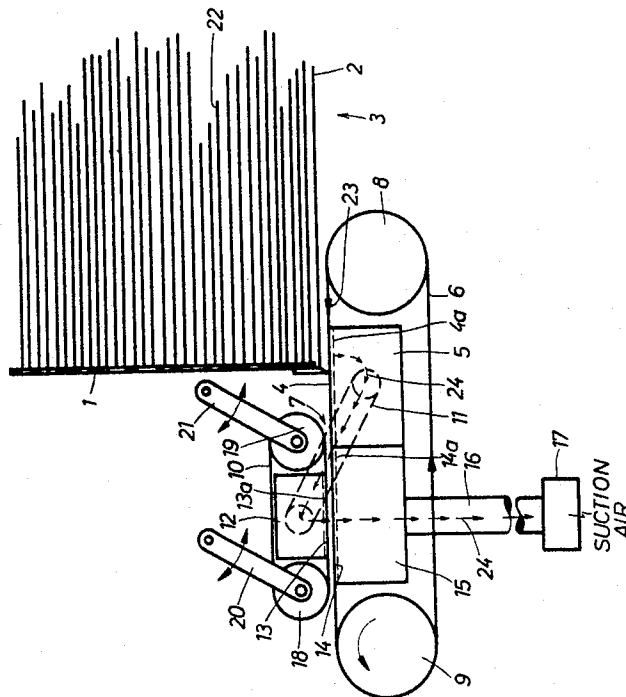
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PNEUMATIC APPARATUS FOR INDIVIDUALLY SEPARATING FLAT ITEMS

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PNEUMATIC APPARATUS FOR INDIVIDUALLY SEPARATING FLAT ITEMS

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9 Claims. (Cl. 271-12)

This invention relates to apparatus for individually pulling flat items off a pile of such items, and, more particularly, to apparatus for individually pulling flat items off a pile of such items at a rate which is determined by the lengths of the items themselves.

In many article sorting systems (such as mail sorting systems) means must be provided for feeding flat items from a pile of such items to a conveyor for subsequent processing. Present feeding means suffer from various disadvantages. Most feeding apparatus pull the articles off the stack at a predetermined rate. Systems utilizing this apparatus work very well if the articles have a uniform length, however, if the articles are not uniform in length, the pull-off rate must be such that it will be appropriate for the longest article. Therefore, when shorter articles are pulled off, there is a large distance between adjacent articles.

Some systems utilize complex photoelectric arrangements or sensing arrangements to sense the trailing edge of conveyed items so that a second document can be conveyed a predetermined distance behind the trailing edge of a first document. Apparatus for accomplishing this has heretofore been complex and expensive.

It is therefore an object of this invention to provide improved apparatus for individually pulling flat items off a stack of such items.

It is another object of this invention to provide apparatus for individually pulling flat articles off a stack of such articles at a rate which is dependent on the lengths of the articles themselves and which is of a simple and inexpensive construction.

A feature of our invention is the provision of apparatus for individually pulling flat items off a stack of such items comprising suction means for effecting a pull-off of the items wherein the suction supplied to the suction means is interrupted by the conveyed articles themselves.

The above-mentioned and other features and objects of this invention will become more apparent by reference to the following description taken in conjunction with the accompanying drawing in which there is shown a schematic view of article-feeding apparatus in accordance with our invention.

Guide 1, in the view of the drawing, guides the first article 2 of a stack 3 of flat articles to a predetermined position with respect to suction nozzles 4a positioned along side 4 of chamber 5. Perforated belt 6 is led past and between suction nozzles 4a and leading article 2 to a conveying system 7 via idler pulley 8 and driver pulley 9. Conveying channel 7 is formed by a portion of belt 6 in cooperation with another perforated belt 10.

Suction nozzles 4a are connected to a source of suction air via flexible tube 11 which is disposed below channel 7 and connects chamber 5 to a chamber 12. Chamber 12 has suction nozzles 13a along side 13, in cooperative relationship with suction nozzles 14a disposed along side 14 of a chamber 15. Tube 16 connects chamber 15 to a source of suction air 17. Arrows 24 indicate the flow of air from nozzles 4a to source 17. The flow of air through nozzles 4a passes via chamber 5 and tube 11 into chamber 12, from chamber 12 via cooperative nozzles 13a and

nozzles 14a to chamber 15, and thence via tube 16 back to the source of suction air 17.

Rollers 18 and 19, around which belt 10 is disposed, are pivotally mounted via brackets 20 and 21, respectively, for movement towards and away from the conveying channel. Brackets 20 and 21 are spring urged (not shown) so that belt 10 is urged against belt 6. It is important to note that the distance between suction nozzles 4a and suction nozzles 14a is less than the length of the shortest article 22 to be handled by the system.

The operation of our apparatus will now be explained. Initially, suction is applied to nozzles 4a via path 5, 11, 12, 13, 14, 15 and 16 from suction source 17 as can be seen by arrows 24. Article 2 is drawn to belt 6 and conveyed therealong in the direction of arrow 23 to conveying channel 7. When the article is disposed between nozzles 13a and 14a, the flow of suction air is effectively cut off as the article interrupts the flow of air between nozzles 13a and 14a. When the trailing edge of the article passes these nozzles, suction air is once again supplied to nozzles 4a, and the next leading article 2 is drawn to the belt for conveyance to channel 7. Therefore, it can be seen that the article itself is used to interrupt the flow of air to prevent a subsequent pull-off until the conveyed article has passed a particular position along conveying path 7. This position is selected by the positioning of nozzles 13a and 14a. It is to be noted that conveying path 7 need not include the pull-off belt 6 but could employ a second endless belt disposed around a pulley so that it is positioned opposite to roller 19.

While we have described the principles of our invention in connection with specific apparatus, it is to be clearly understood that this description is made only by way of example and not as a limitation to the scope of our invention as set forth in the accompanying claims.

We claim:

1. Apparatus for individually pulling flat articles away from a stack of such articles comprising: an article conveying system, means for applying suction to one of the articles in the stack to draw it into the conveying system including a source of suction and means forming a suction path between said source and said article, said suction path crossing said conveying path and being so located at said crossing point that an article along said conveying path at said crossing point cuts off the suction to the articles in the stack.

2. Apparatus for pulling flat articles away from a stack of such articles and feeding them to the conveying path of a conveying system comprising:

- (a) guide means for guiding the first article in said stack to a predetermined position;
- (b) pneumatic means disposed adjacent said predetermined position for pulling the first article off said stack and feeding it to said conveying system;
- (c) a source of suction air; and
- (d) pneumatic connecting means connecting said source of suction air to said first article comprising means forming a pneumatic path across said conveying path of a selected position therealong so that articles passing said selected position will interrupt the connection of said source of suction air to said first article.

3. Apparatus for individually pulling flat articles away from a stack of such articles and feeding them to a conveying system comprising:

- (a) guide means for guiding the first article in said stack to a predetermined position;
- (b) first suction nozzles disposed adjacent said predetermined position;
- (c) a first perforated endless belt;

- (d) means supporting said endless belt for movement along a predetermined path, said predetermined path passing between said first suction nozzles and said predetermined position to said conveying system;
- (e) a source of suction air; and
- (f) means connecting said source to said first suction nozzles for drawing the first article in said stack to said belt for feeding said first article to said conveying system including means responsive to the presence of an article at a selected position with respect to said conveying system for interrupting the connection of said source of suction air to said first suction nozzles.
4. Apparatus according to claim 3 wherein said responsive means comprises second and third suction nozzles, said second suction nozzles being disposed on a first side of the path of said conveying system and said third suction nozzles being disposed opposite to said second suction nozzles on the opposite side of said conveying path whereby conveyed articles are disposed between said second and third suction nozzles when they are at said selected position with respect to said conveying system.
5. Apparatus according to claim 4 wherein said connecting means comprises first, and second, and third chambers containing said first, second, and third suction nozzles, respectively; first tube means pneumatically connecting said first chamber to said second chamber; and second tube means connecting said third chamber to said source of suction air.
6. Apparatus according to claim 5 wherein said first suction nozzles are disposed on said opposite side of said conveying path.
7. Apparatus for individually pulling flat articles away from a stack of such articles comprising:
- (a) first and second perforated belts;
- (b) means supporting said belts to form a conveying path between portions of said belts;
- (c) guide means guiding the leading article of said stack of flat articles to a first position adjacent a portion of a first side of said first belt;

- (d) a first set of suction nozzles disposed opposite said first position on the other side of said first belt;
- (e) a source of suction air; and
- (f) pneumatic connecting means connecting said source of suction air to said first set of suction nozzles via a pneumatic path which crosses said conveying path at a second position, said pneumatic path being so dimensioned and positioned that conveyed articles interrupt the flow of suction air to said first set of suction nozzles when they are disposed at said second position.
8. Apparatus according to claim 7 wherein said connecting means comprises a second set of suction nozzles disposed adjacent said conveying path, a third set of suction nozzles disposed opposite said second set of suction nozzles on the other side of said conveying path so that the portion of said pneumatic path which crosses said conveying path is from said second set of suction nozzles through said perforated belts to said third set of suction nozzles.
9. Apparatus according to claim 8 wherein said pneumatic connecting means comprises first, second, and third chambers containing said first, second, and third sets of suction nozzles, respectively; first tube means pneumatically connecting said first chamber to said second chamber; and second tube means connecting said third chamber to said source of suction air.

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