being applied, for example, onto envelopes. This, in turn, results in poor control of the inserting operation.

[0008] Accordingly, it is desirable to provide improved inserting apparatus for the insertion of discrete paper or film objects into envelopes in a high speed handling machine. It is also desirable to provide a converting apparatus and related methods that address inherent problems observed with conventional converting apparatus.

Summary

[0009] To these ends, in one embodiment of the invention, there is provided an apparatus for inserting a paper or film object or a stack of such objects into an envelope, comprising:

a feeding apparatus for moving the object toward the envelope;

a rotatable vacuum drum having a surface adapted to engage and move the envelope toward the object; and

a ramp element coupled to said vacuum drum and stationary relative thereto, said ramp element including a generally flat surface tangential to said vacuum drum and adapted to support the envelope as the envelope moves with said vacuum drum.

[0009a] In another embodiment the invention provides an automatic envelope stuffing apparatus having a first end associated with feeding of a roll of paper and a processing apparatus for converting the roll of paper into discrete sheets, the envelope stuffing apparatus further comprising:

an apparatus for inserting the discrete sheets of paper into envelopes, said apparatus including:

(a) a feeding apparatus for inserting the discrete sheets of paper toward the envelopes;

(b) a rotatable vacuum drum having a surface adapted to engage and move the envelopes toward the discrete sheets; and

(c) a ramp element coupled to said vacuum drum and stationary relative thereto, said ramp element including a generally flat surface tangential to said vacuum drum and adapted to support the envelopes as the envelopes move with said vacuum drum.

[0009b] In a further embodiment, the invention provides an apparatus for processing envelopes and a paper or film object or a stack of such objects to be inserted into the envelopes, comprising:

a frame structure;

a support plate mounted on said frame structure and generally stationary relative thereto, said support plate having a generally flat surface for supporting a stack of the envelopes in a generally upright orientation;

a pressure sensing lever mounted on said frame structure and having a sensing surface oriented transverse to said support plate, said pressure sensing lever being pivotally movable in response to pressure exerted by the stack of the envelopes, said pressure sensing lever positioned relative to said support plate to permit a leading portion of a first envelope of the stack to extend into a region behind said sensing surface;

a feeding apparatus for moving the object toward an envelope of the stack of envelopes;

a rotatable vacuum drum supported from said frame structure and having a surface adapted to engage and move the envelope toward the object; and

a ramp element coupled to said vacuum drum and stationary relative thereto, said ramp element including a generally flat surface tangential to said vacuum drum adapted to support the envelope as the envelope moves with said vacuum drum.

[0009c] The present invention still further provides a method of processing envelopes and a paper or film object or a stack of such objects to be inserted into the envelopes, the method comprising:

moving the object toward an insertion station;

applying negative pressure against the envelope to engage the envelope against a rotating surface of a drum;

moving the rotating surface of the drum to move the envelope toward the insertion station;

supporting a leading portion of the envelope with a relatively stationary surface as the envelope moves with the rotating surface of the drum;

applying a first force against a stack of the envelopes to move them toward the insertion station;

engaging a first envelope of the stack with a pivotally movable surface;

pivotally moving the movable surface in response to the first force; and

applying a second force against the stack of envelopes different from the first force.

[0009d] The present invention yet further provides a method of processing envelopes and a paper or film object or a stack of such objects to be inserted into the envelopes, the method comprising:

moving the object toward an insertion station;

applying negative pressure against the envelope to engage the envelope against a rotating surface of a drum;

moving the rotating surface of the drum to move the envelope toward the insertion station;

supporting a leading portion of the envelope with a relatively stationary surface as the envelope moves with the rotating surface of the drum;

biasing a stack of the envelopes toward an envelope feed position;

sensing pressure on a lead envelope at the feed position resulting from the biasing; and

controlling the biasing in response to the sensing.

[0009e] As also described herein, an envelope is fed between two rollers toward an insertion station, an insert inserted there and the envelope thereafter fed between one of said rollers and another roller away from the insertion station. Once the envelope is fed between the two rollers toward the insertion station, its trail end clears the two rollers and the motion of the envelope is reversed. The motion of the insert into the envelope pushes the tail end of the envelope back toward the one roller but on an opposite side of its axis where continued motion of that roller in the same angular direction drives the envelope away from the insertion station.

[0010] In other words, the rollers engaging and moving the envelope first toward then away from the insertion station continue to rotate continuously in the same direction, while at least a common roller engaging the envelope serves to drive the envelope toward the insertion station and then, when the envelope clears that roller, to drive said envelope after insertion in another direction away from the insertion station. This is accomplished by the tail edge or end of the envelope first clearing the roller on one side of its axis of rotation, then being driven by the motion of the insert back against the same roller on another side of its axis.

[0011] It will be appreciated that this invention provides apparatus and methods which positively control both the separate work pieces or inserts as they are fed to an insertion station, and of the filled envelope as it departs the insertion station, thus enhancing reliability of the apparatus. More particularly, an apparatus for inserting an object such as an insert into an envelope includes a vacuum drum that engages and moves an envelope and a ramp element having a surface generally tangential to the vacuum drum for disengaging the envelope from the vacuum drum. More particularly, in one embodiment, an apparatus is provided for inserting a paper or file object or a stack of such objects into an envelope. The apparatus includes a feeding apparatus for moving the object toward the envelope and a

vacuum drum that has a surface adapted to engage and move the envelope toward the object. A ramp element is operatively