Aug. 1, 1944. A. NOVICK 2,354,825

MEANS AND METHOD FOR DECURLING ENVELOPE FLAPS

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Fig. 1.

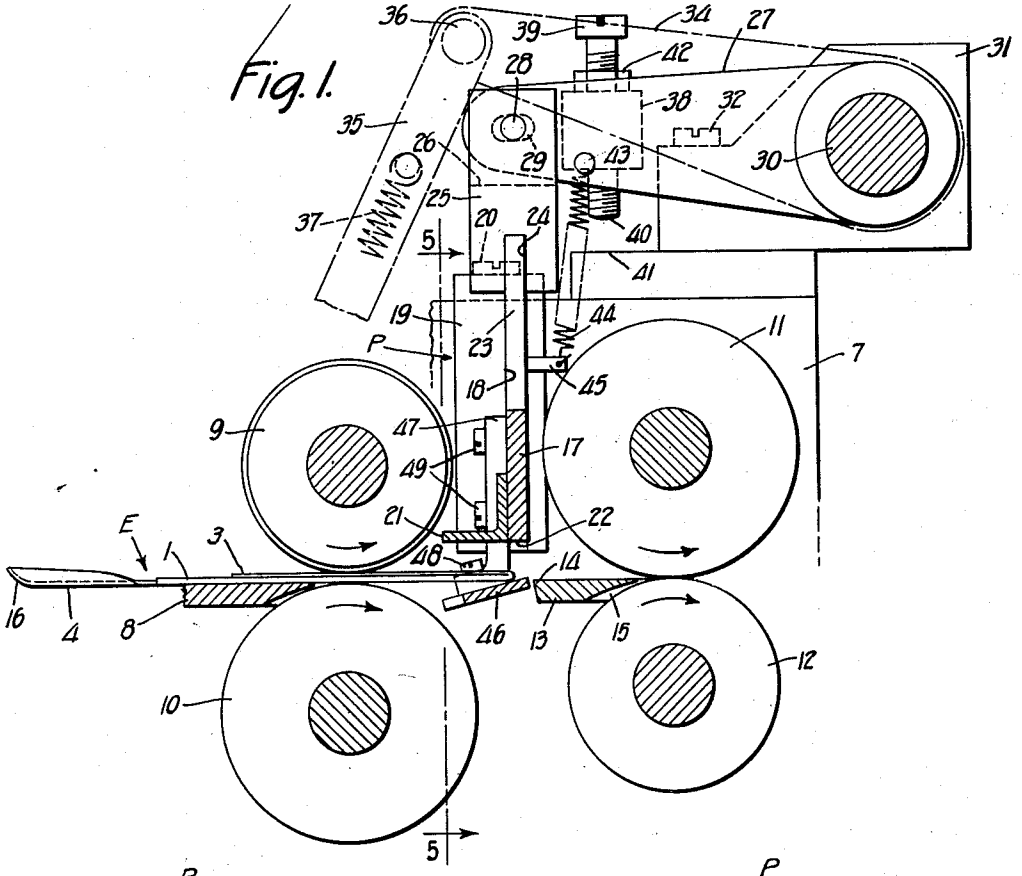


Fig. 2.

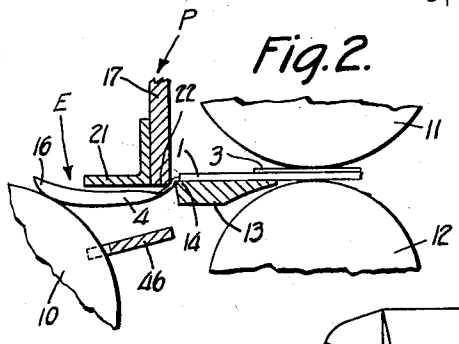


Fig. 3.

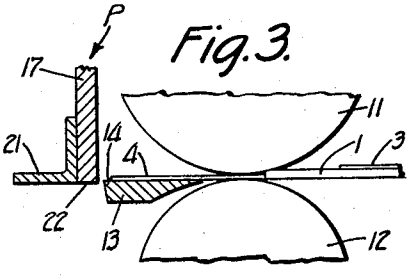
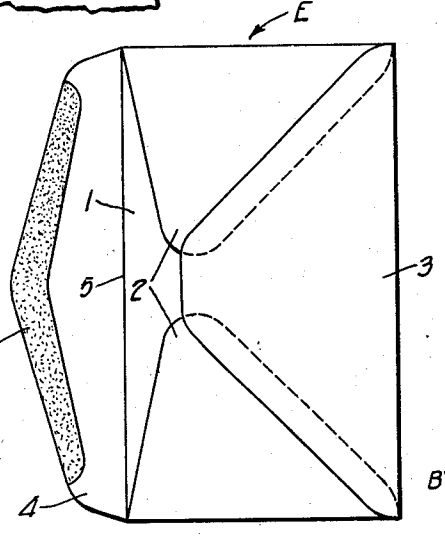


Fig. 4.



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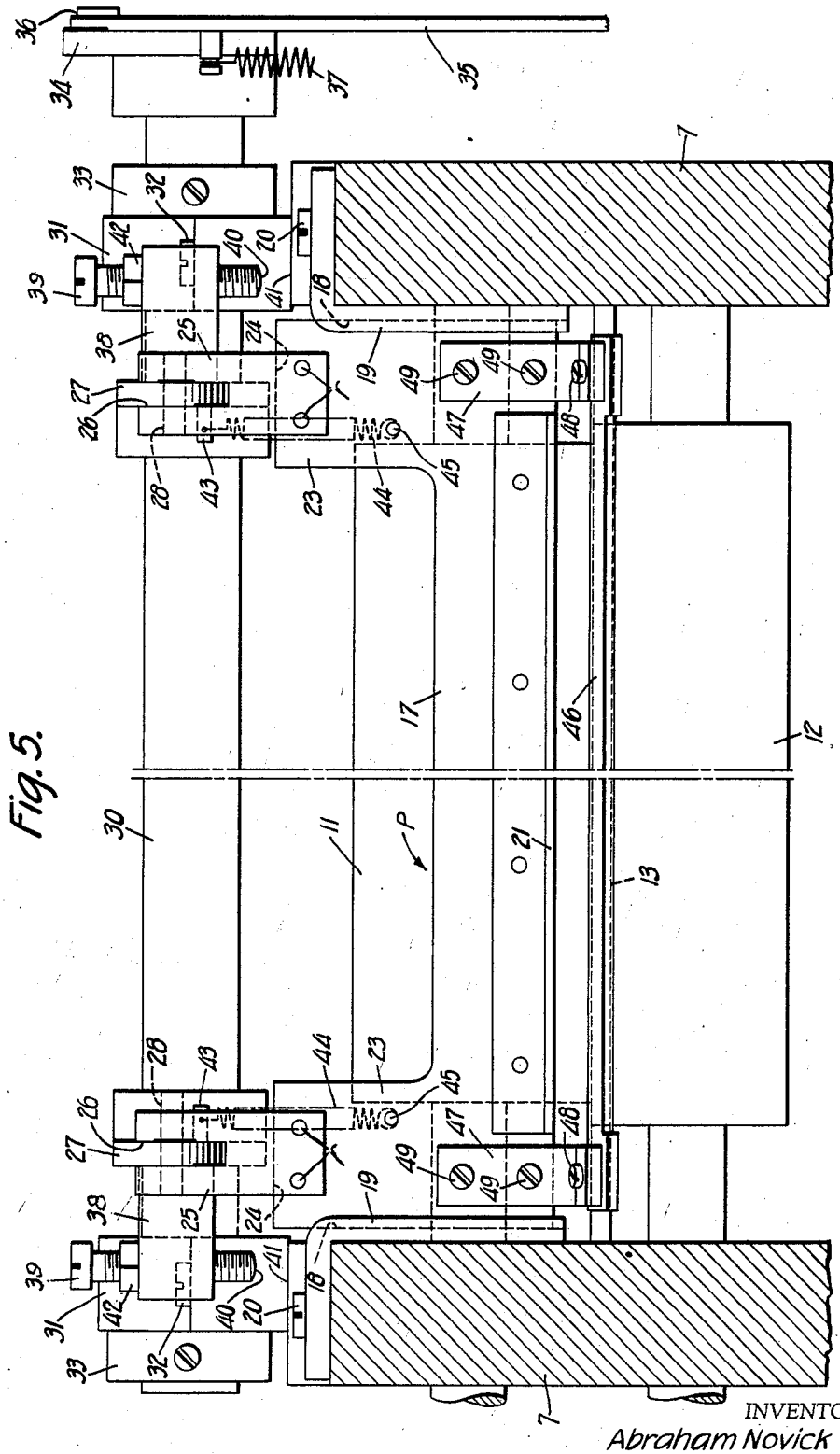


Fig. 5.

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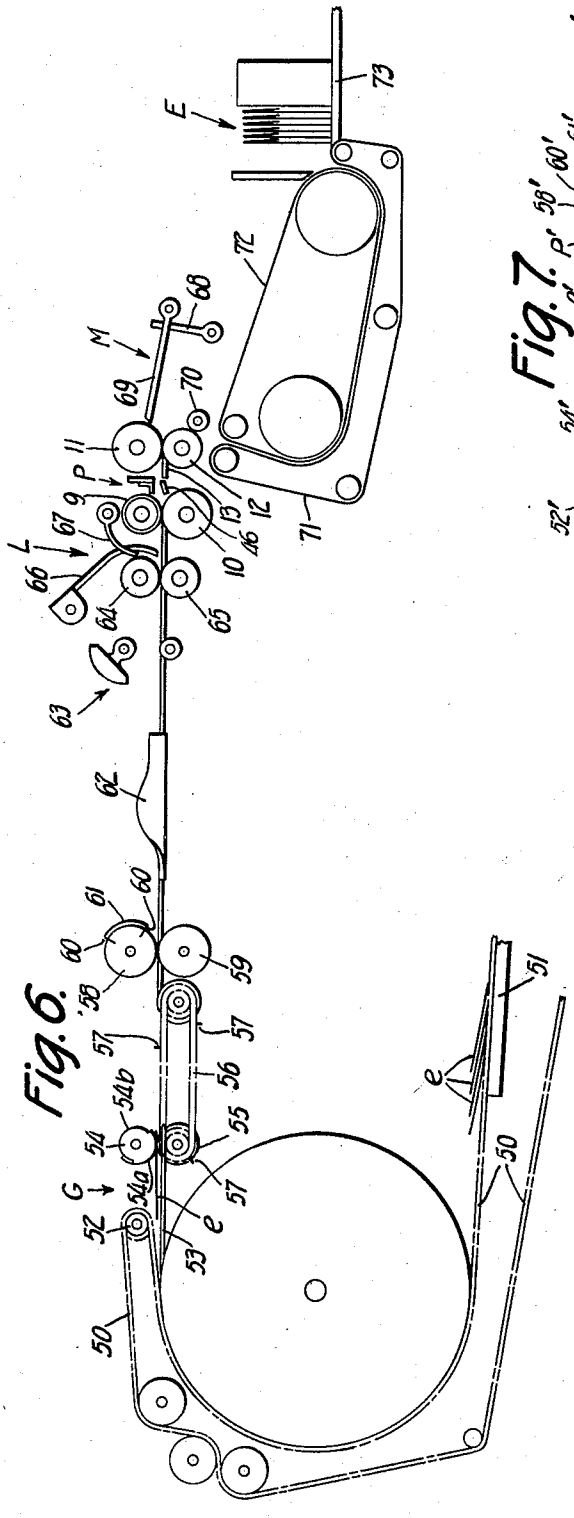


Fig. 6.

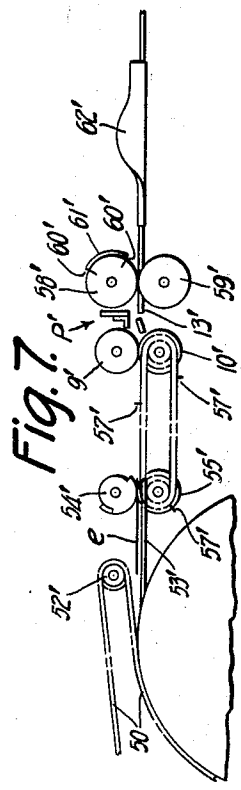


Fig. 7.

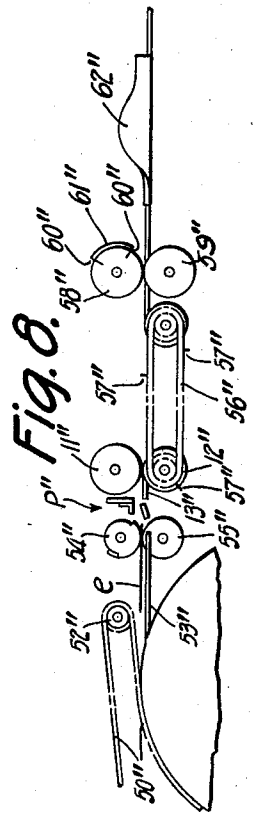


Fig. 8.

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UNITED STATES PATENT OFFICE

2,354,825

MEANS AND METHOD FOR DECURLING ENVELOPE FLAPS

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Application January 4, 1941, Serial No. 373,060

8 Claims. (Cl. 93—62)

This invention relates to a device and method for removing the curl from and straightening the flaps of envelopes. In the manufacturing of envelopes having gummed sealing flaps, it is found that in the operation of drying the gum, the edge of the flap is caused to curl toward the bottom flap in a concave curve so that the entire seal flap does not lie in a single plane. The result of this action is that after the seal flap has been folded over, it does not lie throughout its full area flap against the back of the envelope but extends slightly outwardly therefrom with the result that when a supply of the envelopes is formed into a stack, the stack is not of uniform thickness but is substantially thicker on the side occupied by the sealing flaps than on the opposite side. Furthermore, the curling of the seal flap of an envelope causes an undesired deformation of the body portions of adjacent envelopes in the stack as well as its own body portion. Such a stack of envelopes is inconvenient to pack in a container for shipment to the customer and still more inconvenient when the envelopes are to be used in other machines such as addressing machines, etc. It is a main purpose of the present invention to obviate the above difficulties by removing the curl from envelope flaps by means of a sharp decurling edge which extends across the flap of each envelope and drawing the flap across the edge in such a manner that the curl is removed therefrom.

A further object of the invention is the provision of a suitable pressing means for pressing the portion of the seal flap which extends beyond the decurling edge below the level of such edge and maintaining it there while the envelope is advanced through the machine and the seal flap is drawn across the decurling edge in such manner as to flex it in such a direction as to remove the curl therefrom.

In order to prevent the leading edge of an envelope from striking against the decurling edge and interfering with the proper feed of the envelopes, a further feature of the invention lies in the provision of means for elevating the leading edge of each envelope above the level of the decurling edge as the envelope is advanced thereover. Further objects of the invention will become apparent to those skilled in the art as the description thereof proceeds. For a better understanding of the invention reference is made to the following description taken in connection with the accompanying drawings, in which:

Fig. 1 is a vertical sectional view of a decurling machine embodying the invention;

Figs. 2 and 3 are fragmentary sectional views showing portions of the machine of Fig. 1 in different phases of operation thereof;

Fig. 4 is a rear view of an envelope adapted to be decurled by the machine shown in Fig. 1;

Fig. 5 is a fragmentary sectional view of the machine of Fig. 1 taken on the line 5—5 thereof;

Fig. 6 is a view of a portion of an envelope making machine embodying the invention, portions of the machine being shown diagrammatically, and

Figs. 7 and 8 are skeleton views showing portions of the envelope machine of Fig. 6 embodying the invention.

Referring first to Fig. 4, the envelope E to be decurled comprises a body panel 1, a pair of side flaps 2, bottom flap 3, and a seal flap 4 which joins the body panel 1 along the fold line 5. The edge of the seal flap 4 is provided with a coating of gum, as indicated at 6. A machine for making envelopes of the type shown in Figure 4 is disclosed in the patent to Abraham Novick No. 1,807,867, granted June 2, 1931. The present invention is shown in a form adapted to be incorporated in the envelope making machine of said patent, the side frame members of the envelope machine being indicated in Figures 1 and 5 at 7. Extending between the side frames 7 is a horizontal guide table 8 along which the envelopes are advanced by a pair of feed rolls 9 and 10 whose ends are journaled in the side frames 7 and which are driven in the direction indicated by the arrows by suitable driving means, not shown. The feed rolls 9 and 10 correspond respectively to the feed rolls 70—71 of the aforesaid patent, and in addition to feeding the envelope forward also serve to fold over and press the bottom flap 3 of the envelope against the side flaps 2 to secure these members together. Forwardly of the feed rolls 9 and 10 is a further pair of feed rolls 11 and 12 whose ends are also journaled in the frame members 7, these rolls being rotated in the direction indicated by suitable gearing, not shown. Also extending between the frame members 7 is a guide and decurler plate 13 having a sharp upper edge 14 which is substantially in alignment with the upper surface of the guide table 8, the plate or table 13 being notched out as indicated at 15, to receive a portion of the periphery of the roll 12.

As the partially completed envelopes pass along the table 8 between the feed rolls 9 and 10 with their seal flaps 4 trailing, the gummed edge 6 of each envelope is curled concave upwardly as indicated at 16 in Figure 1, the amount of the curl

being somewhat exaggerated for the sake of clearness. This curl is removed by means of the decurling edge 14 and a pressing device P which serves to bend the seal flap 4 down sharply about the decurling edge 14, as in Fig. 2, while the flap is drawn across said edge by means of the pull rolls 11 and 12.

The pressing device P comprises a transversely extending substantially flat plate 17 whose side edges are guided in a pair of vertical slots 18 formed in a pair of bent guide members 19 whose upper ends rest on the side frames 7 and are secured thereto by means of the securing screws 20. The plate 17 has secured to the rear surface thereof an angle member 21 whose lower flat surface is in alignment with the horizontal lower edge 22 of the plate 17. Each of the upwardly extending ends 23 of the plate 17 is received in a slot 24 provided in an actuating block 25 which is slotted as indicated at 26 to receive the end of an actuating rock arm 27, the plate 17 being secured to the blocks 25 as by the rivets r. Each arm 27 is connected to its block 25 by means of a pin 28 which passes through an elongated slot 29 provided in the arm 27. The arms 27 are secured to a transversely extending rock shaft 30 which is journaled in a pair of bearings 31 supported on the frame members 7 and secured thereto by the screws 32, endwise motion of the shaft 30 in the bearings 31 being prevented by means of a pair of collars 33 secured to the shaft 30.

The shaft 30 is rocked back and forth by means of a rocker arm 34 secured to the shaft and a link 35 which is pivotally connected to the end of the rocker arm 34 by means of a pivot pin 36. The lower end of the link 35 is reciprocated by means of a suitable cam, not shown, the end of the link being biased towards the cam by means of a spring 37. In order to adjust the limit of downward movement of the pressing plate 17 under the action of the spring 37 to accommodate envelope blanks of different thickness, each of the arms 27 is provided with a projecting block 38 threaded to receive an adjustable screw 39, the lower end 40 of which is adapted to engage the upper surface 41 of a frame member 7. After adjustment of a screw 39, it may be locked in such position by means of a lock nut 42. In order to prevent lost motion between the rock arm 27 and the pressing plate 17 which might be caused by wear of the pin 28 or the marginal surface of the slot 29, each arm 27 carries a projecting pin 43 which is connected by a spring 44 to a projecting pin 45 secured to the plate 17 so that each pin 28 is maintained firmly in engagement with the lower edge of the slot at all times.

In order to prevent the leading edge of each envelope blank from striking against the decurling edge 14, thus interfering with the proper feeding of the envelopes, means is provided for lifting the leading edge of each envelope blank slightly above the level of the edge 14 so that the blank will clear said edge as it is advanced thereover by the feed rolls 9 and 10. The illustrated embodiment of such elevating means comprises an elongated plate 46, which is inclined upwardly as shown in Figs. 1 and 5, and whose ends are secured to a pair of angle brackets 47 by means of the screws 48. Each angle bracket 47 is attached to the pressing plate 17 by any suitable means such as the screws 49. The envelope blank elevating plate 46 is thus raised and lowered simultaneously with the pressing plate 17.

In the operation of the device, each envelope blank is advanced between the feed rolls 9 and 10 which serve to fold the bottom flap 3 and press it into firm engagement with the freshly gummed side flaps 2 as described in the above mentioned patent. As the leading edge of each envelope approaches the decurling edge 14, the link 35 is elevated by its actuating cam, not shown, to elevate the pressing plate 17 and the elevating plate 46 into the position shown in Figure 1, the upwardly inclined surface of the plate 46 serving to guide the leading edge of the blank over the decurling edge 14 as the advancement of the blank continues. Shortly thereafter the elevating plate 46 and the pressing plate 17 are lowered under the action of the spring 37 and the advancement of the blank continues along the flat upper surface of the table 13 under the action of the feed rolls 11 and 12. Shortly before or shortly after the fold line 5 between the flap 4 and the body 1 of the envelope reaches the decurling edge 14, the angle member 21 engages the upwardly curled edge 16 of the flap and bends the flap downwardly as the downward advancement of the angle member 21 continues toward its lowest position, as shown in Figure 2. This position is reached shortly after the fold line 5 has passed beyond the decurling edge 14. In this position, the lower edge 22 of the pressing plate 17 is slightly below and close to the decurling edge 14 so that the flap is bent or wrapped partly about the edge 14 as in Fig. 2. With the members in this position, the advancement of the envelope blank continues and the gummed flap is drawn across the sharp edge 14, the bending action of the paper serving to remove the curl from the flap. Figure 3 shows an envelope blank as it is being advanced further along the table 13 and after its flap 4 has passed beyond the decurling edge. It will be noted that the flap is now flat and that the curl has been entirely removed therefrom. Immediately after the parts occupy the lowest position shown in Figure 3, the pressing plate 17 commences to be elevated toward its topmost position, by means of the link 35 and the connections therebetween above described, ready to receive the next envelope which has now been advanced into the bite of the rollers 9 and 10 by any suitable means, disclosed in the aforementioned patent.

In the operation of the device, it was found that if the angle member 21 was omitted from the pressing plate 17, a slight but undesirable crease was formed across the flap 4 by the sharp decurling edge 14 as the flap was abruptly bent about this edge under the action of the lower edge 22 of the plate 17. By the provision of the angle member 21, it was found that the formation of such a crease may be prevented. It appears that the trailing portion of the upwardly curled edge of the flap is first engaged by the angle plate 21 a short time before the plate 17 has reached its lowest position and that the flap is gradually bent about the edge 14 as the angle member 21 continues to be lowered toward its lowest position. The lowest position reached by the edge 22 of the plate 17 may be accurately and easily controlled to secure the proper bending action of the flaps and to accommodate envelope blanks of different thickness by the adjustment of the screws 39.

It will be understood that the feed rolls 11 and 12 advance the envelope blanks into a suitable folding means for folding the seal flap 4 about the fold line 5 and arranging the completed envelopes into stack form, such a folding and stacking arrangement being disclosed in the above mentioned patent. The feed rolls 11 and 12 are shown so disposed in Fig. 6 in an envelope machine of the type disclosed in the aforementioned patent. Referring to said figure, the envelope blanks *e* are advanced by means of a chain conveyor 50 over a dryer 51 which serves to dry the gum previously applied to their seal flaps by the gumming mechanism C of said patent. The conveyor 50 advances the blanks to the individualizing station G, where their travel is speeded up, whereby they may be fed individually to the scoring and folding mechanism. The terminal sprockets 52 of chain 50 are disposed above a table 53 upon which the leading ends of the blanks are advanced to a device which accelerates them and withdraws them from clips (not shown) carried by the chain 50. This accelerating device comprises a pair of feed rolls 54—55, the lower roll 55 projecting through the table 53, as shown, and upper roll 54 having a portion of its periphery cut away to provide an operative segmental portion 54*a* and an inoperative portion 54*b*.

The effect of the rolls 54—55 is to separate the blanks *e* by at least an amount such that the trailing edge of the side flaps 2 is no longer overlapped. In this condition the separated blanks are advanced onto an endless conveyor 56 having spaced apart pins 57 which preferably push the side flaps 2 of the blanks from behind and operate to square the blanks and also to further increase the separation thereof until each blank is clear of the one behind it.

In preparation for folding over the flaps, the blanks are advanced into the bite of a pair of scoring rolls 58—59, the upper scoring roll 58 being provided with transverse scoring blades 60 and circumferential scoring blades 61. The scoring blades 60 serve to form the score lines at the top and bottom of the body panel and the blades 61 form those at the side edges thereof, the construction of the scoring blades being shown in more detail in the aforesaid patent.

The blanks are next fed to the side flap folders 62 which consist of a pair of members resembling ploughshares and hence to gumming apparatus 63 for applying gum to the blanks, whereby the bottom flap 3 will be gummed to the side flaps 2. From the gumming mechanism 63, the blanks are passed to the bottom flap folding mechanism L, consisting of a pair of contacting feed rolls 64—65 and a pair of cooperating folding blades 66—67 which fold the bottom flap 3 over into engagement with the side flaps 2. From the bottom flap folding device L the blanks are fed to the feed rolls 9 and 10 of the decurling device above described which press the gummed side and bottom flaps firmly together and advance the blanks into the bite of the pull rollers 11—12 which draw the seal flaps of the blanks over the edge of the decurler plate 13 and the curl is removed therefrom in the manner above described in connection with Figs. 1 to 5.

From the decurling device the blanks are fed by the rollers 11—12 to a device M which folds the top flap 4 of each blank about the fold line 5 thereof. This flap folding device comprises the folding members 68—69 which reverse the travel of the blank and introduce the seal flap and body of the envelope into the bite of the feed rollers 12 and 70 which press the fold. The rollers 12 and 70 also advance the folded envelopes between a pair of conveying belts 71—72 which deliver the completed envelopes onto a table 73 where they are stacked and counted.

The mechanism for accomplishing the bottom flap folding is shown in greater detail in my U. S. Patent No. 1,734,742 issued on November 5, 1929, and mechanism for accomplishing the top flap folding is shown in detail in my U. S. Patent No. 1,886,832 issued on November 8, 1932.

Instead of effecting the decurling of the seal flaps after the blanks have been scored and the side and bottom flaps folded over, it may be effected prior to such operations while the blanks *e* are being advanced toward the scoring rolls 58′—59′ (Fig. 7) with the side flaps and bottom flap extending straight out from the main body portion of the envelope blank. An arrangement for this purpose is shown in Fig. 7 in which certain portions of the apparatus of Fig. 6 are shown, corresponding parts being indicated by the same reference numerals primed. After leaving the chain conveyor 50′ and being separated by the feed rollers 54′—55′, the blanks are advanced directly and individually into the bite of the feed rollers 9′—10′ of the decurling device by means of the pins 57′ on the endless conveyor 56′. The rollers 9′—10′ advance the blanks with the bottom flaps leading, into the bite of the scoring rolls 58′—59′ which serve to score them in the manner above described. The rolls 58′—59′ also serve the function of the pull rolls 11—12 to pull the blanks over the edge of the decurling plate 13′ which removes the curl from the seal flaps in the manner above described. After scoring, the blanks are advanced to the side flap folding blades 62′ and finished into completed envelopes in the same manner as above described in connection with Figure 6.

In the embodiment of the invention shown in Fig. 8, the decurling operation is also effected before the scoring and folding operations have been performed on the blanks. The blanks are removed from the chain conveyor 50″ by the accelerating rolls 54″ and 55″ which serve to accelerate and separate the blanks and also to feed them individually into the bite of the pull rolls 11″—12″ of the decurling device. At this stage the trailing seal flaps are pulled over the edge of the decurling plate 13″ by the rolls 11″—12″ and the curl removed therefrom in the manner above described. From the rolls 11″—12″ the blanks in a flat condition are advanced by the pins 57″ of the conveyor 56″ to the scoring rolls 58″—59″ and the side flap holding blades 62″ and finished into completed envelopes in the manner above described.

I have described what I believe to be the best embodiments of my invention. I do not wish, however, to be confined to the embodiments shown, but what I desire to cover by Letters Patent is set forth in the appended claims.

I claim:

1. The method of decurling the gummed flap of an envelope blank which consists in advancing the blank toward a member having a substantially flat guide surface terminating in a decurling edge, elevating the leading edge of the blank above the level of the decurling edge while advancing the blank, bending the flap downwardly about the decurling edge and drawing the envelope blank along the guide surface of said

member while maintaining the flap bent about the decurling edge.

2. An envelope making machine comprising, in combination, means for advancing an envelope blank having a curled seal flap along a path with the seal flap trailing, a member having a decurling edge disposed alongside said path and extending transversely thereto, means for elevating the leading edge of the blank above the level of the decurling edge during the advancement of the blank means for bending the curled seal flap about the decurling edge, a pair of feed rollers arranged to pull the blank with the seal flap bent about the decurling edge, a flexible conveyor adapted to receive the blank from said feed rollers and advance it along said path, said conveyor being provided with spaced projecting pins adapted to straighten the blank during its advancement along said path and means for later folding over and gumming together the side and bottom flaps while advancing the blank.

3. The method of decurling the gummed flap of an envelope blank which consists in advancing the blank toward a member having a decurling edge, pressing the front portion of the blank upwardly while advancing the blank to cause the leading edge thereof to clear the decurling edge, bending the flap downwardly about the decurling edge and drawing the envelope blank along above said member while maintaining the flap bent about the decurling edge.

4. In an envelope machine, apparatus for decurling the trailing gummed flap of a traveling envelope blank comprising a sharp decurling edge transversely engaging the ungummed side of the blank, and a blank-bending device movable into engagement with the blank in advance of said edge, including a bending member engageable with the gummed side of the blank immediately in advance of the edge and movable into overlapping relation to said edge, arranged to bend the flap across said edge at an angle sufficient to decurl the flap during travel around the edge, and a flap-deflecting member located in advance of the bending member, movable into engagement with the gummed side of the curled flap in bending the curled flap more sharply in the same direction in which it is bent by the deflecting member.

5. In an envelope machine, apparatus as set forth in claim 4 in which the flap-deflecting member and the bending member are rigidly connected and move as a unit.

6. In an envelope machine, apparatus as set forth in claim 4 in which the flap-deflecting member is located in register with the path of the curled flap margins, arranged to bend the flap by engagement with said margins.

7. In an envelope machine, means for decurling the flap of an envelope blank, comprising a guide table provided at the rear end thereof with a substantially straight decurling edge, a pair of feed rolls arranged to pull an envelope blank along said guide table with the gummed flap trailing, and automatically operated means arranged to engage the flap rearwardly of said decurling edge and bend it about the decurling edge during the advancement of the envelope blank by said feed rolls, said automatically operating means comprising a movable pressing member, means for reciprocating said member in a path disposed immediately adjacent to the decurling edge, and an adjustable stop device for accurately controlling the lower extreme position in said path reached by the pressing member.

8. In an envelope machine, means for decurling the flap of an envelope blank, comprising a guide table provided at the rear end thereof with a substantially straight decurling edge, a pair of feed rolls arranged to pull an envelope blank along said guide table with the gummed flap trailing, and automatically operated means arranged to engage the flap rearwardly of said decurling edge and bend it about the decurling edge during the advancement of the envelope blank by said feed rolls, said automatically operating means comprising a lifting device arranged to guide the leading end of the envelope blank clear of the decurling edge.

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