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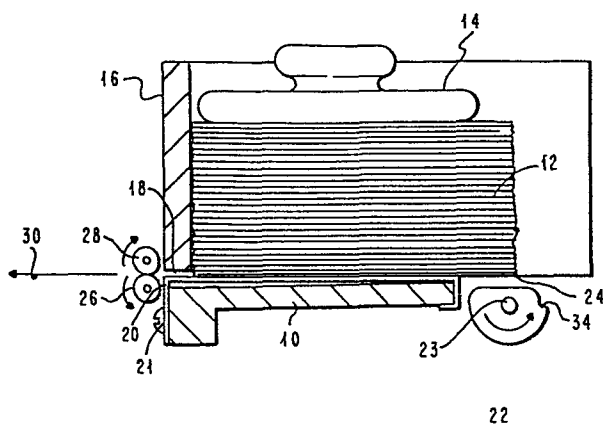
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54 **Document separator wheel and document hopper using the same.**

57 A wheel (22) for reliable separation of the bottommost document in a stack (12) of such documents is formed of low friction material having formed therein a groove (34) of material of a high friction material so that rotation of the wheel (22) causes the groove (34) to engage an edge of the lowermost document in the stack (12) urging it toward an adjustable width throat (18) so that only a single document can pass therethrough, continued rotation of the wheel (22) allowing the document edge to snap over the high friction portion without resulting damage.



DOCUMENT SEPARATOR WHEEL AND DOCUMENT HOPPER USING THE SAME

This invention relates to document feeding, more specifically to feeding one document at a time from the bottom of a stack of documents using a document separator wheel of composite material having a generally arcuate periphery with a single groove formed thereacross for engaging the edge of a document and urging it away from the stack.

Many expedients for feeding the bottommost document in a stack in a reliable manner are known. Improvements in feed reliability with minimum damage possibilities to the documents are ever sought.

U.S. Patent 1,599,700 to Davidson relates to a blank feeding device and discloses a feed roller comprising a rigid core surrounded by a softer rubber covering having a plurality of grooves formed therein. Pins are provided in the center of each groove for engaging a blank to be fed to a typewriter.

U.S. Patent 3,961,785 to Gall discloses a feeding device for withdrawing a single film sheet from the bottom of a stack of such film sheets and utilizes a roller having step-like protrusions for engaging the edge of a film sheet and urging it away from the stack.

U.S. Patent 1,061,585 to Armstrong discloses a sheet feeding device utilizing a stripper roll comprising a smooth peripheral portion and a frictional peripheral portion.

U.S. Patent 854,826 to Johnson discloses an envelope feeder utilizing a fingered roller for separating the outermost envelope in the stack.

The present invention comprises a separator roller of improved structural arrangement having particular utility in separating the bottommost document in a stack of documents maintained in a hopper having a throat through which a single document

thickness may pass. The improved separator wheel is of generally arcuate periphery but includes a U-shaped notch or groove formed parallel to the axis of wheel rotation, the notch being particularly adapted for engaging an edge of the document and urging it toward the hopper throat. The separator wheel is made of a low friction material except for the area comprising the grasping groove which is made of a high friction material.

A better understanding of the present invention may be had from the following more detailed description taken in conjunction with the accompanying drawings wherein like reference numerals are used throughout to denote the same parts and wherein:

Fig. 1 is a side cross sectional view of a hopper for bottom feeding of a stack of documents using the improved separator roller of the present invention.

Fig. 2 is a view similar to that of Fig. 1 soon after the start of a separating cycle.

Fig. 3 is a cross-sectional view of the separator wheel structure.

Fig. 4 is similar to Fig. 1 showing means for adjusting the document throat.

Fig. 1 shows a hopper having a base 10 for supporting a stack 12 of documents. A weight 14 may be used to maintain stack configuration. Vertical wall 16 is positioned to form a throat 18 of a width substantially equal to the thickness of a single document. A plate 20 is provided on base 10 and is adjustable by means of screw 21 to vary the distance between the plate 20 and vertical wall 16.

The picker separator wheel 22 of the invention is rotatable on shaft 23 in the counterclockwise direction for urging the

bottommost document 24 from the stack 12 through feed roller 26 and back-up roller 28 in the direction of arrow 30 toward the using device (not shown). Crosswise groove 34 is shown in the wheel 22.

In Fig. 2 wheel 22 has turned a distance counterclockwise and groove 34 has engaged the edge of the bottommost document 24 from the stack 12 and urged it through throat opening 18 between plate 20 and wall 16 toward feed roller 26 and back-up roller 28.

Fig. 3 shows the structural details of the picker separator wheel 22. Wheel 22 may be molded in two shots around a metal insert hub 36. The low friction first shot material 38 is molded to hub 36 followed by the high friction second shot material 40 which forms groove 34. This provides a reliable picker separator wheel for separating documents, in particular envelopes, from the bottom of a stack at a relatively low cost with easy manufacturability. In addition, bottom feeding has inherently good human factors considerations for improving the man/machine interface in the office of the future.

As shown in Figs. 1 and 2 picker separator wheel 22 is mounted on a shaft 23 connected to appropriate controls, not shown. Of course, the shaft 23 may be adjustably positioned for accommodating document stacks 12 of varying widths.

An additional modification is shown in Fig. 4 wherein the throat thickness may be varied by vertically adjusting a plate 50 attached to vertical wall 16 by screws 52 and 54. The operation of this modification of hopper structure is the same as above described.

The particular material used for the high friction groove 34 insert is chosen to give a positive thrust to the edge of the bottom document but is soft enough to snap off the edge upon continued rotation counterclockwise without causing damage to

the document. It will, of course, be understood that as used herein, document includes cut sheets and envelopes.

While the present invention has been described having reference to a preferred embodiment and the above-described modifications, it will be understood by those skilled in the art that these and other modifications may be made in form and detail without departing from the spirit and scope of the present invention.

Claims

1. A document separator wheel (22) for separating the outermost document in a stack (12) of such documents, characterized in that it comprises a generally arcuate periphery of low friction material (38), including a soft, high friction groove (34) for engaging the edge of a document, imparting motion thereto and releasing the document as rotation of the wheel continues.
2. The wheel (22) in accordance with Claim 1 having a generally D-shaped cross section.
3. The wheel (22) in accordance with Claim 1 or 2 wherein the low friction material (38) is molded around a hub (36) in a first shot and said groove (34) is formed in a second shot with a high friction material (40).

4. A document hopper for feeding documents one at a time from the bottom of a stack (12) of such documents comprising:

a hopper having a horizontal base (10) and a vertical wall (16) defining an opening (18) substantially equal to the thickness of a document to be fed;

a feed nip (26, 28) adjacent said opening;

means (50) for adjusting the size of the opening; and

the document separator wheel according to anyone of claims 1 to 3.

5. The hopper according to claim 4 wherein said means for adjusting the size of the opening comprises:

a knife edge (50) slidably attached to the vertical wall (16); and

means (52, 54) for locking said knife edge in a given position.

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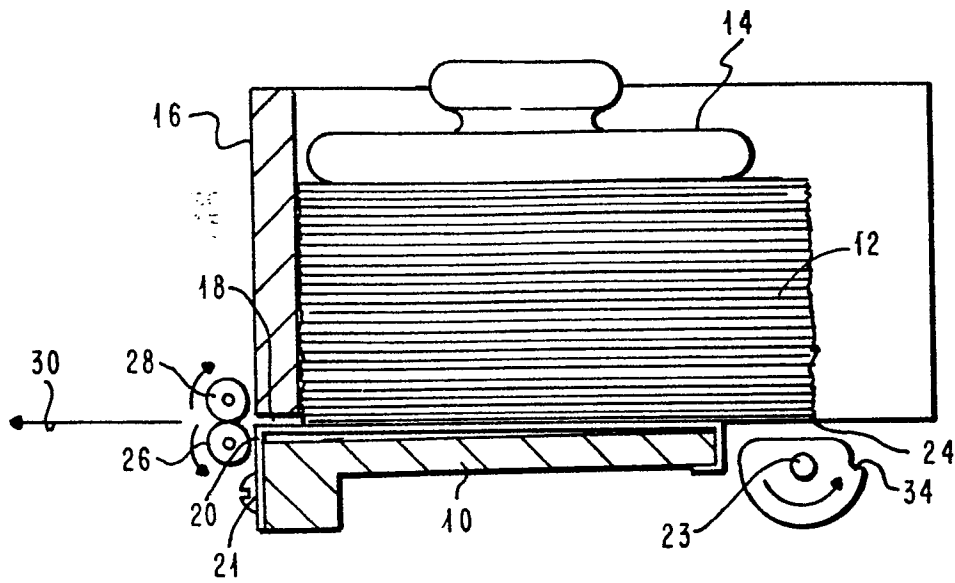


FIG. 1

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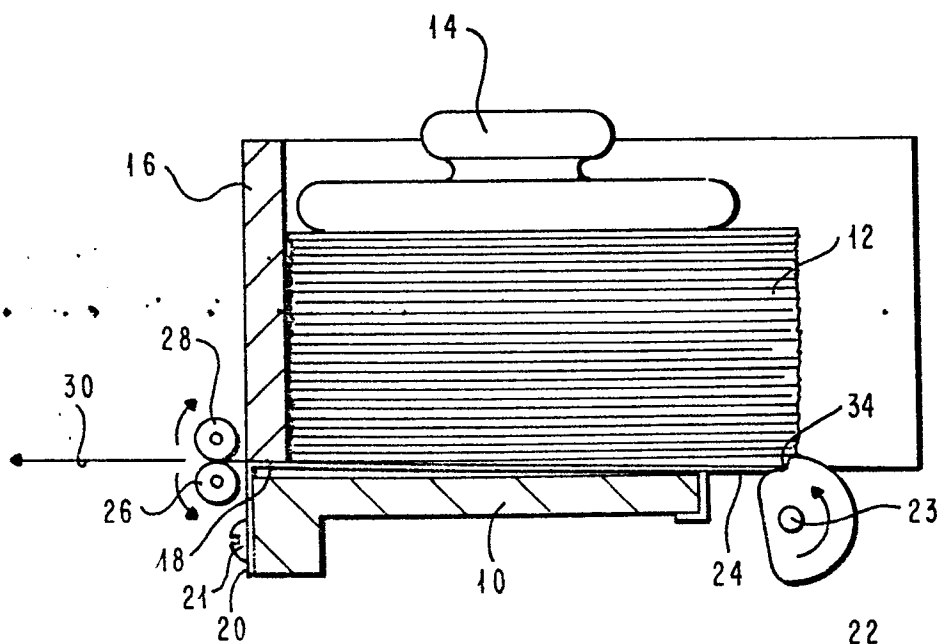


FIG. 2

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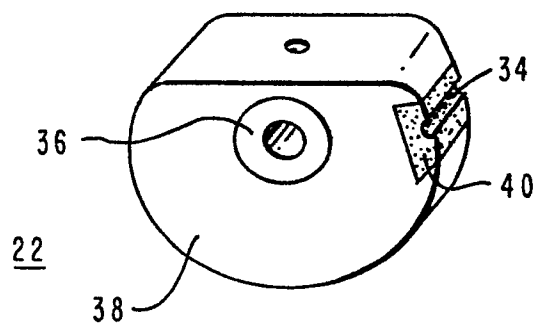


FIG. 3

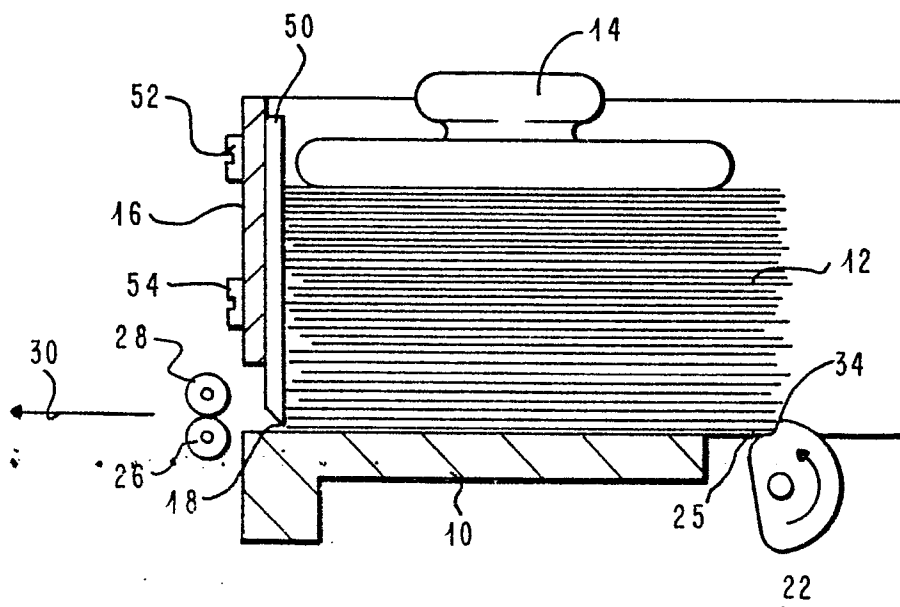


FIG. 4