SIDF FLAP FOLDING SECTION OF A ROTARY ENVELOPE MAKING MACHINE

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This invention relates to a side flap folding section of a rotary envelope making machine.

Usually envelope blanks are carried through the flap folding section on rollers or other conveyer systems and the blanks are retained in time and place by means of spring actuated pressure rollers bearing upon the upper faces of the blanks as they are carried along by the lower rollers. The side flap folding mechanisms of most envelope making machines comprise a form of plow located along the side of the conveyer in the path of the side flaps, to lift them up and turn them over forming rails. In other envelope making machines, the folding mechanisms are movably mounted to swing upwardly and inwardly over the forming rails.

It is obvious that the folding mechanisms of either type tend to retard the blanks and cause them to slip out of time and reaarranged position in their order of travel, because the spring actuated pressure rollers are insufficient to hold the blanks from shifting on the rollers, particularly at high speeds. Consequently, the flaps are improperly formed and the side seams gum, when applied, is out of place on the defectively shaped envelopes. Moreover, misformed folds and gumming cause serious ball-ups of the partially formed envelopes, requiring frequent shutdowns of the machine to remove the balled-up and misaligned blanks.

It is, therefore, a principal object of the present invention to overcome these difficulties by providing an improved means for conveying the blanks through such sections of an envelope making machine, and by which the blanks are securely held thereon to resist operating forces on the blanks that tend to knock them out of alignment.

A further object of the invention is to provide envelope blank conveying or transporting means movable with the travel of the blanks in association with vacuummeans for seizing and holding the blanks immovable thereon.

Other objects of the invention are to provide a conveying means which consists of an endless toothed belt operating over toothed rollers driven in timed relation with the operating mechanisms of the envelope making machine, and to provide an upper run movable along and over a manifold in which a vacuum is drawn to seize the envelope blanks to the upper run of the belt.

In accomplishing these and other objects of the invention as hereinafter described, I have provided improved structure, the preferred form of which is illustrated in the accompanying drawings, wherein:

FIG. 1 is a plan view of the actuating mechanisms of the side flap folding and gumming section of an envelope making machine equipped with blank transporting means constructed in accordance with the present invention.

FIG. 2 is a longitudinal section taken on the line 2—2 of FIG. 1.

FIG. 3 is a fragmentary cross section on the line 3—3 of FIG. 1.

FIG. 4 is a fragmentary perspective view of the blank transporting mechanism, shown in section and broken away to better illustrate the construction.

FIG. 5 is an underneath face view of the transport belt, particularly illustrating the teeth or ribs thereon.

Referring more in detail to the drawings:

Envelope blanks to be folded are designated "A" in the present drawings and may be of various shapes and sizes, but all envelope blanks have common main characteristics in that they have a body portion "b", side flap portions "c" and "d", respectively. The side flap portions "b—b" are usually the first folds to be made, and the folds must be accurately located, otherwise all the subsequent operations on the blanks are out of position and the envelope is deformed. Also, with the folds not properly located the adhesive is not accurately applied. Accuracy of fold is difficult to maintain in rotary envelope making machines of the type illustrated in the Winkler and Dunnebier Patent No. 2,008,236, issued July 16, 1935, particularly when such envelope making machines are operated at high speeds in an attempt to increase the output capacity thereof. As illustrated and described in said patent, and in other types of rotary envelope making machines, the blanks move from a drying section into the folding section illustrated in FIGS. 2A and 3A of the drawings of the patent in fanned-out, overlapping relation, after which they are drawn out at higher speed, to separate the blanks so that they travel through registering and timing means and between the scoring rollers, after which they are carried between the side flap folders, designated 300 in said patent, and delivered to the side flap gum applicator 309, by which adhesive is applied to the turned-over side flaps.

It is to be noted that the blanks are mainly transported upon rollers, while being held in contact therewith by spring actuated pressure rollers, consequently, at high speeds there is a tendency for the blanks to slip and be knocked out of alignment when contacted by the side folders so that, as above described, the resultant envelopes have inaccurate shapes. These difficulties are characteristic of all modern rotary envelope making machines, regardless of the type of folders.

I have found that the inaccuracies caused by high speed production can be corrected by advancing the transporting means with the blanks and by holding the body portions of the blanks so that the flaps cannot slip on the transporting means when contacted by the side flap folders. It is, therefore, to be understood that while the invention is in combination with side flap folders of an envelope making machine, a specific construction of the side flap folders is not individual and the invention may be used with any known folder mechanism. Therefore, in order to simplify the illustration of the invention, only those portions of the envelope making machine that are closely associated with the present invention are illustrated in the present drawings and in a generic manner, since these elements are well known to those skilled in the art.

In the present drawings, the envelope blanks A pass in individual spaced apart relation through a scoring mechanism 1, including upper and lower rollers 2 and 3, and onto laterally spaced apart longitudinal guides 4 and 5 extending longitudinally through the folding section 6 of the envelope making machine. The folding section 6 includes side folders 7 and 8, which may be of any construction as the specific construction thereof forms no part of the present invention. Cooperating with the folders 7 and 8 are folding rails 9 and 10 that are supported over the guides 4 and 5 from a transverse rod 11. The supporting rails 9 and 10, like the folders 7 and 8, form no part of the present invention and may be of any of the well known constructions used in modern envelope making machines. Located above the opposite ends of the guide rails is a flap gumming mechanism 12, including presser rollers 13 and 14 and an applicator roller 15 having applying blades 16 and...
thereon for applying gum to the inturned side flaps of the envelope blanks, as later described. The gum or adhesive is carried in a receptacle 18 that is supported above pressure rollers 13 and 14, as shown in FIG. 2. The gum is picked up from the receptacle 18 by means of a pickup roller 19 and transferred to the arcuate faces 20 of the blades 16 and 17 by means of a transfer roller 21. After application of the gum, the blanks continue on through the envelope making machine on vacuum consultancy 22 under pressure rollers 23 and 24.

All of the parts thus far described are found in a standard rotary envelope making machine, and are carried from the side frames 25—25 of the machine. The rollers are all actuated in time relation by suitable gear trains to operate the driving connections 26 with other connections, not shown, of the envelope making machine of which the folding section 6 forms a part.

The improvement comprising the present invention distinguishes from conventional envelope making machines by the blank transporting means 27 on which the blanks are carried through the folding section 6 along the guides 4 and 5.

The transporting mechanism 27 is supported from the side frames 25—25 on spaced apart transverse shafts 28 and 29, the shafts 28 and 29 being suitably journaled in the side frames of the machine, with the shaft 28 located on the lower scoring roller 2 and the shaft 29 located approximately under the pressing roller 14. Fixed to the shafts 28 and 29 are rotary supporting drums or sprockets 30 and 31, carrying thereon an endless conveyor belt 32. The rotary drums 30 and 31 are preferably of the width of the endless conveyor belt and are arranged around the peripheries thereof to engage with corresponding teeth 34 on the endless conveyor belt, by which the conveyor belt is advanced and kept in time with the other operating mechanisms of the envelope making machine. The conveyor belt 32 thus provides a continuously moving upper run 35 and supports the envelope blanks thereon as they are transported through the folding section.

While I have illustrated the transporting mechanism in the form of a belt, it is obvious that other types of endless conveyors may be used as long as they are of sufficient width to adequately support the body portions of the blanks as they are carried along the guides 4 and 5 and to be provided with perforations 36 through which a vacuum may be drawn. However, a flexible belt, having the driving teeth 34 integrally formed on the under side thereof, has been found to be most satisfactory, in that it may be kept in accurate time relation with the other mechanisms of the machine and have sufficient stability in the longitudinal direction thereof to maintain the course of the envelope blanks exactly in registry with the guides 4 and 5 when the blanks are seized upon the upper run of the belt by a vacuum established through the perforations 36.

In order to provide the vacuum and to support the upper run of the belt in plane with folds on which the side flaps are turned by the folding mechanism, the transporting mechanism also includes a stationary manifold 37, in the form of an elongated trough 38 extending between the toothed drums 30 and 31 and carried on transverse supports 39 and 40 having their ends carried by the side frames 25—25 of the machine. The trough 38 consists of a longitudinal bottom 41 curving transversely upwardly into side walls 42 and 43 which terminate along sides of the conveyor belt, as best shown in FIG. 1 between an open top. Extending inwardly from the inner faces of the side walls are guide rails 44 and 45 which cooperate with a fumigated cover 46 to support the upper run of the belt, which is slidably movable when the belt is in operation. The rails thus provide a sliding seal for the edges of the belt, to assure that the vacuum within the trough is effective through the perforations 36 of the belt. The ends of the trough are closed by arcuate end walls 47 and 48 following the contour of the rotary supporting members 30 and 31. A continuous vacuum is maintained in the trough through a duct 49 and that connects the trough with a source of vacuum, which may be the vacuum pump usually forming a part of the envelope making machine.

The conveying mechanism also includes a pressure roller 50 above the drum 30, to press the blanks into initial contact with the belt and assure that the blanks are in flat contact with the belt when they are engaged by the first of the vacuum ports 36.

The conveying mechanism may be driven from the gearing 26 through a gear 51 on the shaft 28, so that the blanks are transported through the folding section in accordance with the working cycle of the machine.

Assuming that the folding section of an envelope making machine is equipped with a blank transport mechanism constructed in accordance with the present invention, a vacuum is maintained in the trough 35 of the manifold 37 by way of the duct 49. With the sprocket drum 30 driven at the speed of the scoring rollers, the upper run 35 of the belt 32 will advance along the manifold with the side edges of the belt sliding along the rails 44 and 45 supported by the fumigated cover 46. The open top of the trough is thus sufficiently covered by the belt that air is sucked through the perforations 36 in an attempt to satisfy the vacuum that is maintained in the trough of the manifold. The belt travels at a linear speed corresponding to the rate of movement of the blanks to and from the folding section 6 of the envelope making machine, because of the driving connection 26 with the sprocket drum 30 and by the interengagement of the teeth 34 of the belt with the teeth 33 of the sprocket drum. Consequently, when the blanks issue from between the scoring rollers 2 and 3 onto the guides 4 and 5, they will be fed therafter by the scoring rollers until the forward edge of the bottom flap e of a blank is engaged between the pressure roller 50 and the face of the belt 32. The pressure roller 50 presses the blank and smooths the blank upon the surface of the belt, so that when the first of the apertures 46 that are under the blank enter over the open top of the trough, the blank is immediately seized to the belt, and as the blank is advanced with movement of the belt other of the apertures will be successively effective in seizing the blank, to hold the body portion of the blank immovable on the belt while the side flaps b are extended therefrom and freed from suction or vacuum of the manifold, but they are carried into contact with the folders 7 and 8 which fold them over the seized body portion of the blank, as shown in FIG. 1 of the drawings, at the time the blank passes the folders. It is obvious that the blank is held squarely upon the belt and is carried in fixed relation therewith, so that it cannot shift its position under any action of the folders.

The hold on the blank continues as the blank passes under the pressure rollers 13 and 14, so that there is a sufficient portion of the blank held in fixed relation with the belt to assure against slipping of the blank as the faces 20 of the applicator blades 16 apply gum to the side flaps.

At the time the blank has passed over the end wall 48 of the vacuum manifold, the vacuum is released, but the blank is held sufficiently firmly by the pressure roller 14 and forwarding roller 24 to maintain its position and timing when advanced into the bottom flap folding section (not shown).

While the invention is particularly illustrated and described as associated with the side flap folding section of an envelope making machine, the invention may be employed in transporting blanks in other sections of an envelope making machine or the like.

From the foregoing, it is obvious that I have provided an improved means for transporting blanks so that they are firmly held in their required position in those sections
of an envelope making machine in which the blanks are apt to slip or be disarranged from their required path of travel.

What I claim and desire to secure by Letters Patent is:

1. In an envelope making machine wherein envelope blanks are delivered with the side flaps laterally extended from body portions of the envelope blanks and with the envelope blanks in a pre-registered and timed position to a folding section which includes
   side flap folders at respective opposite sides of the machine,
   an endless perforate belt between the folders and having an upper face no wider than said body portions of the envelopes,
   toothed wheels for carrying said belt with the teeth of said wheels meshing with similar teeth on the belt, means rotatably carrying said wheels at ends of the folding section to provide a run of said belt coextensive with length of the folding section and in underlying registry with said body portions of the envelope blanks,
   a fixed manifold having side, bottom and end walls providing an open top substantially coextensive with and completely covered by said run of the belt,
   belt guides along inner faces of the side walls of the manifold for supporting the edges of said run of the belt thereon for providing a sliding seal between the belt and said manifold,
   means connected with the manifold for drawing a vacuum in said manifold for producing a continuous suction through said run of the belt along the length of the folding section for seizing the overlying body portion of each pre-registered blank as it is delivered to said folding section and for maintaining continuously the same seized hold on each envelope blank while the envelope blanks are being carried by the conveyor along the length of said folding section for preventing displacement of the blanks from said pre-registered and timed position by said folders when folding the side flaps over the seized body portions, and
   belt supporting means in the manifold between said belt guides for cooperating with the guides for supporting said run of the belt with the upper face in plane with the lines of fold produced in said flaps.

2. In an envelope making machine wherein envelope blanks are delivered with the side flaps laterally extended from body portions of the envelope blanks and with the envelope blanks in a pre-registered and timed position to a folding section which includes

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