United States Patent

Groeber

[15] **3,698,538**

[45] **Oct. 17, 1972**

[54] **PNEUMATIC ROLL DEVICE FOR DOCUMENT HANDLING APPARATUS**

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[21] Appl. No.: **122,955**

[52] **U.S. Cl.**.....**198/33 AD,** 198/DIG. 4

[51] **Int. Cl.**.....**B65g 41/24**

[58] **Field of Search**...198/33 AC, 33 AD; 209/DIG. 16; 302/2 R, 29, 31

[56] **References Cited**

UNITED STATES PATENTS

3,343,885 9/1967 Lundeberg.....198/33 AC

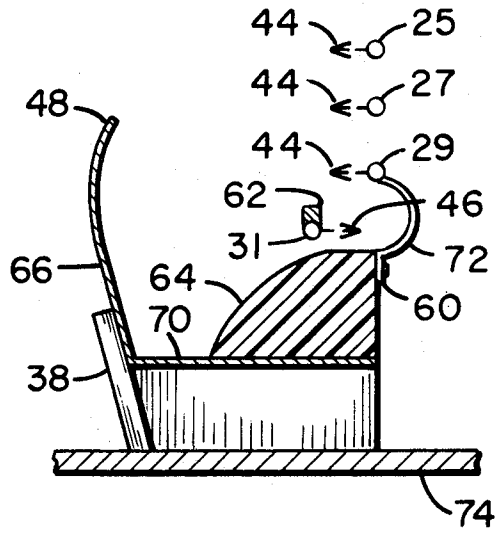
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[57] **ABSTRACT**

A pneumatic device that receives spaced, singulated letter-mail documents in a vertical on-long-edge attitude and permits the documents to pass through in their entering attitude or pneumatically rolls the documents into a vertical on-other-long-edge attitude in response to a stamp detector whereby all emitted letters are in a vertical on-long-edge attitude with the stamp in like face orientation is disclosed.

6 Claims, 9 Drawing Figures



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SHEET 1 OF 3

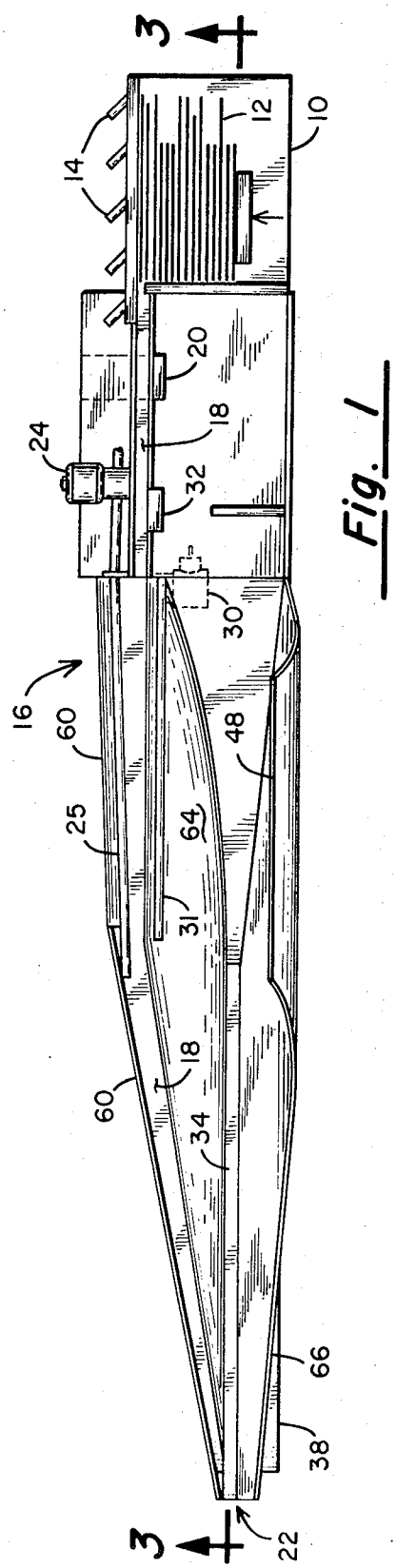


Fig. 1

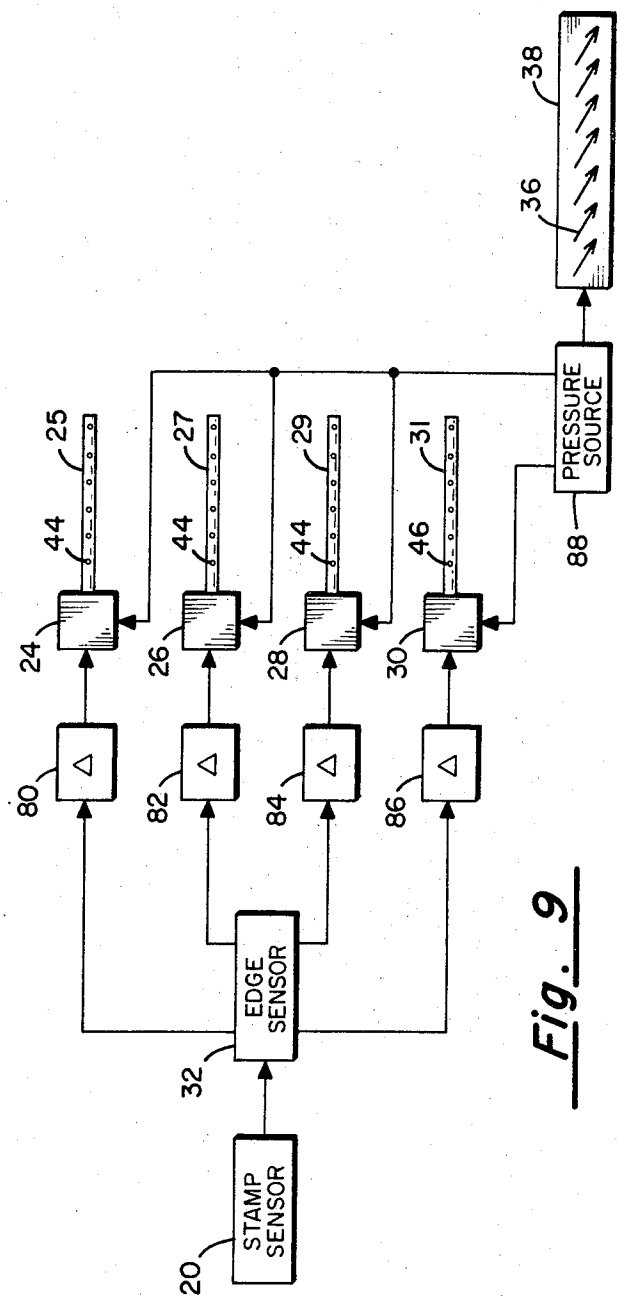


Fig. 9

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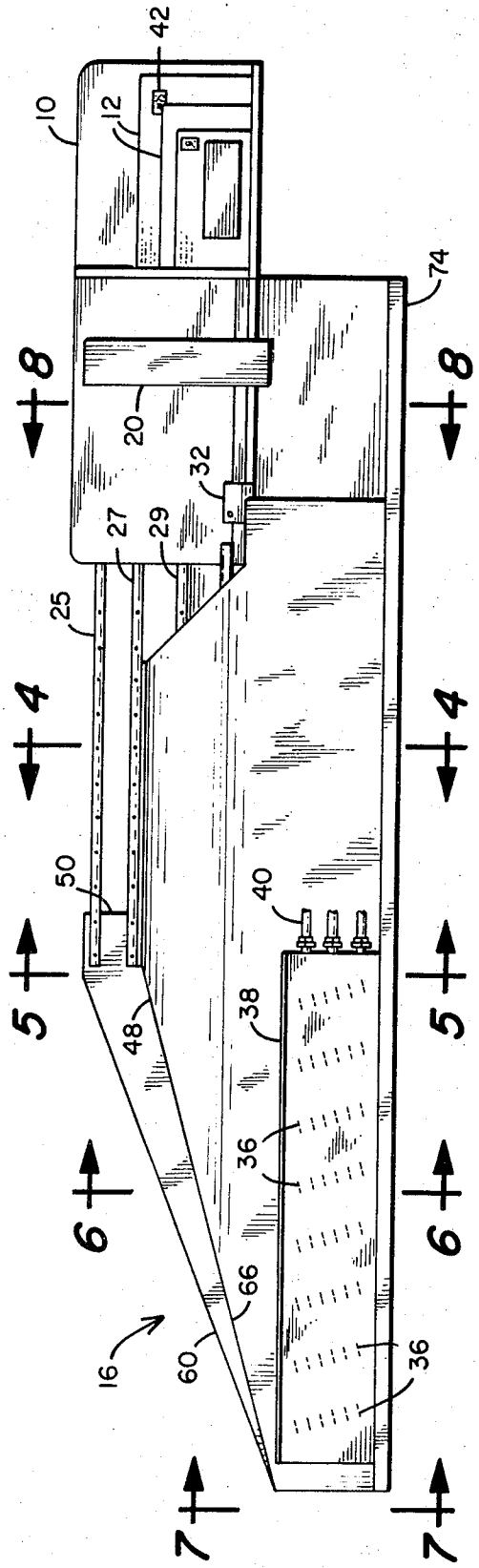

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Fig. 2

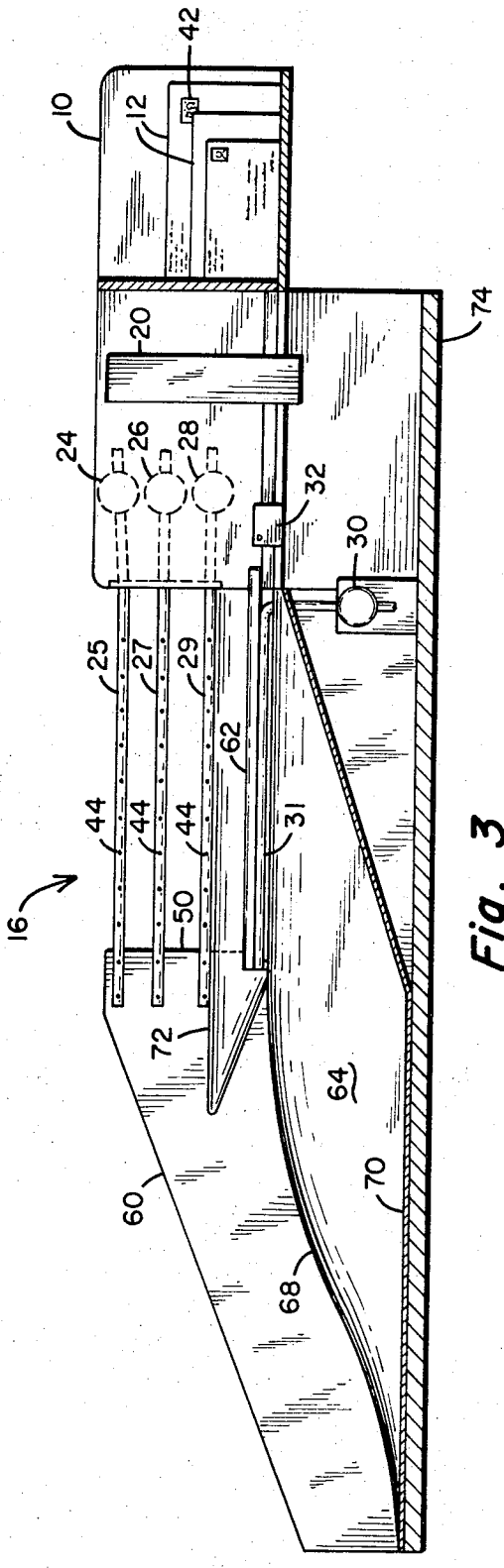

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Fig. 3

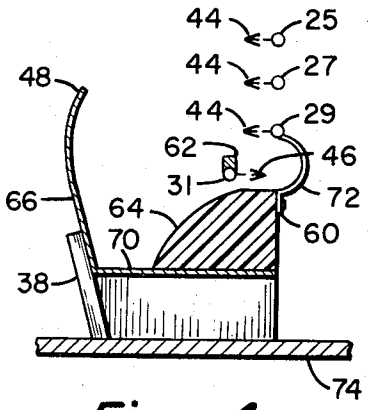


Fig. 4

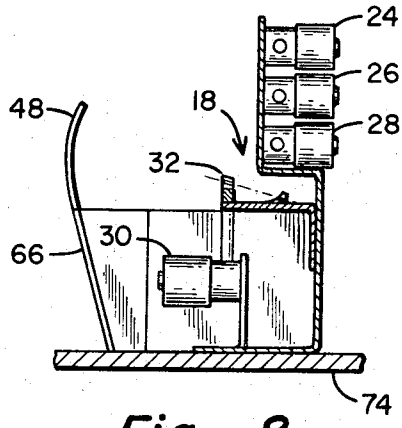


Fig. 8

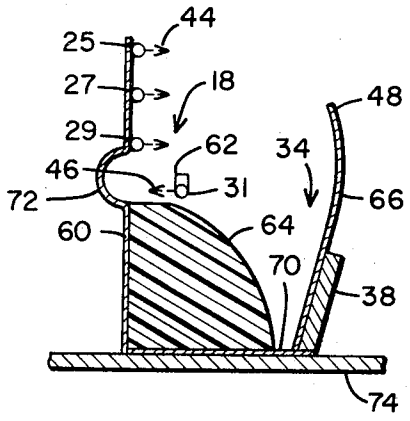


Fig. 5

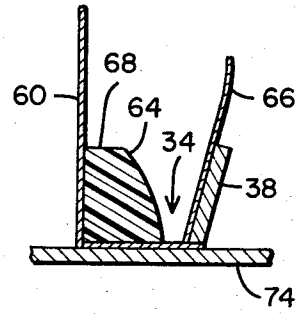


Fig. 6

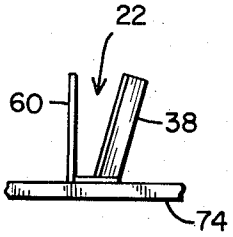


Fig. 7

PNEUMATIC ROLL DEVICE FOR DOCUMENT HANDLING APPARATUS

BACKGROUND OF THE INVENTION

The present invention relates to a sheet handling system and in particular to such a system in which a plurality of sheets are sorted and arranged to have classifying indicia like-oriented. Sheet handling systems especially adapted to orient letter mail have in the past generally relied upon extensive use of electromechanical-pneumatic devices to convey, sort and face the individual letters for the cancellation of the stamps on the face, or side, thereof. Such systems include perforated belts and drums having associated negative/positive air pressure systems for the transport of letter mail — see E. Richert, et al, U.S. Pat. No. 3,140,780 and R. Heaney, et al, U.S. Pat. No. 3,389,909 for some typical configurations.

For the facing of letter mail — the term facing as used herein shall mean orienting the letter mail to have all stamps on a like oriented face or side, i.e., all stamp sides facing the same direction — extensive electromechanical—pneumatic systems have been devised — see M. Stewart, U.S. Pat. No. 2,929,490 for a typical configuration. As it is necessary to reduce the number of operative elements of such a facer-canceler to the minimum to optimize system reliability, it is desirable that a means be found for replacing such electromechanical-pneumatic systems with a purely pneumatic system using only a fluid medium, such as air at positive or negative pressures, as the operative element. The present invention is directed toward such a pneumatic facer of letter mail.

SUMMARY OF THE INVENTION

The roll device, or facer, of the present invention receives a singulated letter or document in a vertical on-long-edge attitude in a through-path. The document passes a stamp sensor which determines whether the stamp is on the proper side or face thereof. If the stamp is on the proper side the document continues on through the through-path out a common exit. However, if the stamp is not on the proper side the stamp sensor initiates a series of air jets that impinge upon the top and bottom edges of the document causing it to roll out of the through-path onto a convexly arcuate wall and into a roll-trough from which the document continues out the common exit. Transport air jets maintain the singulation velocity of the document through the roll device whereby the document's desired spacing and velocity are maintained within acceptable limits.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a plan view of a portion of a sheet handling system in which the present invention may be incorporated.

FIG. 2 is a front-view of the system of FIG. 1.

FIG. 3 is a view of the roll device of FIG. 2 taken along line 3—3.

FIG. 4 is a view of the roll device of FIG. 2 taken along line 4—4.

FIG. 5 is a view of the roll device of FIG. 2 taken along line 5—5.

FIG. 6 is a view of the roll device of FIG. 2 taken along line 6—6.

FIG. 7 is a view of the roll device of FIG. 2 taken along line 7—7.

FIG. 8 is a view of the roll device of FIG. 2 taken along line 8—8.

FIG. 9 is a block diagram of the sensor, pneumatic system of the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENT

With particular reference to FIGS. 1 and 2 there are presented illustrations of a plan view and a front view, respectively, of a portion of a sheet handling system in which the pneumatic roll device of the present invention may be incorporated. Singulator 10 is preferably a fluidic device such as that of the B. Lyman, U.S. Pat. No. 3,136,539 which fluidically singulates a stack of individual documents 12 in a vertical on-long-edge attitude, passing the stream of individual documents 12 on to pneumatic roll device 16. Singulator 10 includes a plurality of positive pressure air jets 14 that serve to singulate and transport the documents 12 therethrough in a fluidic medium.

Pneumatic roll device 16 of the present invention receives the singulated documents 12 in a vertical on-long-edge attitude in a through-path 18 past a stamp sensor 20 which determines whether the stamp is on the proper side or face thereof. If the stamp is on the proper side, the document 12 continues on through the through-path 18 and out a common exit 22. However, if the stamp is not on the proper side the stamp sensor 20, through valves 24, 26, 28 and 30 and edge sensor 32, initiates a series of opposite-directioned positive pressure air jets 44 and 46 from nozzles 25, 27, 29 and 31 which impinge upon the top and bottom edges, respectively, of document 12 causing it to roll out of the upper level of through-path 18 into the lower level of roll-through 34 from which the document 12 continues out the common exit 22. Transport air jets 36 from plenum 38 having air couplings 40 maintain the singulation velocity of the documents 12 through the roll device whereby the desired document spacing and velocity are maintained within acceptable limits.

With particular reference to FIG. 2 there is illustrated the vertical on-long-edge attitude of the documents 12 in singulator 10 in which air jets 14, under positive air pressure from a suitable pressure source, serve to singulate the documents 12 and to propel such documents through roll device 16 in a right-to-left direction. The nozzles 25, 27, 29 and 31 under positive air pressure and controlled by their associated valves 24, 26, 28 and 30 are shown as being in the area of an opening 50 in the back wall 60 of through-path 18 while the air jets 36 are shown as being spacially distributed along the front wall of roll-trough 34 and obtaining their air supply from plenum 38. As stated above, the different sized documents 12 are singulated under control of air jets 14 of singulator 10 into through-path 18 past stamp sensor 20. Stamp sensor 20 determines, from the side location of controlling indicia such as stamp 42 on letter mail, whether or not the particular document 12 is to be passed along upper level through-path 18 or is to be affected by roll air jets 44 and 46 of nozzles 25, 27, 29 and 31 to roll over the forward edge of through-path 18 and to slide down into lower level roll-trough 34 and under the influence of air

jets 36 together with their initial velocity to pass out common exit 22. The front side wall of roll-trough 34 continues in an upward, convexly arcuate manner forming a relatively high side wall 48 to ensure the capture of the rolled documents 12 when thrust forward and down stream under the influence of roll air jets 44 and 46 and their initial velocity from singulator 10.

With particular reference to FIG. 3 there is presented a cross-sectional view of the pneumatic roll device 16 of the present invention taken along line 3—3 of FIG. 1. As stated above, roll device 16 receives, at its input end in through-path 18, a singulated, vertical document 12 that is oriented on a bottom long-edge. Document 12, in its passage through through-path 18, first encounters a stamp sensor 20 which upon not detecting a stamp on document 12 activates an edge sensor 32. Edge sensor 32, in turn, upon detecting the leading short edge of document 12 initiates (after a suitable delay time to permit document 12 to move down stream in through-path 18 to substantially encompass nozzles 25, 27, 29 and 31) a plurality of roll air jets 44 (through opening 50 in back side wall member 60 of through-path 18) and 46 which impinge upon the top and bottom portions, respectively, of document 12. Roll air jets 44 and 46 cause document 12 to roll off shoulder 62 of through-path 18, down wall 64 and into and along roll-trough 34 exiting at common exit 22. Document 12 has then assumed a vertical attitude in roll-trough 34 with its previous bottom long edge now being its top long edge, i.e., document 12 has rolled 180° about its longitudinal axis. Alternatively, if stamp sensor 20 does detect a stamp on document 12, edge sensor 32 is not activated, and, accordingly, roll air jets 44 and 46 are not activated whereupon document 12 continues down through-path 18 along wall members 60, 61 exiting at common exit 22 in its previous bottom long-edge retained vertical attitude.

To facilitate the passage of document 12 therethrough, roll device 16 includes a plenum 38 which is mounted on the front surface of side wall member 66. Side wall member 66, in the area encompassed by plenum 38, has a plurality of horizontally and downwardly directed transportation air jets 36 — see the R. L. Blosser Patent application, Ser. No. 71,534 filed Sept. 11, 1970 — which, through plenum 38 and couplings 40, are coupled to a source of positive air pressure (in a manner similar to air jets 14).

With particular reference to FIGS. 4, 5, 6, 7 and 8 there are presented views of roll device 16 taken along their respectively numbered lines of FIG. 2. These views are given for the purpose of providing exemplary illustrations of the positional relationships of the elements thereof. FIGS. 4 – 8 illustrate that roll device 16 is formed of back and front side wall members 60 and 66, respectively, with convexly arcuate wall member 64 joining the bottom surface 68 of through-path 18 while forming the back side-wall member of roll-trough 34. Bottom member 70 forms the bottom surface of roll-trough 34. Front side-wall member 66 of roll-trough 34 is a forwardly inclined member terminating in a convexly arcuate lip member 48 which is located at least partially down stream, i.e., to the left, of opening 50 in wall member 60 (and roll air jets 44 and 46) for providing a smooth capture of the rolled document 12 in roll-trough 34. Also illustrated is a base member 74 for supporting roll device 16 along its entire length. Additionally illustrated is a convexly arcuate portion 72 of wall member 60 in the area of roll air jets 46 for permitting the rolling document 12 to roll free of any interference with wall member 60.

With particular reference to FIG. 9 there is presented a block diagram of the sensor, pneumatic system of the present invention. As discussed above, roll device 16 receives, at its input end in through-path 18, a singulated, vertical document 12 which, in its passage through through-path 18, first encounters a stamp sensor 20. Stamp sensor 20 upon not detecting a stamp on a predetermined front face of document 12 activates an edge sensor 32. Edge sensor 32, in turn, upon detecting the leading short edge of document 12 initiates, after a suitable delay time established by delays 80, 82, 84, 86 to permit document 12 to move down stream in through-path 18 to substantially encompass nozzles 25, 27, 29 and 31, a plurality of roll air jets 44 which through opening 50 in back side wall member 60 of through-path 18 impinge upon the top back portion of document 12 and a plurality of roll air jets 46 which impinge upon the bottom front portion of document 12.

Roll air jets 44 and 46, couples to pressure source 88, cause document 12 to roll out of through-path 18 and down into roll-trough 34 and to come under the influence of transport air jets 36, also coupled to pressure source 88, which air jets 36 maintain the desired singulation velocity of document 12. Alternatively, if stamp sensor 20 does detect a stamp on document 12, edge sensor 32 is not activated whereby document 12 continues on through through-path 18 and out the common exit 22 at its output end.

What is claimed is:

1. A roll device for a document handling apparatus, comprising:
   - singulator means for pneumatically singulating a plurality of vertically oriented documents on one or the other of their two long edges;
   - first and second means for transporting said vertically oriented documents on said one long edge only;
   - third means for intercoupling said first and second means; shoulder means between said first and second means;
   - pneumatic means for rolling a transported document on said other long edge from said first means over said shoulder into said second means and onto said one long edge.

2. The roll device of claim 1 in which a portion of said first means is at a relatively higher level than that of said second means for rolling said transported document downward into said second means.

3. The roll device of Claim 2 in which said singulated transported documents in said first and second means converge at a common exit from said roll device at the lower level of said second means.

4. The roll device of claim 1 in which said pneumatic means comprises nozzle means for directing a plurality of oppositely directed roll air jets upon the top and the bottom portions of said transported document.

5. A roll device for a document handling apparatus comprising:
   - a through-path and a roll-trough, both converging at a common output end;

said through-path and said roll-trough having associated back and front side walls, respectively, and bottom surfaces;

means for coupling said through-path to said roll-trough;

means for forming a shoulder between said through-path and said roll-trough;

said roll-trough bottom surface on a first lower level;

said through-path bottom surface at its input end being at a second upper level that is substantially higher than said first lower level and at said common output end being at said first level;

sensor means for detecting a document entering said through-path at said input end and for responding to classification indicia on said document;

pneumatic means operatively coupled to said sensor means for rolling said detected document over said shoulder into said roll-trough 180° about its long axis.

6. A roll device for a document handling apparatus, comprising:

first and second means for transporting vertically oriented documents on one edge;

third means for intercoupling said first and second means;

shoulder means between said first and second means;

pneumatic means for rolling a transported document from said first means over said shoulder into said second means, said pneumatic means including;

indicia sensor means for detecting classifying indicia upon a face of said document; and,

roll air jet means responsively coupled to said indicia sensor means for pneumatically transporting said document from said first means into said second means and rolling said document 180° about its long axis.

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