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(54) Infeed unit for sheet-like value documents

(57) An infeed unit (20) for sheet-like value documents (14, 14') in a sheet handling apparatus (10), comprising an infeed opening (22) for receiving in the infeed unit (20) a stack (12) of the documents standing on edges of the documents. For the infeed unit swiftly and without intermediary storage be capable of feeding the stack to a handling unit in the sheet handling apparatus it is inter alia suggested that it has a feeding means (38) in the infeed opening (22) for engagement with a lateral face of the stack (12) to feed the stack down to a sheet handling unit (50) in the apparatus (10); and a movable arresting means (28) opposite to the feeding means (38) in the opening and adapted in a first position to form a bottom for the edges of the documents and in a second position to remove said bottom (30) and form a counter support (32) to the stack against the feeding means (38) when the stack is fed down to the sheet handling unit.

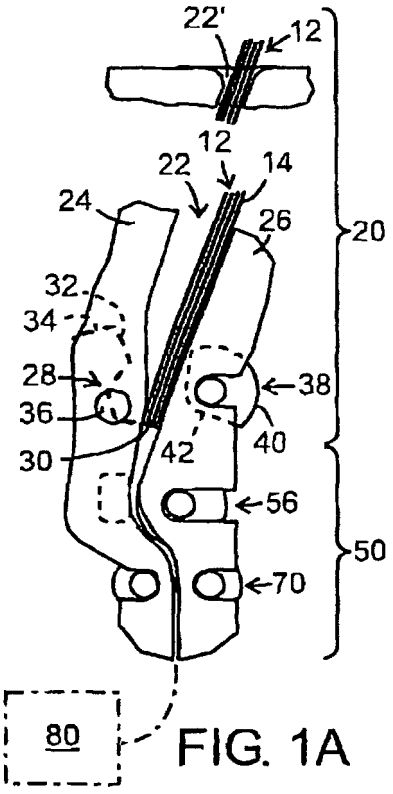

FIG. 1A

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Description

TECHNICAL FIELD

[0001] The invention relates to an infeed unit for sheet-like value documents in a sheet handling apparatus.

BACKGROUND

[0002] Valuable documents such as bank notes are commonly fed one after the other to an intermediate storage in the sheet handling apparatus, to possibly be later fetched therefrom for further handling. Examples of such infeed arrangements are shown in US patents 5 156 393 and 6 213 310. In order to keep the size down of such an infeed unit so that it does not consume valuable space, for example in different cash payment localities, it would be desirable if the documents could be fed as vertically oriented stacks into a small opening of a unit having small outer dimensions, such as a small top surface.

SUMMARY OF THE INVENTION

[0003] An object of the invention is to provide an infeed unit of the kind described above that may have small dimensions and without any intermediate storage is capable of swiftly feeding the stack to a handling unit in the sheet handling apparatus.

[0004] In one aspect of the invention, the infeed unit comprises an infeed opening for receiving in the infeed unit a stack of the documents standing on edges of the documents, a feeding means in the infeed opening for engagement with a lateral face of the stack to feed the stack down to a sheet handling unit in the apparatus, and a movable arresting means opposite to the feeding means in the opening and adapted in a first position to form a bottom for the edges of the documents and in a second position to remove said bottom and form a counter support to the stack against the feeding means when the stack is fed down to the sheet handling unit.

[0005] According to an embodiment of the invention, the arresting means is pivotable about an axis between the first and the second positions.

[0006] The arresting means is suitably a piece of a thin-walled material having portions forming said bottom and said counter support.

[0007] The feeding means suitably comprises a rotatable feeding wheel having such a shaped periphery and such a feeding frequency that it engages the lateral face of the stack first when said bottom is removed.

[0008] Other features and advantages of the invention will be apparent from the following detailed description.

DETAILED DESCRIPTION OF EMBODIMENTS

[0009]

FIG. 1A-C are diagrammatic views of a broken away portion of an sheet handling apparatus according to the invention showing three steps during an infeed of a stack of sheets;

FIGS. 2A-C are diagrammatic sectional views at a larger scale of a separation unit of the sheet handling apparatus according to FIG. 1 having interior parts exposed and being separating a sheet from the stack;

FIG. 3 at a larger scale shows approximately the encircled area 3 of FIG. 1C; and

FIG. 4 at a larger scale shows approximately the encircled area 4 of FIG. 3

[0010] FIG. 1A shows a sheet handling apparatus according to the invention generally designated by 10. The sheet handling apparatus 10 comprises an infeed unit 20 for a stack of sheet-like value documents and cooperating with a separation unit 50 adapted for fully bringing the documents in the stack apart from each other so that they thereafter can be further processed in a handling unit 80 indicated by phantom lines.

[0011] As desired, the handling unit 80 may, for example be adapted to identify, register, sort, intermediary store and outfeed the documents, for example bank notes of a varying kind and denomination.

[0012] The infeed unit 20 has a vertical or a sloping infeed opening 22 for receipt of a stack 12 of documents 14. In FIG. 1A, the infeed opening 22 is shown delimited by a pair of side end pieces 24, 26 at one side of the apparatus 10. To delimit the thickness of the stack 12 that is each time manually inserted in the infeed opening 22, the infeed opening 22 may have a constriction 22' at its input end. A pivotably movable arresting means 28 in the shape of a bent — approximately to the character "2" shown on a seven segment display — low-friction sheet metal plate, in a first position according to FIG. 1A at one end thereof forms a counter support or a bottom 30 for the lower end of the inserted stack 12. When the arresting device 28 is pivoted clockwise about an axis 36 to a second position shown in FIG. 1B. the bottom will be removed, and a sliding and pushing surface 32 in the vicinity of the other end of the sheet metal plate will form a counter support and push the inserted stack 12 of documents towards a feeding means in the shape of a feeding wheel 38 having a friction surface 40.

[0013] The feeding wheel 38 has a surface having a reduced diameter over a large portion of its circumference so that it will not engage in the infeed opening 22 at an infeed position shown to FIG. 1. When the feeding wheel 38 is rotated counter clockwise from the position of FIG. 1B, the friction surface 40 is, however, brought to engagement with the adjacent document 14 of the stack 12. When the feeding wheel 38 continues to rotate, the stack 14 is driven further down into the infeed opening 22 to the position shown in FIG. 1 C under influence of

the counter spring force from the pushing surface 32. In the position shown in FIG. 1C, the lower end of the stack 12 engages with a sloping engagement surface 54 (FIG. 1 C) of a supporting element 52 of a friction increasing material, for example rubber, so that the bottom edges of the individual documents in the stack 12 will be displaced approximately in the manner that is further shown in FIGS. 3 and 4.

[0014] When the feeding wheel 38 is rotated a bit further so that its radius decreases to the surface 42 having the reduced diameter, the stack 12 is pushed back, in a manner not shown, to the right side of the infeed opening 22 by virtue of the pushing surface 32. An ending flat surface of the sheet metal arresting device 28 may then possibly form a higher bottom for a newly inserted stack of sheets. The feeding of the stack 12 down to and through the separation unit 50, however, occurs so rapidly that the user in practice does not have enough time to insert a new stack in the infeed opening before all documents in the stack have left the infeed unit 20 and the arresting device has returned to the position of FIG. 1A.

[0015] When the stack 12 is separated in the manner to be later described, the arresting device 28 is pivoted back to the position of FIG. 1A so that the possibly present subsequent stack (not shown) drops downwards to the lower bottom 30.

[0016] FIGs. 2A-C illustrate the operation of the separation unit 50 according to the invention. In FIG. 2A the lowest document 14 of the stack 12 has been fed forward a bit further into a separation channel 66 of a pre-separating first separation means 56. The separation means 56 comprises a feeding or friction wheel 58 having a relatively large diameter, freely journalled on a drive shaft 64, against which friction wheel 58 the lowest document 14 is in contact. A drive means 62 rigidly secured to the driving shaft 64 is driving a pin 60 protruding from the end face of the feeding wheel 58 so that the wheel 58 rotates with a relatively small peripheral speed and strives to pull the lowest document 14. As is indicated in FIG. 2A, the next following document 14' may possibly be dragged forward a small distance in dependence of varying friction between the documents in the stack 12.

[0017] As is apparent from FIGs. 2A-2C, the separation channel 66 is suitably curved along a portion of the circumference of the feeding wheel 58 so that the document 14 by virtue of its inherent stiffness is forced against the feeding wheel 58 to facilitate the feeding of the document in the separation channel 66

[0018] The lowest document 14 that is fed by the friction roller 58 at each occasion, is guided in the separation channel 66 in a direction towards a second separation means 70 in the shape of a "roll nip" between a pair of contacting feed rolls 72, 74 continuously rotating at a high speed.

[0019] When the leading edge of document 14 reaches the fast rotating feed rolls 72, 74 of the separation unit 70, the document 14 is captured and is subjected to a jerk so that the document 14 — roughly as in a so called "tablecloth trick" — positively overcomes the friction of the adjacent document 14' so that this document stays in the stack. The freely journalled feeding wheel 58 can be allowed to be entrained almost a full turn by friction against document 14, before the trailing edge of document 14 leaves the wheel 58. The feeding wheel 58 preferably has such a large diameter that the trailing edge of document 14 positively leaves the wheel 58 before wheel 58 has completed the full turn by the pin 60 catching up the drive means 62 from behind. It is instead also conceivable to allow the feeding wheel 58 being driven by a coupling having a freewheel function. It may then be driven by a still lower speed to allow the complete pulling apart of the documents in cooperation with the feeding rolls 72, 74.

[0020] When the drive means 62 again catches up the pin 60, the next document 14' will be separated from the stack 12 in the manner described above until the complete stack is separated. The possibly new stack 12'

[0021] In the handling unit 80 (FIG. 1) the document 14 is advanced downstream the separation apparatus by feeding means (not shown) having such an adjusted feeding speed that a desired distance is maintained between the documents, for example a certain minimum distance between their adjacent edges.

[0022] In a manner not shown, the functions of the infeed unit 20 and the separation unit 50 can be initiated by, for example a photoelectric sensor in the infeed opening 22 that signals to a control unit to start and control the operation of respective drive motors (not shown) for the arresting device 28, the feeding wheel 38 and the first and second separation means 56 and 70, respectively

Claims

1. An infeed unit (20) for sheet-like value documents (14, 14') in a sheet handling apparatus (10);
   characterised by
   an infeed opening (22) for receiving in the infeed unit (20) a stack (12) of the documents standing on edges of the documents;
   a feeding means (38) in the infeed opening (22) for engagement with a lateral face of the stack (12) to feed the stack down to a sheet handling unit (50) in the apparatus (10): and
   a movable arresting means (28) opposite to the feeding means (38) in the opening and adapted in a first position to form a bottom for the edges of the documents and in a second position to remove said bottom (30) and form a counter support (32) to the stack against the feeding means (38) when the stack is fed down to the sheet handling unit.

2. The unit according to claim 1, wherein the arresting means (28) is pivotable about an axis (36) between

the first and second positions.

3. The unit according to claim 1 or 2, wherein the arresting means is a piece of a thin-walled material having portions forming said bottom (30) and said counter support.

4. The unit according to any of the previous claims, wherein the feeding means (38) comprises a rotatable feeding wheel (40) having such a shaped periphery and such a feeding frequency that it engages the lateral face of the stack (12) first when said bottom (30) is removed.

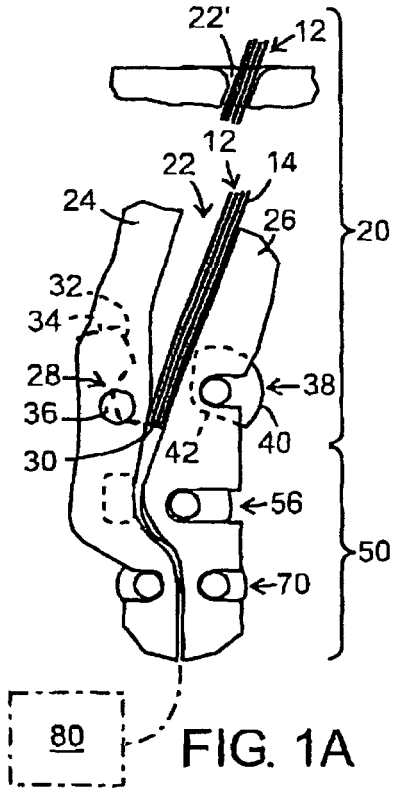

FIG. 1A

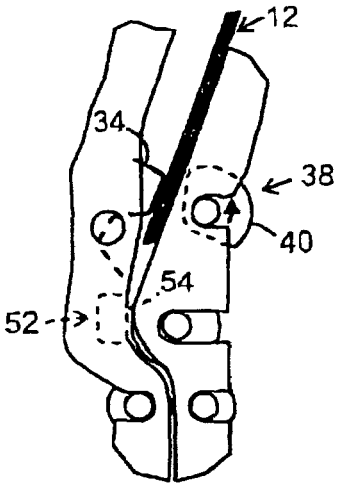

FIG. 1B

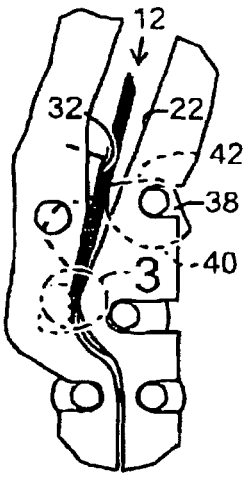

FIG. 1C

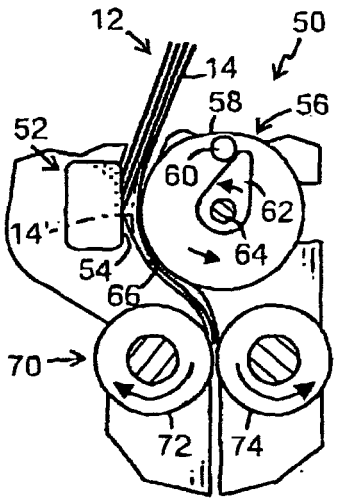

FIG. 2A

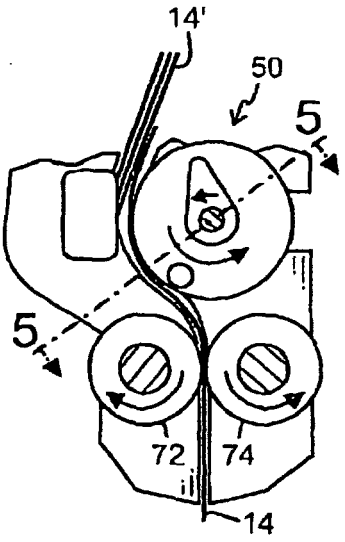

FIG. 2B

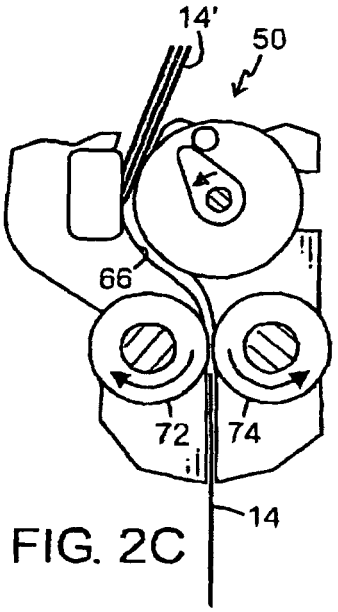

FIG. 2C

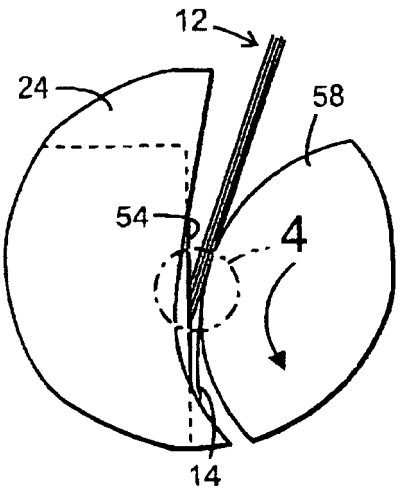

FIG. 3

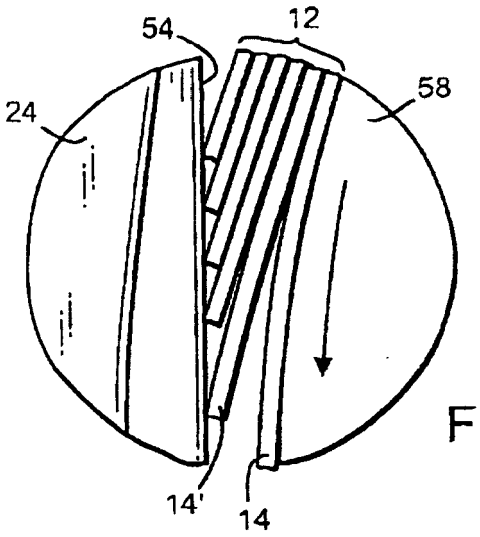

FIG. 4

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EUROPEAN SEARCH REPORT

Application Number
EP 05 02 7491

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A	US 3 999 749 A (ZAMBOLIN ET AL) 28 December 1976 (1976-12-28) * column 2, line 25 - column 3, line 7 *	1	B65H3/44 B65H9/06 G07D11/00
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TECHNICAL FIELDS SEARCHED (IPC)

B65H
G07D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	18 January 2006	Stroppa, G

CATEGORY OF CITED DOCUMENTS

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18-01-2006

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