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[54] SUCTION BELT SEPARATOR FOR FLAT ITEMS

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[58] **Field of Search** 271/26, 32, 35, 12, 74

[56] **References Cited**

UNITED STATES PATENTS

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[57] **ABSTRACT**

A suction belt separator in which the passage between a suction opening for removing items from a stack and the vacuum source extends across the conveying path followed by separated items so that an item intersecting the passage blocks it and interrupts the suction at the suction opening, the suction opening also being in permanent communication with the atmosphere through a small throttle opening.

4 Claims, 2 Drawing Figures

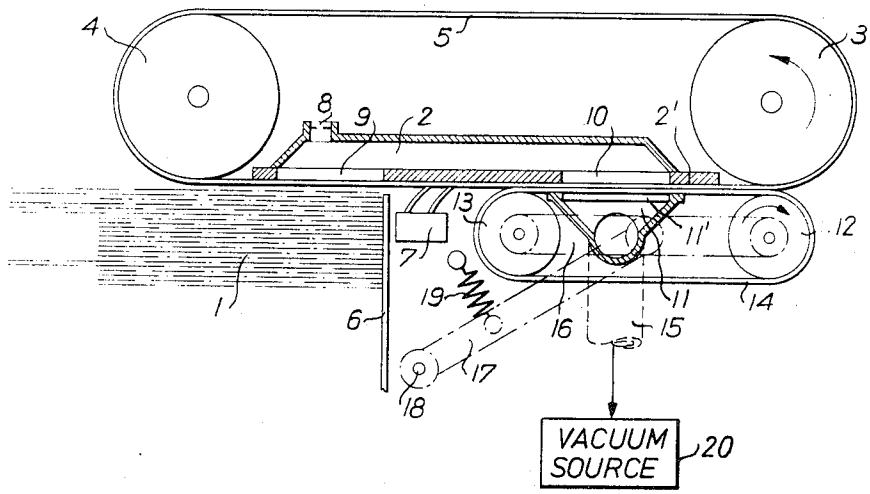


Fig. 1

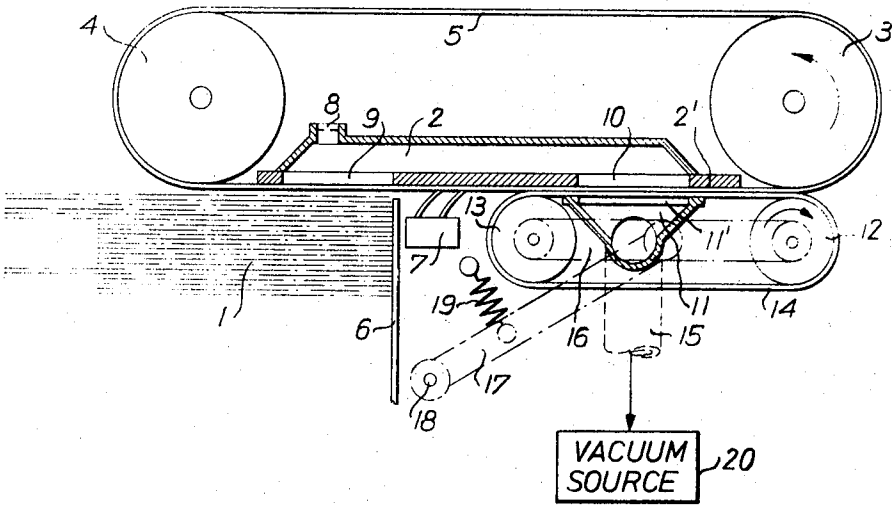
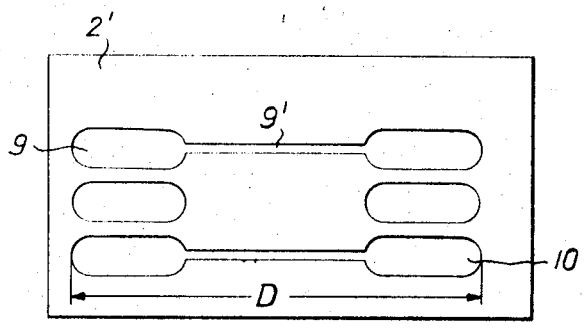


Fig. 2



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SUCTION BELT SEPARATOR FOR FLAT ITEMS

BACKGROUND OF THE INVENTION

The present invention relates to a suction belt separator for flat items, particularly those having different lengths, such as letters for example.

The invention is particularly directed to the type of separators in which the suction chamber disposed opposite the stack is in communication with the vacuum source through a control channel extending, at a distance from the suction point which is less than the length of the shortest item, across the conveying channel and which is controlled directly by the already separated item then passing through the separator.

The regulation of the suction applied to the stack in dependence on the position of the trailing edge of the preceding item can produce the result that the items will not be conveyed with their front edges spaced at constant intervals but with gaps of constant length therebetween, which may be desirable, for example, at different points within an automatic mail distribution system.

A suction belt separator having these properties and in which the suction chamber opposite the stack is also controlled by direct pneumatic means is disclosed in German Pat. No. 1,177,174. This separator is so constructed that the rotating perforated belt is brought past two suction chambers, one behind the other in the conveying direction, with the second chamber, seen in the conveying direction, being connected with a suction air source whereas the first chamber is connected with a third suction chamber disposed on the other side of the conveying path from the second chamber and cooperating with its own rotating conveying member. This third suction chamber receives its suction from the first suction chamber across the suction channel.

To assure that the spaces between consecutive items are indeed substantially constant in such an arrangement, it is necessary for the pressure in the suction chamber to be quickly restored. Because after, for example, an item having the shortest possible length has covered the control channel, its trailing edge must not release the suction openings of the suction chamber opposite the stack until the vacuum previously present in this chamber has been dissipated. Otherwise there would occur an overlapping removal. For a given apparatus size, the length of the shortest item that can be handled is thus directly dependent on the replenishment time of the volume of air to be controlled. In the known arrangement constructed with three suction chambers the volume to be controlled includes the interior of two suction chambers—i.e., the chamber opposite the stack and the third suction chamber—as well as the movable hose connecting the chambers which, for structural reasons, has a relatively large volume.

SUMMARY OF THE INVENTION

A primary object of the present invention is to eliminate the shortcomings of these known devices.

A further object of the invention is to increase the item-handling rate of such devices.

Another object of the invention is to permit a device of given size to handle shorter items than was heretofore possible.

Yet another object of the invention is to simplify the structure of such devices.

It is a specific object of the present invention to construct a suction belt separator of the type mentioned in the introductory paragraph in such a manner that a substantially smaller air volume must be controlled.

These results are achieved according to the invention by forming the control channel between control openings disposed in the suction chamber itself and the suction openings of a second suction chamber which is disposed opposite the first suction chamber together with a rotating perforated belt, the second chamber and belt being mounted in a known manner to be resiliently urged toward the first chamber, the vacuum source being connected directly to the second suction chamber and the first suction chamber being in communication with the atmosphere through a throttle opening.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a plan view, partly in cross section, of a suction belt separator according to the invention for letters.

FIG. 2 is an elevational view of an element of the arrangement of FIG. 1.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

The separator illustrated in FIG. 1 includes a first suction chamber 2 disposed opposite the stack 1 of letters. A suction belt 5 is brought past chamber 2 and over a drive roller 3 and a guide roller 4 and is provided with perforations along its length. The abutment wall for the stack is indicated at 6. A stripper 7, which may be a known suction stripper, is shown schematically behind the initial suction region and is disposed on the side of the conveying path opposite the suction belt 5.

Suction chamber 2 is in communication with the atmosphere through a throttle opening 8 having a small cross section. The chamber wall 2' facing the suction belt 5 is provided with suction openings 9 in the initial suction region, which openings cooperate in a known manner with the suction belt. Control openings 10 are provided in wall 2' at a location such that the total length D of the path covered by openings 9 and 10 and the distance between them is not greater than, and preferably less than, the length of the shortest item to be separated, and in such a manner they are also disposed in the paths of the openings of suction belt 5. The effective width of the suction region defined by openings 10 should be no greater than the width of the narrowest item to be separated.

As shown in FIG. 2, narrow suction slits 9' are formed in wall 2' in line with the paths of the belt openings and extending between the suction openings 9 and control openings 10, the slits being provided to effect a positive transport of the items.

A second suction chamber 11 is disposed opposite the control openings 10 of suction chamber 2 and is provided with suction openings 11' in registry with the control openings 10. An auxiliary belt 14 passes in front of this second suction chamber 11 and is guided around rollers 12 and 13. This belt is also provided with openings which extend along its edges in line with the openings in suction belt 5 and thus in line with the control openings 10 and suction openings 11'. A separate drive may be provided for auxiliary belt 14, but is not necessary since belt 14 will be driven by contact with belt 5. Suction chamber 11 is connected to a vacuum source 20 through a hose 15.

Suction chamber 11 and the shafts of rollers 12 and 13 are fastened to a supporting bar 16 which is mounted on an arm 17 to be freely movable about an axis perpendicular to its length. Arm 17 is itself pivotal about an axis 18 and is urged in a counterclockwise direction by a tension spring 19. Thus, the auxiliary belt 14 is always maintained in contact with suction belt 5 or with the item carried along therewith.

The above-described suction belt separator operates as follows:

Let it be assumed that no item is in the conveying path when the suction belt 5 is put into operation. The control channel formed between suction openings 11' and control openings 10 is thus open so that a vacuum is developed in suction chamber 2. Thus, the first item in the stack is sucked onto the belt 5 through the suction openings 9 and is removed from the stack with the aid of the narrow suction slits 9'. As soon as the control openings 10 have been covered by the item passing through, the connection between suction chamber 2 and the vacuum source is interrupted and the suction in chamber 2 is dissipated by the passage of air through throttle opening 8 so that a suction effect no longer exists. Since the item, however, is now pressed between belts 5 and 14, it is further trans-

ported, simply by friction, between belts **5** and **14**. After the trailing edge of the item passes openings **10**, those openings are free again so that a new vacuum is formed in suction chamber **2** and the next item is sucked onto belt **5** and removed from the stack.

The size of throttle opening **8** can be selected in a straightforward manner as a function of the volume of chamber **2** and the time in which the vacuum in the chamber is to be dissipated.

It will be understood that the above description of the present invention is susceptible to various modifications, changes and adaptations and the same are intended to be comprehended within the meaning and range of equivalents of the appended claims.

I claim:

1. A suction belt separator for separating flat items from a stack and for moving them along a conveying path, comprising, in combination:

means defining a region in which the stack is placed;

a first suction chamber disposed opposite the stack region, said chamber having a suction opening communicating with the stack region, a control opening spaced along the conveying path from said suction opening by a distance not greater than the length of the shortest item to be conveyed, and a throttle opening communicating with the atmosphere;

a second suction chamber disposed on the opposite side of the conveying path from said first chamber, said second chamber being urged resiliently toward said first chamber and having a suction opening disposed opposite said control opening and forming therewith a control channel extending across the conveying path;

a vacuum source connected to said second chamber; and

a moving belt moving along the conveying path and across said suction and control openings at the same side of the conveying path as said first chamber, said belt having a series of suction perforations in line with said openings;

whereby: said suction opening of said first chamber is in communication with said vacuum source only through said control channel; an item can be taken from the stack and conveyed by said belt only when a suction exists at said suction opening of said first chamber; and the suction at said suction opening of said first chamber is interrupted when an item intersects said channel so as to block communication between said control opening and said second chamber suction opening.

2. An arrangement as defined in claim **1** wherein said first chamber further has narrow suction slits extending between said suction opening of said first chamber and said control opening and communicating with said belt.

3. An arrangement as defined in claim **1** wherein said first chamber has a plurality of suction openings extending across the width of the conveying path and a plurality of control openings extending across the width of the conveying path.

4. An arrangement as defined in claim **1** further comprising a second belt moving across said suction opening of said second chamber on the opposite side of the path from said first defined belt.

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