United States Patent [19]

Manolis

[11] **3,733,982**

[45] **May 22, 1973**

[54] MACHINE FOR PRODUCING SELF-OPENING ENVELOPES

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[22] Filed: **Sept. 3, 1971**

[21] Appl. No.: **177,749**

Related U.S. Application Data

[63] Continuation-in-part of Ser. No. 873,939, Nov. 4, 1969, abandoned.

[52] **U.S. Cl.** .....**93/76,** 93/1 TS, 93/61 R

[51] **Int. Cl.** **B31b 1/90**

[58] **Field of Search**.....93/76, 61 R, 1 TS

[56] **References Cited**

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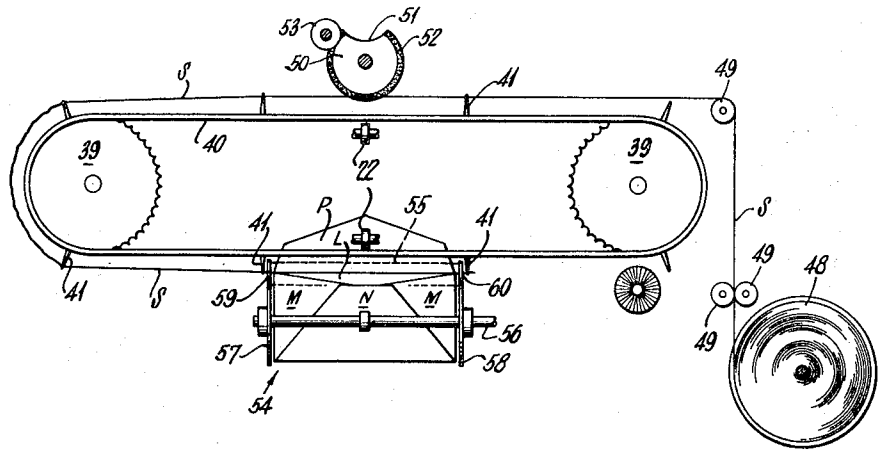
[57] **ABSTRACT**

A machine for producing self-opening envelopes, feeds precut envelope blanks and advances them, transversely oriented, longitudinally along a path where successively: score lines are impressed in the blank to delineate the flaps from the front panel; the side flaps are folded and adhesive applied to its borders; the bottom flap is folded over the side flaps; a tear strip is advanced from a continuous length transversely across and above the envelope path and severed from the continuous length and depressed into engagement with an underlying envelope along a line delineating the front panel and closure flap, an adhesive having been previously applied to the tear strip; an adhesive is then applied to the closure flap border and the envelopes are then dried, closed and stacked. The tear strip applying mechanism includes a horizontal endless chain positioned above the envelope path and regularly spaced fingers depend from the chain and terminate in tear strip gripping notches. Transversely spaced severing blade and transfer fingers sever a length of tear strip from the conveyor fingers and transfer it to an underlying envelope.

10 Claims, 9 Drawing Figures



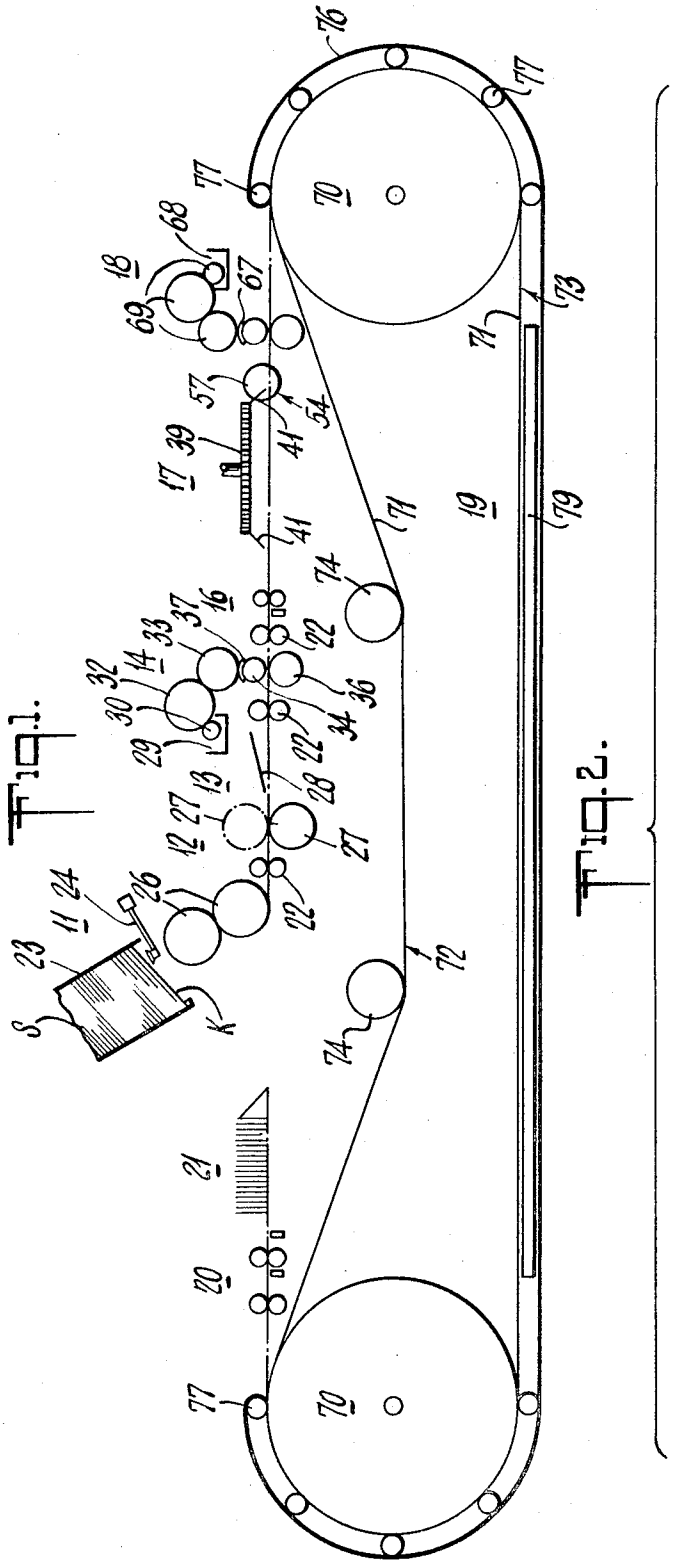


FIG. 1.

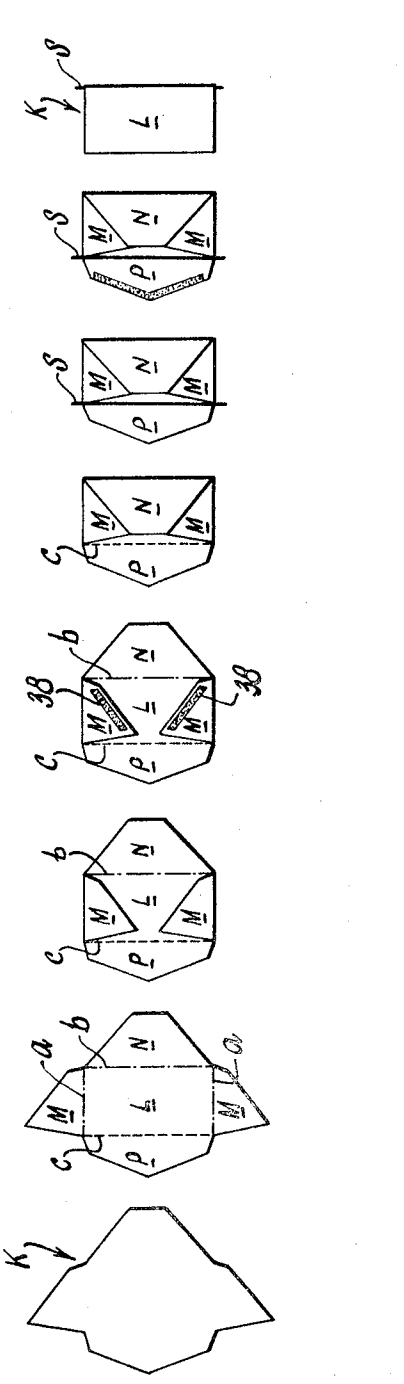


FIG. 2.

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Fig. 7.

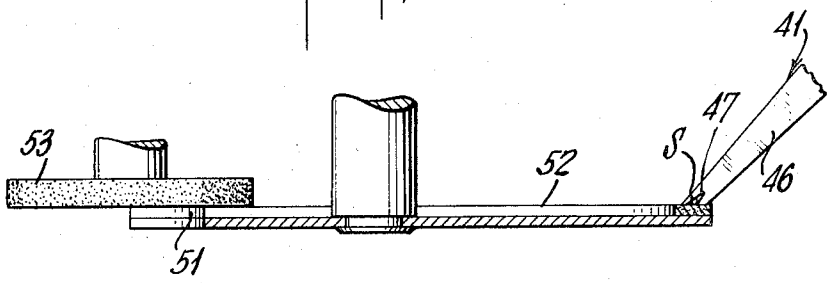


Fig. 8.

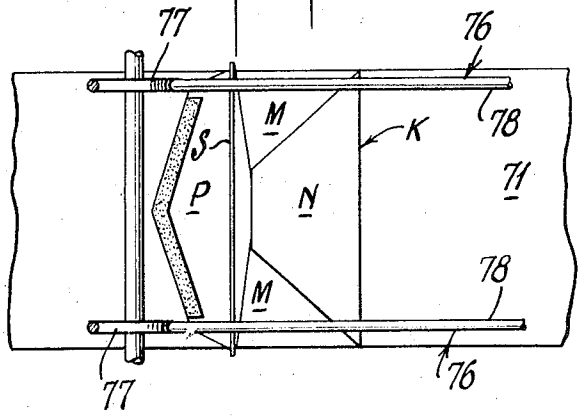
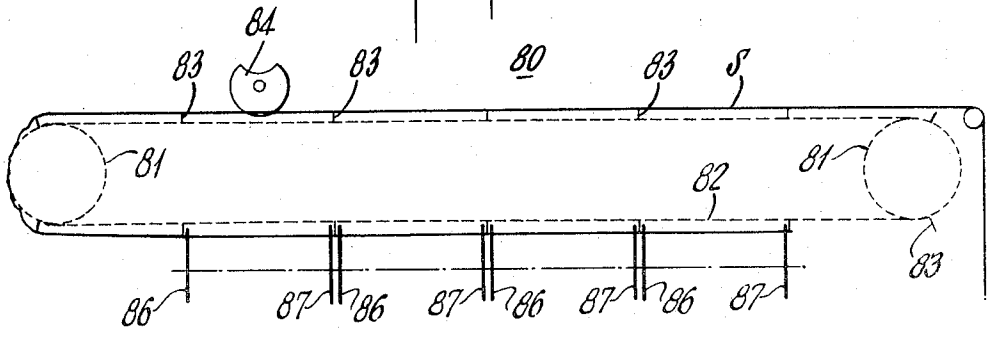


Fig. 9.



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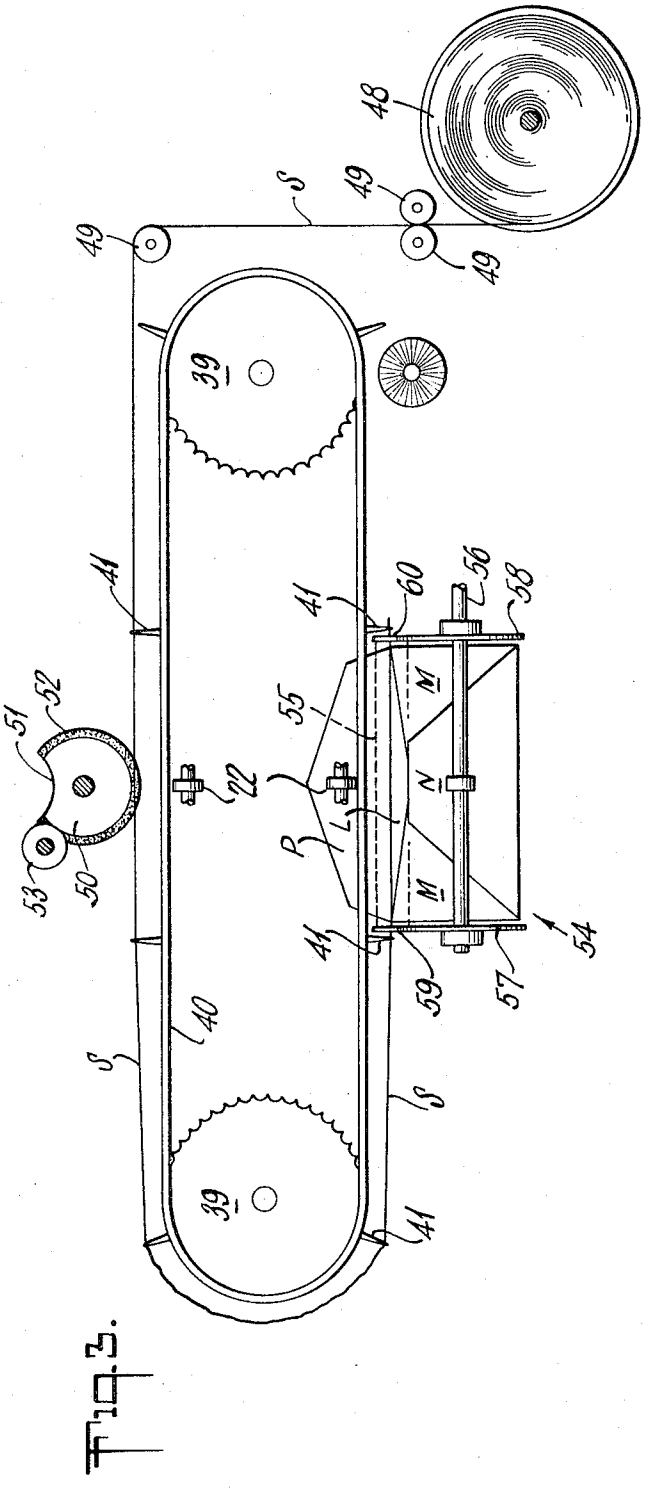

FIG. 3.

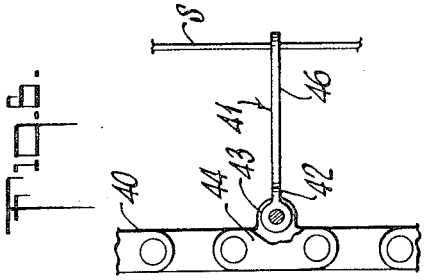

FIG. 6.

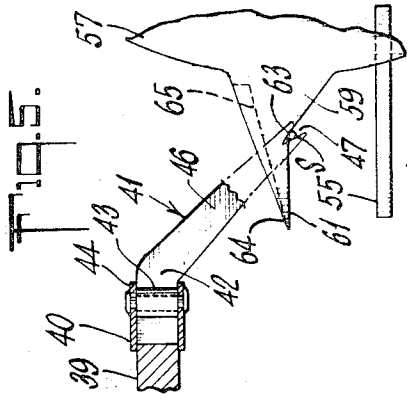

FIG. 5.

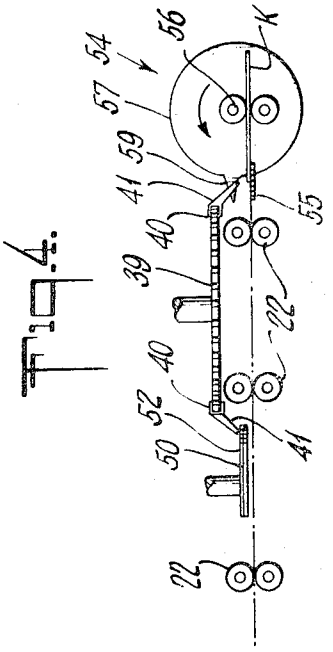

FIG. 4.

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MACHINE FOR PRODUCING SELF-OPENING ENVELOPES

REFERENCE TO RELATED APPLICATIONS

The present patent application is a continuation-in-part of patent application Ser. No. 873,939 filed Nov. 4, 1969, and now abandoned.

BACKGROUND OF THE INVENTION

The present invention relates generally to improvements in envelope processing machines and it relates particularly to an improved machine for the production of self-opening envelopes.

Envelopes are conventionally produced by successively advancing from a stack thereof precut envelope blanks and successively forming score lines delineating the bottom, side and closure flaps from the envelope front panel, applying adhesive to the inside outer border of the closure flap, drying the adhesive, inwardly folding the side flaps, applying adhesive to the exposed inner borders of the side flaps, folding the bottom flap to overlie the side flaps and adhere thereto, and then closing the closure flaps and stacking the finished envelopes. Where the envelopes are to be of the self-opening type provided with tear strips, the application of the tear strips is conventionally a separate operation in which the envelopes are longitudinally advanced, the closure flaps opened, the tear strips applied longitudinally and adhered to the open envelopes along the closure flap fold line and the envelopes closed and stacked. The conventional and heretofore proposed procedures and equipment for producing self-opening envelopes possess numerous drawbacks and disadvantages. The self-opening envelopes are considerably more expensive to produce than conventional envelopes and are frequently lacking in uniformity and quality. Moreover, the equipment employed is additionally expensive and highly space consuming and the procedures highly labor consuming so that the conventional equipment leaves much to be desired.

SUMMARY OF THE INVENTION

It is a principal object of the present invention to provide an improved machine for producing envelopes.

Another object of the present invention is to provide an improved machine for producing self-opening envelopes.

Still another object of the present invention is to provide an improved mechanism for applying tear strips to envelopes.

A further object of the present invention is to provide a machine of the above nature characterized by its efficiency, reliability, ruggedness, low cost of operation and high versatility and adaptability.

The above and other objects of the present invention will become apparent from a reading of the following description taken in conjunction with the accompanying drawings, which illustrate preferred embodiments thereof.

In a sense the present invention contemplates the provision of a machine for producing self-opening envelopes comprising means for feeding and longitudinally advancing precut envelope blanks in longitudinally spaced relationship along a predetermined path, the blanks including a front panel transversely spaced side flaps and longitudinally spaced bottom and closure flaps, means for applying score lines to successive blanks delineating the flaps from said front panel, means for folding the bottom and side flaps into border overlapping relationship and applying an adhesive to the confronting faces of said borders, means for advancing a tear strip transversely across and above the envelope path, means for depressing and severing a predetermined length of tear strip into engagement with an underlying envelope proximate the line delineating the front panel from the closure flap, and means for applying an adhesive to the inside outer border of the closure flap.

The mechanism for applying the tear strips to successive envelopes advantageously includes an endless chain supported and advanced across and over the path of the envelopes and includes regularly spaced outwardly downwardly inclined fingers terminating in notched ends for releasably engaging the continuous tear strip and conveying it across the envelope path. Transversely spaced transfer arms, one of which includes a cutting blade, are synchronized with the tear strip transport and the envelope feed for cutting the tear strip and transferring it to an underlying envelope. A mechanism applies adhesive to the tear strip along discontinuous lengths so as to leave the tear strip ends as applied to the envelopes free of adhesive.

The improved machine produces self-opening envelopes in a continuous procedure without the necessity of separate handling in the production of the envelopes and the application of the tear strips and is efficient, rugged, reliable and highly versatile.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a front elevational view of a machine embodying the present invention for the production of self-opening envelopes;

FIG. 2 is a top plan view of envelopes in successive stages of formation and tear strip application by the improved machine;

FIG. 3 is a top plan view of the tear strip applying mechanism.

FIG. 4 is a front elevational view thereof;

FIG. 5 is an enlarged fragmentary front elevational view of the transfer section of the tear strip applicator;

FIG. 6 is a top plan view thereof;

FIG. 7 is a fragmentary end view of the tear strip adhesive applicator;

FIG. 8 is a fragmentary top plan view of the drier feed end; and

FIG. 9 is a schematic top plan view of the applicator section of a multiple line machine embodying the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring now to the drawings, and particularly FIG. 1 to 8 thereof which illustrate a preferred embodiment of the present invention, the reference numeral 10 generally designates the improved machine as applied to the production of finished conventional envelopes provided with tear strips. Except for the tear strip applying section and the relationships of the various sections and their sequence, the individual mechanisms and conveying systems are of conventional and known construction and operation. The machine 10 includes in successive arrangement an envelope blank feed section 11, a blank scoring section 12, a side flap folding section 13, a side flap adhesive applying section 14, a bottom flap

folding section 16, a tear strip applying section 17, a closure flap adhesive applying section 18, a dryer section 19, a closure flap closing section 20, and a stacking section 21. The various mechanisms and conveyors are driven in synchronism and in proper relationship by a drive motor and transmissions, not shown, in the known manner. The envelopes, during their formation are advanced between successive sections along a longitudinally extending path by a plurality of longitudinally spaced positively driven friction roller pairs 22.

The blank feed section 11 includes an inclined open ended magazine 23 supporting a stack S of envelope blanks K and a driven transfer arm 24 picks up successive individual envelope blanks K from stack S and delivers them in closely longitudinally spaced relationship with their widths perpendicular to the direction of feed to the bite of a pair of driven feed rolls 26 which feeds the blanks K by way of feed rolls 22 to the scoring section 12. The scoring section 12 includes a pair of driven scoring rolls 27 of known construction which impresses fold or score lines in the envelope blank which divide the blank K into a rectangular front panel L, side flaps M, bottom flaps N and closure flap P. The score lines include transversely spaced longitudinal lines *a* which delineate side flaps M from front panel L, leading transverse line *b* which delineates bottom flap N from front panel L and transverse line *c* which delineates closure flap P from front panel L. The line *c* is advantageously a line of weakness or perforations and scoring rolls 27 are accordingly constructed to produce such line of weakness *c*.

The scored blanks K are advanced through folding station 13 which include side folding former members 28 of conventional configuration, the members 28 engaging the side flaps M of the advancing envelope and folding them, inwardly along score lines *a* into overlying superimposition on the upper or inner face of front panel L. The adhesive applying station 14 includes an open topped tank 29 containing a suitable liquid adhesive in which a first adhesive transfer roll 30 is immersed. The transfer roll 30 engages a second driven transfer roll 32 which in turn engages a third adhesive transfer roll 33. A driven adhesive applicator roll 34 is positioned above the envelope path and a pressure roll 36 is positioned below the envelope path. The applicator roll 34 has a pair of helical adhesive applicator elements 37 along its face so positioned that as an envelope passes between rolls 34 and 36, liquid adhesive, transferred by rolls 30, 32 and 33, is applied as bands 38 by applicator elements 37 to the outside lower borders of the folded flaps M in the known manner. Thereafter the envelopes advance through flap folding section 16 of conventional construction where the bottom flap N is folded inwardly to overlie front panel L and the adhesive carrying borders of side flaps M and the envelopes are then advanced with their closure flaps open through the tear strip applying section 17.

The tear strip applying section 17 includes a pair of transversely spaced coplanar horizontal sprocket wheels 39 located above and on opposite sides of the envelope path and a sprocket chain 40 extends between sprocket wheels 39 and is driven along a trailing transverse run from right to left and a leading transverse run from left to right as viewed in FIG. 3. A plurality of tear strip conveying fingers 41 are regularly positioned along the sprocket chain 40 and are spaced from each other, a distance somewhat greater than the width of an envelope K. The fingers 41 are advantageously formed of thin resilient metal so as to be transversely flexible and each finger 41 includes an upper horizontal section terminating in a vertical knuckle 43 which is rigidly secured to a respective bracket link 44 on sprocket chain 40 so as to prevent rotation of the finger on the bracket. Integrally formed with finger section 42 and depending therefrom is a downwardly outwardly inclined outwardly tapered finger section 46 which terminates in a downwardly outwardly directed triangular notch 47 adopted to releasably engage the tear strip material. A roll 48 of any suitable tear strip S such as string, strip, or the like is suitably rotatably supported and the strip S is led by guide rolls 49 into engagement with the finger notches 47 as they enter the trailing run so that the advancing fingers draw the tear strip from the roll 48 and advance it along the run of the conveyor fingers.

Disposed medially and rearwardly and below the level of the rear run of the finger conveyed tear strip S is a horizontal adhesive applying wheel 50 having a notch 51 in the perimeter thereof and provided on the border of its top face with a raised adhesive applicator member 52 of known composition which engages the underfaces of the successive tear strip S. A horizontal adhesive transfer wheel 53 engages the top face of applicator member 52 and receives liquid adhesive from a source thereof in a known manner and meters it to the applicator member 52.

A tear strip severing and transfer mechanism 54 is medially positioned proximate the conveyor finger front run and includes a transverse horizontal shaft 56 positioned above the path of envelopes K. A pair of transversely spaced flat thin transfer wheels 57 and 58 are mounted on shaft 56. The distance between wheels 57 and 58 is less than that between successive fingers 41 and their confronting faces are disposed proximate the paths of the side edges of advancing envelopes K and a narrow horizontal plate 55 of lesser length than the envelope width underlies the envelope path below the rear and inwardly of wheels 57 and 58. Each of the wheels 57 and 58 is provided with a respective radially projecting transfer finger 59 and 60, the fingers 59 and 60 being parallel and of similar outer configuration. Each of the transfer fingers 59 and 60 has an angular leading edge 61 provided with an apex 63 which engages the conveyor finger carried tear strip when the apex 63 is at the level of the tear strip the short section 64 projecting beyond apex 63 being of narrow triangular configuration.

The bottom edge 61 of transfer finger 60 is blunt and the bottom edge of finger 59 is a sharp edge and defines a strip severing blade. An inwardly directed transfer shoulder 65 is formed on the inner face of finger 59 above apex 63 and the bottom cutting edge.

The sprocket wheels 39, adhesive applicator wheel 50 and strip transfer wheels 59 and 60 are driven in any suitable manner, in synchronism with the advance of the envelopes so that as the envelope score line *c* approaches to a position below tear strip S along its forward run a pair of strip carrying successive conveyor fingers 41 are positioned symmetrically to the underlying envelope K and the transfer fingers 59 engage the tear strip S. When the finger apices 63 advance to the level of the underlying envelope K the score line *c* and the apices 63 are in transverse alignment. The applicator wheel 50 is so dimensioned and driven that as suc-

cessive fingers 41 pass the applicator wheel 50 they register with notch 51 so that adhesive is not applied to tear strip S at those sections proximate the fingers 41.

The tear strip carrying envelope K is advanced from the tear strip applying station 17 to the closure flap adhesive applying station 18 which includes a transverse applicator roll provided with helical adhesive applicator members 67. Liquid adhesive is transferred to the adhesive applicator members 67 from an adhesive reservoir 68 by a series of driven surface engaging adhesive transfer rolls 69 in the known manner. Following the adhesive applying section 18 the envelopes are fed to the drying section 19.

The drying section 19 includes a pair of longitudinally spaced driven drums 70 which support and advance an endless belt 71 along a top return run 72 and a bottom horizontal forward run 73. The belt 71 is lowered along its return run by a pair of idler rolls 74 and joins the belt at the drums 70 by inclined runs. A pair of transversely spaced endless narrow friction bands 76 extend along the borders of the outer face of belt 71 from the top of leading drum 70 downwardly and along belt run 73 and upwardly to the top of trailing drum 70. The bands 76 are engaged by peripheral grooves in pairs of transversely spaced idler wheels 77 which are spaced along the borders of belt 71 and include an inner run 78 where the bands are urged into engagement with the borders of belt 71 and advance with the belt 71 from the top of leading drum 71 downwardly, along belt run 73, and then to the top of trailing drum 70 and thence around the outer peripheries of trailing wheels 77 back along the outer peripheries of intermediate wheels 77 and then about leading wheels 77 in a bite with belt 71 and then to forward inner run 78. A suitable adhesive heating and drying device 79 confronts the belt 71 along the length of its bottom run 73.

Upon the discharge of the finished envelopes K from the discharge end of drier section 19 at the top of trailing drum 70 they emerge from the bite between belt 71 and bands 76 and are advanced successively through the folding section 20 which is of conventional construction and closes the envelope closure flaps P and the stacking section 21 wherein the closed finished envelopes are stacked in the known manner.

The successive stages in the production of the self-opening envelope as shown in FIG. 2 and their formation is clear from the above. In stage A the envelope blank is in a precut unscored condition and is stacked in section 11 from which it is fed to section 12 wherein it is scored to form the stage B, scored blank, and the side flaps M are then folded inwardly in section 13 to form the envelope stage C. Bands of adhesive are applied to the side flap borders in section 14 to form the stage D and in section 16 bottom flap N is folded back to result in the stage E envelope to which the adhesive carrying severed tear strip is applied in section 17, as described above to form the stage F envelope. Adhesive is then applied, in section 18, to the closure flap resulting in the stage G envelope which passes through the heater section 19 to dry the adhesives and the dried envelop has its closure flap folded in section 20 to form the closed finished envelope, stage H, which is then stacked in section 21.

The embodiment of the present invention illustrated in FIG. 9 of the drawing is similar to that first described except that a plurality of lines of envelopes, for example four lines, are advanced and produced side by side and a corresponding number of side by side envelope forming sections are provided. However, a single tear strip applying section 80 is provided of greater length than the section 17 earlier described. The section 80 includes a pair of transversely spaced sprocket wheels 81 which drives a sprocket chain 82 over and across the envelope path. The chain 82 supports regularly spaced conveyor fingers 83 similar to fingers 41, and an adhesive applicator wheel 84, similar in structure to applicator wheel 50, applies adhesive to the strip S. Instead of one pair of transfer wheels, the section 80 is provided with four transversely spaced pairs of transfer wheels 86 and 87 similar in structure and relationship to transfer wheels 57 and 58 respectively. The section 80 operates in the same manner as section 17 except that it severs and transfers four tear strips to underlying envelopes each cycle.

While there have been described and illustrated preferred embodiments of the present invention, it is apparent that numerous alterations, omissions and additions may be made without departing from the spirit thereof.

What is claimed is:

1. A machine for producing self-opening envelopes comprising means for feeding and longitudinally advancing precut envelope blanks in longitudinally spaced relationship along a predetermined path, said blanks including a front panel transversely spaced side flaps and longitudinally spaced bottom and closure flaps, means for folding said bottom and side flaps into border overlapping relationship and applying an adhesive to the confronting faces of said borders, means for advancing a tear strip transversely across and above said path, and including an endless conveyor having a horizontal transverse run across and over said predetermined path, a plurality of regularly spaced downwardly directed fingers mounted on said endless conveyor and provided with grip elements for releasably engaging said tear strip, and means for guiding a continuous length of tear strip from a source thereof into engagement with successive grip elements, means for severing and depressing a predetermined length of said tear strip into engagement with an underlying envelope proximate a line delineating said front panel from said closure flap and means for applying an adhesive to the inside outer border of said closure flap.

2. The machine of claim 1 including means for applying score line delineating said front panel and said closure flap.

3. The machine of claim 1 including means for drying said adhesive on said closure flap, and means for closing said closure flap following said drying.

4. The machine of claim 1 including means for applying adhesive to said tear strip prior to application thereof to an envelope.

5. The machine of claim 1 wherein said grip elements are defined by the free ends of said fingers, said finger free ends having notches formed therein with upwardly converging opposite edges.

6. The machine of claim 1 wherein said tear strip depressing means comprises a pair of elements transversely spaced approximately the distance between successive fingers and movable between raised and depressed positions above and below the level of said predetermined path.

7. The machine of claim 1 wherein one of said depressing elements includes a severing blade.

8. The machine of claim 1 including means for applying adhesive to said tear strip between successive fingers for less than the length thereof between said fingers.

9. An apparatus for applying tear strips to envelopes comprising means for longitudinally advancing along a predetermined path envelope bodies having front panels and open closure flaps delineated by transversely extending lines, means for advancing a tear strip transversely across and over said path, and including an endless conveyor having a horizontal transverse run across and over said predetermined path, a plurality of regularly spaced downwardly directed fingers mounted on said endless conveyor and provided with grip elements for releasably engaging said tear strip, and means for guiding a continuous length of tear strip from a source thereof into engagement with successive grip elements, and means for severing and transferring a predetermined length of said tear strip from said tear strip advancing means into engagement with an underlying envelope body parallel to and proximate by a respective panel closure flap delineating line.

10. The apparatus of claim 9 wherein said envelope body advancing means advances a plurality of transversely spaced side by side envelopes, and said severing and transferring means simultaneously severs and transfers a plurality of tear strips to underlying side by side envelope bodies.

* * * * *