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(54) **Insert Feeder Apparatus**

(57) A sheet separator for a paper handling apparatus comprising: a pick-up shaft (1) having an axis; a plurality of pick-up wheels (2,3,4,5,6,7,8,9) mounted on the

shaft for rotation about the axis; and wherein the axial location, on the pick-up shaft, of at least one pick-up wheel (5a,6a) is adjustable.

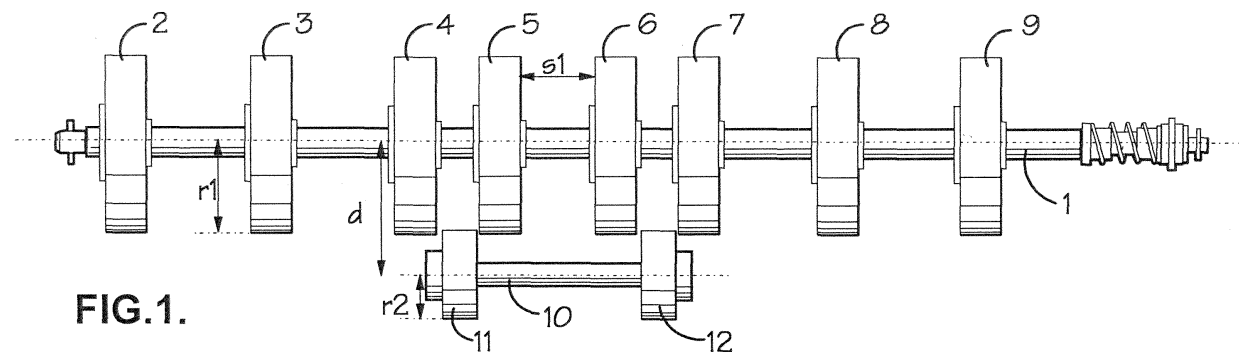


FIG.1.

Description

[0001] The present invention relates to an insert feeder for a paper handling apparatus.

[0002] An insert feeder typically picks up single or folded sheets of paper, or other documents such as pamphlets or card, from a storage hopper to feed to an inserter module for stuffing into envelopes.

[0003] Traditionally the inserts are picked up from the storage hopper using wheels on two parallel rotatable shafts. Wheels, set at spaced intervals along a pick-up wheel shaft, engage the top sheet in a stack of sheets in the storage hopper. They lift the top sheet off the stack by friction and drive it into engagement with separator wheels of a smaller diameter mounted on a separator wheel shaft spaced from the pick-up wheel shaft. Thereafter the two sets of wheels engage opposite sides of the sheet and drive it off the stack and toward the inserter station.

[0004] To accommodate different thicknesses of insert one or both shafts may be set to a plurality of relative positions and may be spring loaded.

[0005] Ideally the insert feeder should be or separating a wide variety of thicknesses and sizes of inserts. In addition the storage hopper or hoppers should be capable of storing a large variety of inserts, and be able to hold a large quantity.

[0006] US 2006/0151938 describes a typical known sheet maternal feeder with pick-up rollers and separator rollers. US 5,445,371 describes apparatus and a method for buckling a sheet using a feed roller and a singulation roller. US 4,290,593 shows a method for sheet feeding using feed rollers including an overhead roller.

[0007] According to the present invention there is provided a sheet separator for a paper handling apparatus comprising: a pick-up shaft having an axis; a plurality of pick-up wheels mounted on the shaft for rotation about the axis; and wherein the axial location, on the pick-up shaft, of at least one pick-up wheel is adjustable.

[0008] Preferably at least one separator wheel is mounted on a separator shaft spaced from the pick-up shaft.

[0009] According to one embodiment the adjustment is made by interchanging two pick-up shafts, one with a pick-up wheel aligned with the separator wheel and one with a pick-up wheel not aligned with the separator wheel.

[0010] According to a second embodiment at least two of the pick-up wheels are moveable on the pick-up shaft between a first position in which they are aligned with the respective separator wheels and a second position in which they are not aligned with the respective separator wheels.

[0011] For a better understanding of the present invention and to show how the same may be put into effect, reference will now be made to the accompanying drawings, in which:

tus according to the present invention having wheel in an interleaved configuration;

Figure 2 is a front view of the sheet separator apparatus of figure 1 with the wheels in an opposed configuration;

Figure 3a is a cross section and figure 3b is a front view of the sheet separator apparatus showing more detail and with the wheels in the interleaved configuration;

Figure 4a is a cross section and figure 4b is a front view of the sheet separator apparatus of figure 3 with a smaller separator gap; and

Figure 5a is a cross section and figure 5b is a front view of the sheet separator apparatus with the wheels in the opposed configuration.

[0012] The sheet separator apparatus of the figures comprises a pick-up wheel shaft 1 with a plurality of pick-up wheels 2 to 9 arranged along its length. Eight wheels are shown but any number may be used. A parallel separator shaft 10 has two separator wheels 11 and 12 mounted at opposite ends. The separator shaft 10 is mounted on a separator assembly 20 which is pivotable about a pivot point 21 and resiliently biased toward the pick-up shaft by a spring 23 acting against fixed point 22. A separator adjuster slider mechanism 24 is mounted on a pin 25 to the assembly 20.

[0013] Typically the separator wheels 11 and 12 do not rotate during sheet separation, only the pick-up wheels 2 to 9 rotate. However they can be rotated in incremental movements to continually take up wear of the rollers. This incremental movement would typically be counter to the pick-up direction and would take place between separations.

[0014] The shafts 1 and 10 are positioned so that they are separated by a distance d which is equal to, or slightly larger than, the sum of the radius r_1 of each of the pick-up wheels 2 to 9 and the radius r_2 of each of the separator wheels. This distance determines the separation of the outer edges of the pick-up wheels 2 to 9 and the separator wheels 10 and 11, i.e. the separator gap g . This gap g is set by the position of the separator adjuster slider 24. For example an operator may choose from several positions for the separator shaft 10. In one example five positions might be provided, four of these using the spring loading provided by the spring 23, and one being a fixed position with no spring loading.

[0015] The preferred gap g for any job will depend upon the thickness and nature of the documents to be handled by the apparatus.

[0016] In Figures 1, 3 and 4 the separator wheel 11 is located between pick-up wheels 4 and 5 in an axial direction, and similarly separator wheel 12 is located between pick-up wheels 6 and 7. This configuration is

Figure 1 is a front view of a sheet separator appa-

known as interleaved wheel geometry and is particularly efficient for separating folded sheets of insert paper. With this interleaved geometry the spring loading of the separator assembly will be used to take up small variations in the thickness of the documents being handled, which makes this configuration more forgiving for folded documents.

[0017] One problem with the sprung loaded interleaved wheel geometry is that the document hopper capacity is more limited in general. This is because the hopper uses gravity to feed the documents against the pick-up wheels 2 to 9 in order to drive them past the separator wheels 11 and 12. If more or heavier documents are in the hopper the force on the separator will be greater. Thin sheet material is denser and thinner than folded inserts and tends to produce a wedging action and push through the spring-loaded wheels. Hence for thin sheet material a different, opposed, wheel geometry is preferred as shown in Figures 2 and 5.

[0018] In opposed wheel geometry two of the pick-up wheels 5a and 6a are in different axial positions on the shaft 1a compared to the wheels 5 and 6 in Figure 1. Thus the separator wheel 11 is now axially aligned with the pick-up wheel 5a and the separator wheel 12 is now axially aligned with the pick-up wheel 6a. In addition the spring loading 23 is disabled and the gap g is fixed. Disabling the spring 23 allows the gap g to be set more precisely and this fixed geometry does not allow thin sheets to push through the separator so easily. Hence this geometry is particularly efficient at separating single sheet inserts. A fine adjuster is preferably provided to accommodate different sheet thicknesses.

[0019] The opposed wheel geometry of Figures 2 and 5 can be achieved by replacing shaft 1 of Figure 1 with the shaft 1a which has central wheels 5a and 6a axially spaced by a larger separation distance s2 compared to the distance s1 in Figure 1.

[0020] Alternatively the two central pick-up wheels 5 and 6 in Figure 1 may be moveable axially along the shaft into the equivalent positions of wheels 5a and 6a in Figure 2.

[0021] This invention makes the separator 1 pick-up area more versatile than has been possible before and makes the apparatus capable of reliably handling a wide variety of thicknesses and sizes of inserts.

shaft;

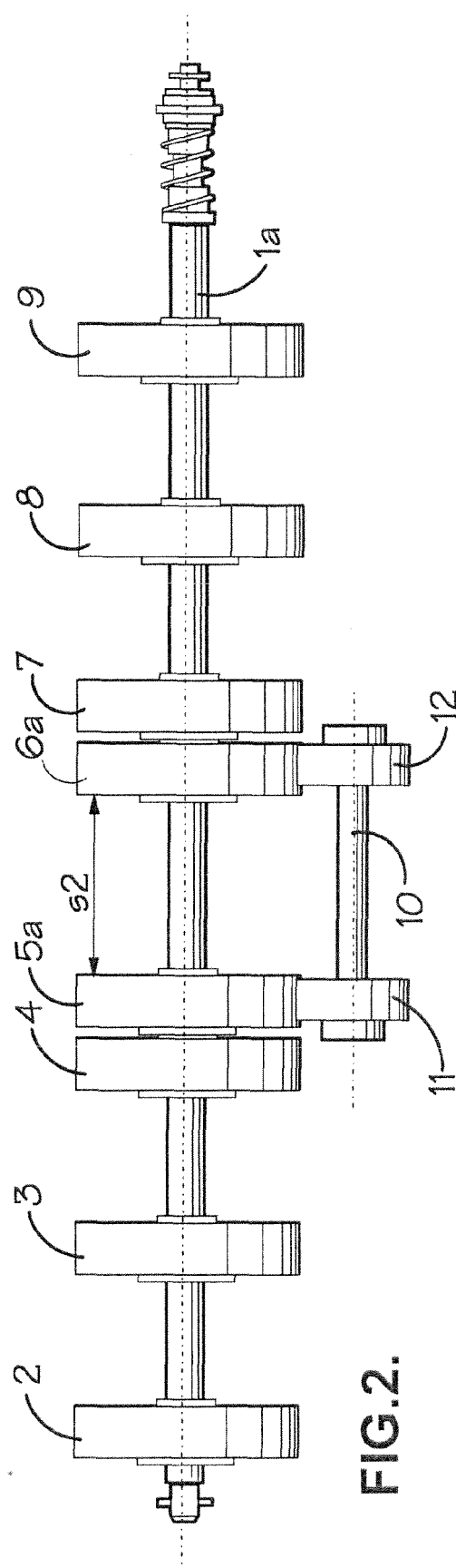
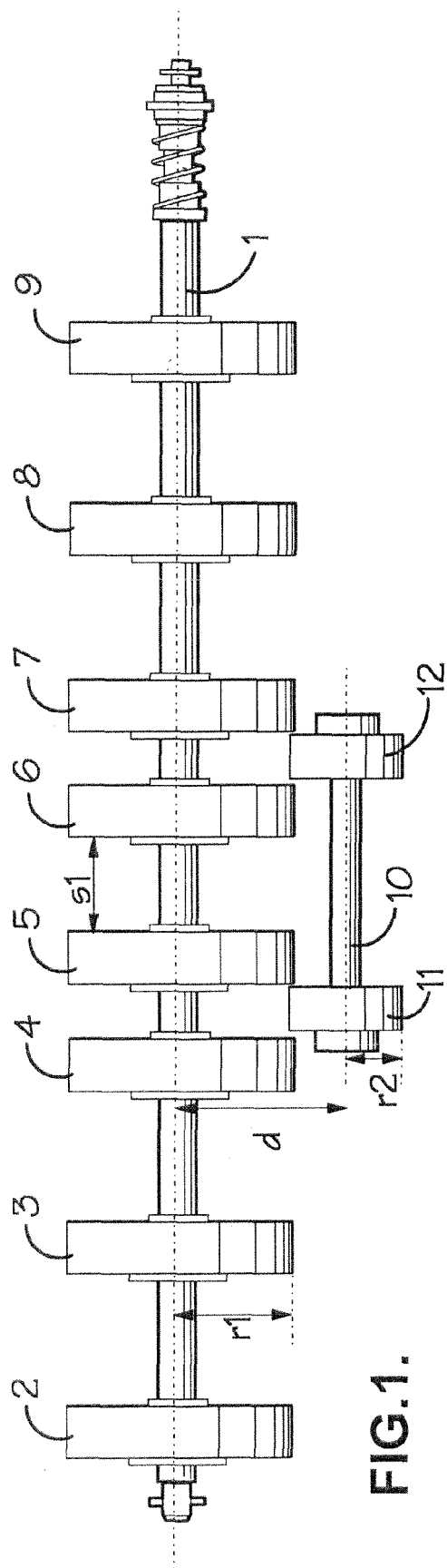
wherein the axial location on the shaft of the pick-up wheel is adjustable between a position in which it is axially aligned with the separator wheel and a position in which it is out of alignment with the separator wheel.

2. A sheet separator according to claim 1, comprising at least two separator wheels mounted at spaced intervals along the axis of the separator shaft and at least two adjustable pick-up wheels on the pick-up shaft.
3. A sheet separator according to claim 3, wherein the adjustable pick-up wheels are moveable into and out of positions of alignment with respective ones of the two separator wheels.

Claims

1. A sheet separator for a paper handling apparatus comprising:

a pick-up shaft having an axis;
a plurality of pick-up wheels mounted on the shaft for rotation about the axis; and
a separator shaft having an axis mounted a predetermined distance from the pick-up shaft, and at least one separator wheel mounted on the



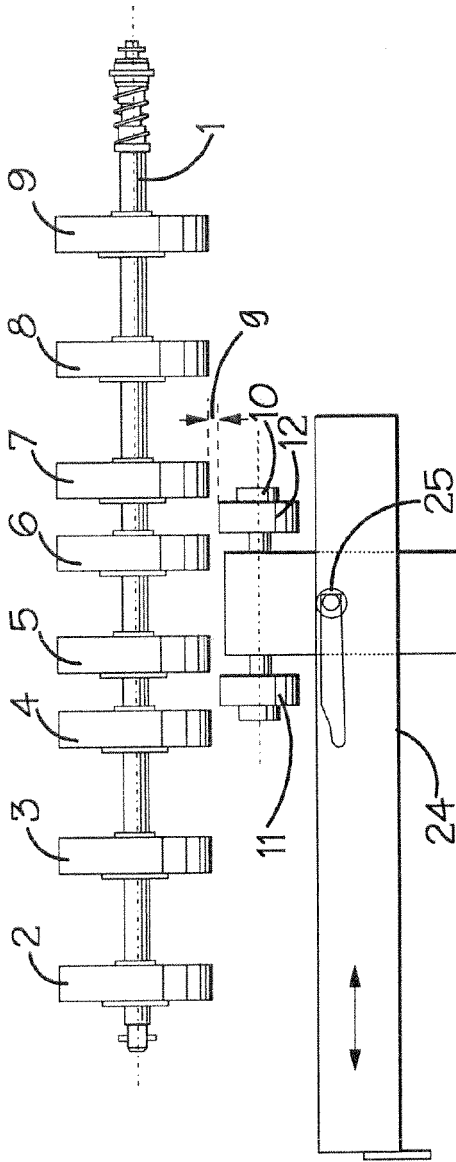


FIG. 3a.

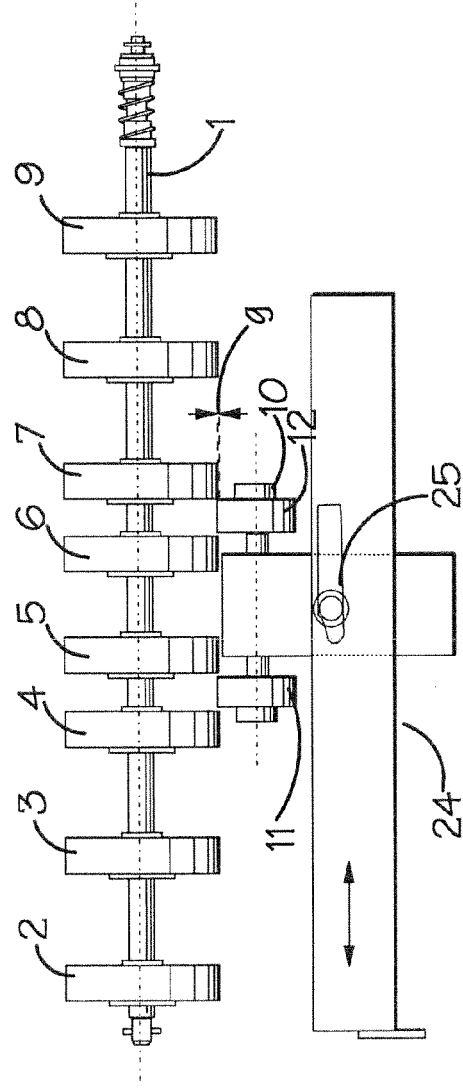


FIG. 3b.

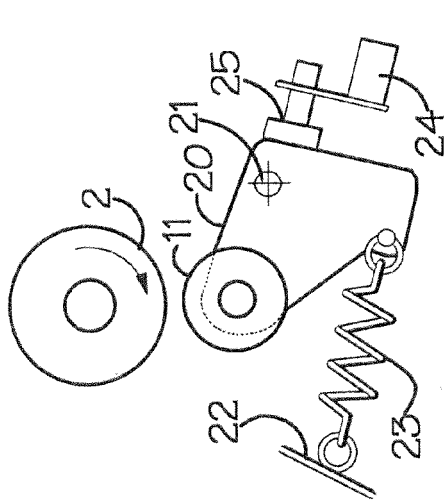


FIG. 4a.

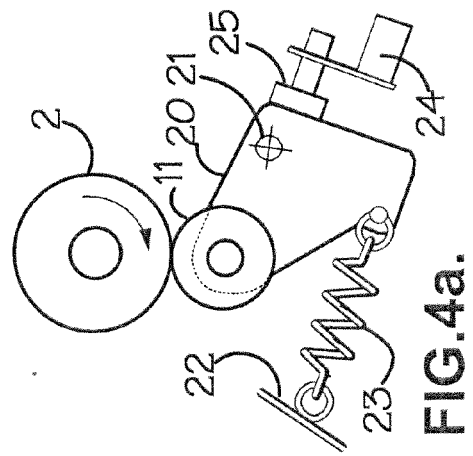


FIG. 4b.

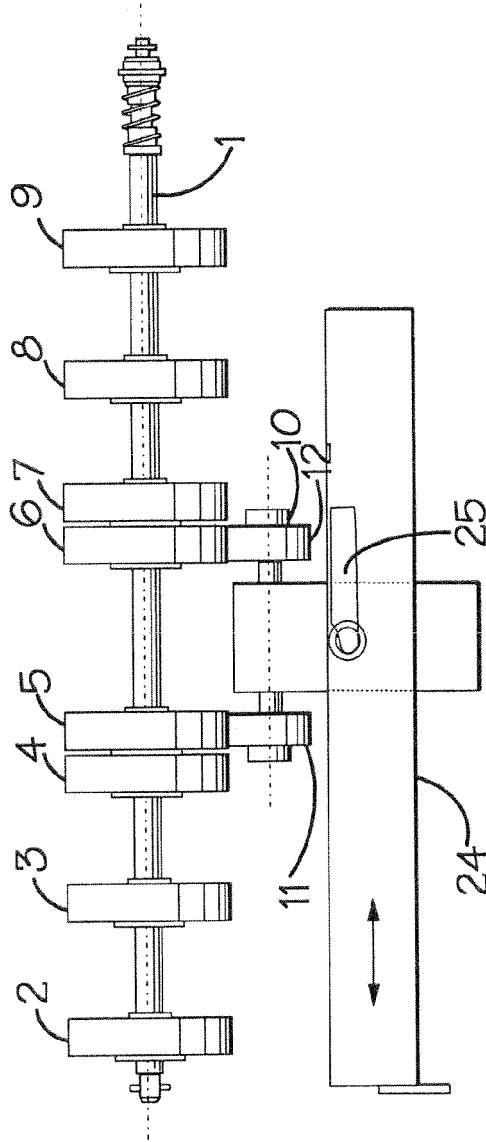


FIG. 5b.

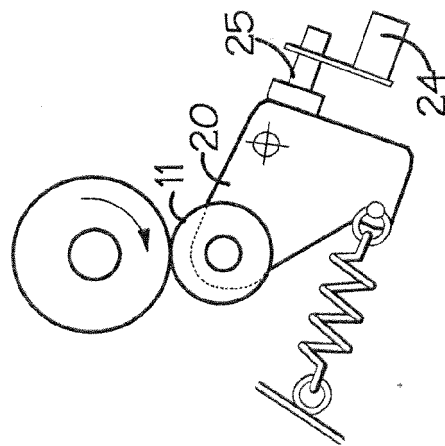


FIG. 5a.

REFERENCES CITED IN THE DESCRIPTION

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