# United States Patent [19]

**Manolis**

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[54] **MACHINE FOR PRODUCING SELF-OPENING ENVELOPES**


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[52] **U.S. Cl.** ..... **93/76,** 93/1 TS
[51] **Int. Cl.** ..... **B31b 1/90**
[58] **Field of Search** ..... 93/76, 1 TS, 61 R



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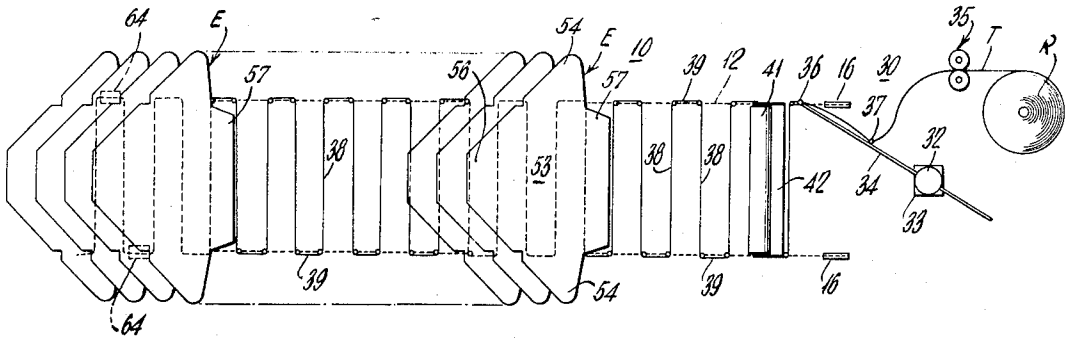
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[57] **ABSTRACT**

A machine for producing self-opening envelopes includes a pair of laterally spaced sprocket chains transporting along a longitudinal path regularly spaced pairs of laterally spaced studs and an arm with a strip guide at an end thereof is oscillated to opposite sides of the advancing stud pairs and withdraws tear strip from a roll and interlaces the studs so that successive transverse tear strip sections which are interconnected at alternate ends are applied to the advancing studs by the guide. Adhesive is applied to the transverse tear strip sections and overlapping precut envelope blanks are superimposed on the advancing transverse tear strip sections with the flap, front panel delineating lines coinciding with the tear strip sections and the longitudinal tear strip sections are severed between their ends.


**12 Claims, 8 Drawing Figures**



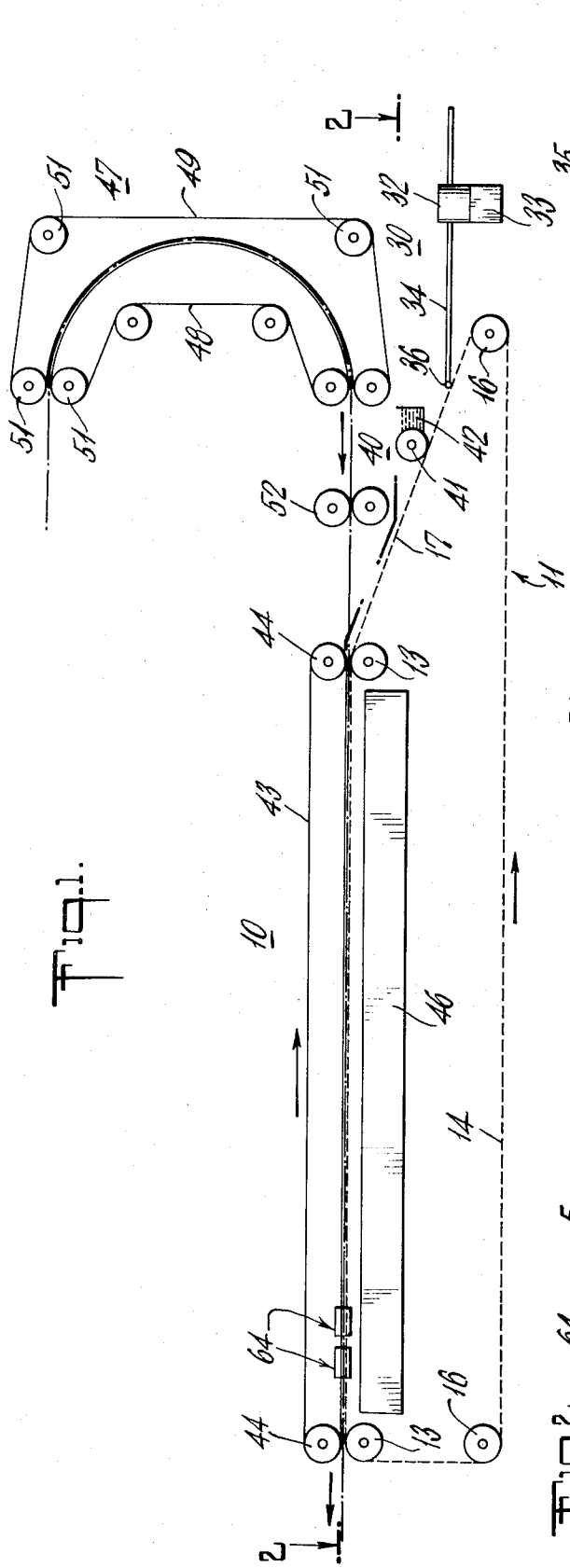


Fig. 1.

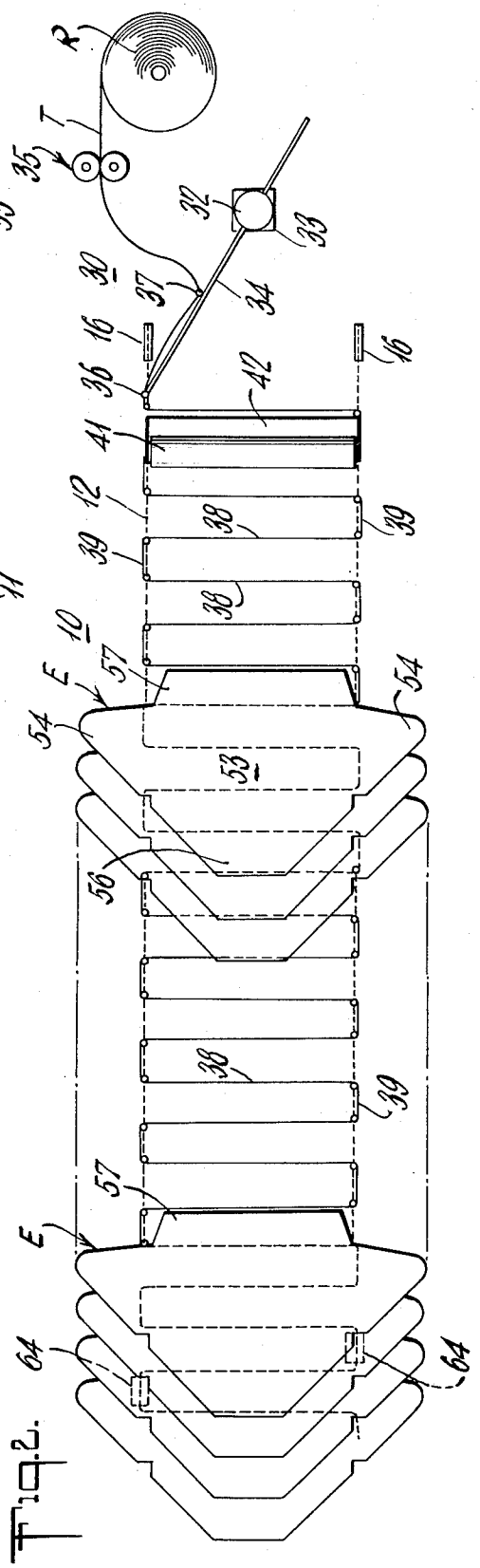


Fig. 2.

Fig. 3.

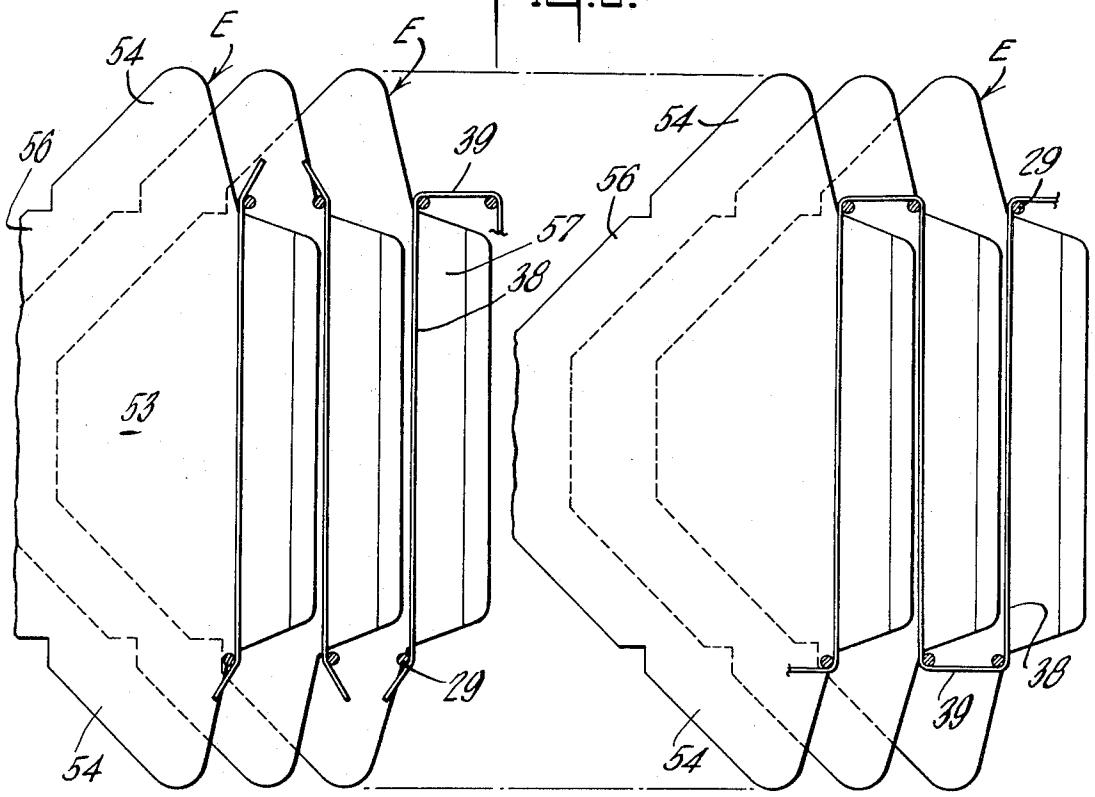



Fig. 4.

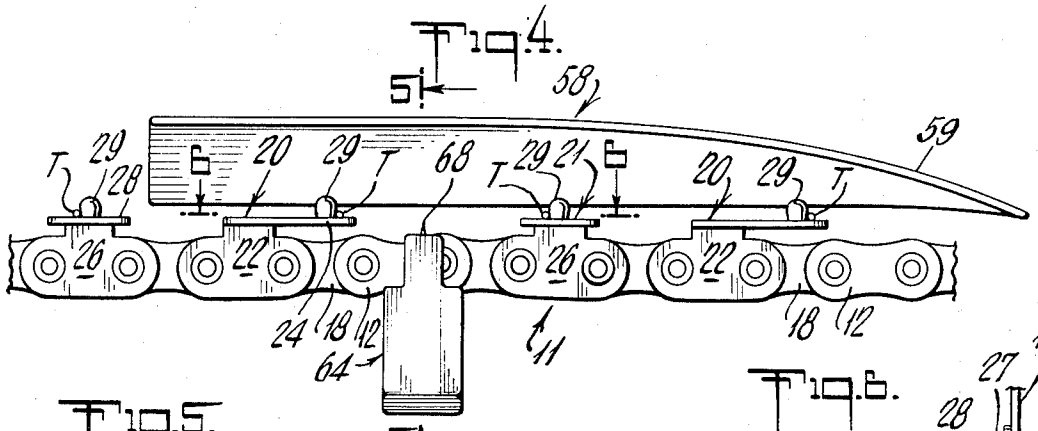



Fig. 5.

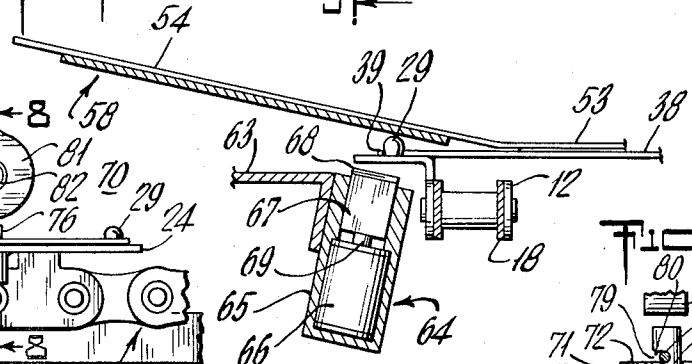



Fig. 6.

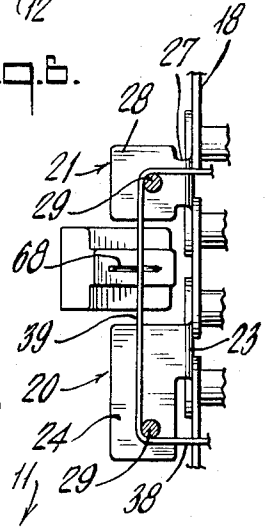



Fig. 7.

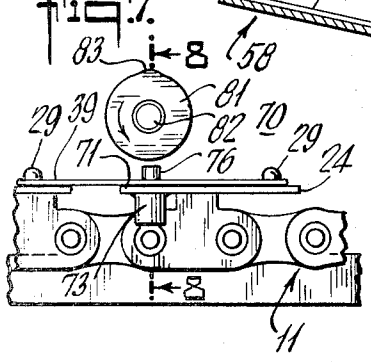
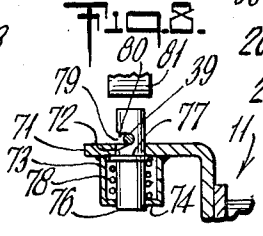



Fig. 8.



# MACHINE FOR PRODUCING SELF-OPENING ENVELOPES

## 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 a preferred embodiment thereof.

In a sense the present invention contemplates the provision of an improved machine for producing self-opening envelopes which comprises a plurality of longitudinally spaced pairs of transversely spaced studs, means for advancing the studs along a longitudinal path, means for applying a continuous tear strip to the advancing studs to interlace the studs with the tear strip extending transversely between the studs of each successive pair of studs and longitudinally between successive longitudinally spaced studs alternately along opposite sides of the longitudinal path, means for superimposing successive envelope members on the stud advanced tear strip with the lines delineating the envelope closure flap from the envelope body coinciding with successive transverse tear strip sections and means for securing the tear strip sections to the envelopes.

In the preferred form of the improved apparatus a pair of laterally spaced sprocket chains support the opposite studs and advance them along longitudinal upper runs extending upwardly and forwardly along the trailing ends of the runs and then horizontally. An arm provided with a thread guide at its free end is periodically oscillated with the advance of the studs to draw tear strip through the thread guide from a roll of the tear strip to apply it to the studs along the rear face of one stud, around the front face of the opposite stud, around the rear face of the next successive stud and around the front face of the opposite stud, continuously repeating the cycle. The lay flat precut envelope blanks are superimposed on the advancing tear strip with the lines delineating the envelope closure flaps and front panels coinciding with the transverse tear strip sections to which adhesive has been earlier applied. The tear strip superimposed overlapping envelopes are advanced under the pressure of an overlying driven endless belt and the tear strip is subjected to warm air to dry the adhesive. Before the discharge of the envelope blanks the tear strips between successive studs are severed by a synchronized blade.

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 adaptable and versatile.

## BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a side elevational view of a tear strip applying machine embodying the present invention;

FIG. **2** is a view taken along line **2** — **2** in FIG. **1**;

FIG. **3** is a fragmentary enlarged bottom plan view of a section thereof;

FIG. **4** is an enlarged fragmentary side elevational view of a section thereof;

FIG. **5** is a sectional view taken along line **5** — **5** in FIG. **4**;

FIG. **6** is a sectional view taken along line **6** — **6** in FIG. **4**;

FIG. **7** is a fragmentary side elevational view of the cutting mechanism in accordance with another embodiment of the present invention; and

FIG. **8** is a sectional view taken along line **8** — **8** in FIG. **7**.

## DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring now to the drawings, particularly FIGS. **1** to **6** thereof which illustrate a preferred embodiment of the present invention, the reference numeral **10** generally designates the improved tear strip applying mechanism which comprises a pair of transversely spaced sprocket chains **11** which are parallel and transverse similarly shaped paths lying in vertical planes. Each sprocket chain **11** extends in an advancing horizontal upper run **12** about longitudinally spaced upper sprocket wheels **13**, in a return run **14** about longitudinally spaced lower sprocket wheels **16**, and a forwardly upwardly inclined run **17** between the trailing ends of the upper and lower runs. At least one pair of laterally spaced sprocket wheels are positively driven to ad-

vance the sprocket chains 11 forwardly along their upper runs.

Each sprocket chain 11 is of conventional construction including pin connected successive links 18. Alternate links 18 are provided with brackets 20 and 21 respectively. Each bracket 20 includes an upwardly projecting medial leg 22 coplanar with the corresponding outer link section and joining an outwardly directed horizontal leg 23 terminating in a rearwardly projecting outwardly disposed horizontal arm 24. Each bracket 21 likewise includes an upwardly projecting medial leg 26 coplanar with a corresponding outer link section and joining an outwardly directed horizontal leg 27 terminating in an outwardly projecting horizontal arm 28. Projecting vertically upwardly from the arms 24 and 28 and located outwardly of the sprocket chains 11 are short rounded fingers or studs 29. The studs 29 carried by each sprocket chain 11 along its upper run 12 are longitudinally aligned and upwardly directed and the studs 29 on the laterally spaced sprocket chains form regularly longitudinally spaced pairs of transversely spaced studs 29.

Disposed behind the lower section of the sprocket chain inclined run 17 is a mechanism 30 for applying a tear strip T of any suitable type to the advancing studs 29 in an interlaced zigzag pattern. The mechanism 30 includes a hub 32 positioned rearwardly of and transversely between and above the rear bottom sprocket wheels 16 and oscillated or rocked about its vertical axis by a suitable drive motor and motion transducer 33 which is synchronized with the sprocket wheel drive in any suitable manner. An arm 34 projects forwardly of and is oscillatable with hub 32 and is of such length as to swing between points shortly outside the paths of studs 29 along run 17.

A strip or thread guide or eye 36 is supported by the free end of arm 34 and a second guide 37 is mounted in arm 34 inwardly of its free end. The tear strip T is drawn from a suitably mounted spool R thereof by way of the bite between a pair of feed or guide rolls 35 and thence successively through guides 37 and 36 to the take-up studs 29. The arm 34 is so oriented and disposed and swung from one side to the opposite side of the horizontal run of the stud pairs in synchronism with the continuously advancing studs that when it is outside and forward of one of the studs 29 the stud 29 and the next successive trailing stud 29 advance forwardly of the guide 36 and then swings to its opposite side along a path forwardly of the stud which is transversely spaced from the aforesaid trailing stud. Any suitable mechanism, not shown, is provided for extending the arm 34 momentarily as it intersects the paths of the studs 29 approaching the end of its swing so as to transport the tear strip T forwardly of the stud paired with the trailing stud about the rear of which the tear strip T was carried. The above cycle is repeated with each swing of the arm 34 so that the tear strip T interlaces the advancing studs 29 in the pattern shown in FIG. 2 and 3 of the drawings, extending transversely from around the rear face of one stud 29 to about the front face of an opposite stud 29 to form a transverse tear strip section 38 and thence rearwardly around the rear face of the next successive stud 29 to form a longitudinal tear strip section 39 and the above pattern unit is repeated back and forth to provide successive parallel transverse tear strip sections 38 and longitudinal tear strip section 39 which extend alternately between the opposite longitudinal sets of studs 29.

Forward of the tear strip lacing mechanism 30 and along and above inclined run 17 between chains 11 is an adhesive applying device 40 of any suitable construction. The device 41 includes a transverse adhesive applying or transfer roll 41 which communicates with a liquid adhesive fountain or tank 42 and has an underface along which the transverse tear strip sections 38 are conveyed to receive liquid adhesive over a major part of the length of each tear strip section 38 between support studs 29.

An endless belt 43 of a width slightly less than the transverse distance between studs 29 is supported by end rollers 44 and includes a bottom run which traverses a path overlying the advancing transverse tear strip sections 38. At least one of the end rollers 44 is positively rotated to advance the belt 43 along its bottom run at the same velocity and in the same direction as tear strip sections 38. A heating device 46 of any suitable type underlies the tear strip sections 38 and extends for substantially the full upper run thereof and directs heat toward the plane of tear strip sections 38.

Trailing the rear rollers 44 and rear sprocket wheels 13 is an envelope blank feed device which comprises a pair of driven endless belts 48 and 49 which are supported, driven and guided by horizontal rollers 51. The belts 48 and 49 have juxtapositioned confronting advance runs which are curved about a horizontal transverse axis and have forwardly direct upper inlet and lower discharge bites formed by the corresponding rollers 51. Belts 48 and 49 are driven to advance at a slightly slower speed than the sprocket chains 11, the bottom discharge bite thereof being directed toward the bite between the lower run of belt 43 and the advancing tear strip sections 38, a pair of feed rollers 52 being disposed between the aforesaid bites and being driven at the same peripheral speed as sprocket chains 11. A conventional feed mechanism delivers successive lay flat open envelope blanks E to the inlet bite of belts 48 and 49 at a slightly slower rate of advance of the pairs of studs 29.

The envelope blanks E are of conventional construction and each includes a rectangular front panel 53, laterally projecting triangular wings 54, a depending trapezoidal wing 56 and a trapezoidal closure flap 57 which may be delineated from front panel 53 by a score line. Score or fold lines may be provided to delineate the panel and wings from each other.

Disposed along the outside of each of the sprocket chain upper runs 12 proximate their leading ends are side wing deflecting guide plates 58 which extend longitudinally and have upwardly forwardly inclined trailing sections 59 and horizontal leading sections 60. The rear edge of inclined section 59 is at about the level of and immediately outside the advancing arms 24 and 28 so as the envelope blanks E advance along the leading section of upper run 12 the side wings 54 are raised.

Supported by fixed brackets 63 below guide sections 60 and the path of bracket arms 24 and 28 are a pair of opposite strip severing devices 64. Each of the severing devices 64 includes an open topped case 65 which houses an inclined solenoid 66. An armature 69 is actuated by solenoid 66 and has a suitable guide blade 67 affixed to its upper end, the blade having a sharply honed edge 68. The armature and blade are downwardly spring biased to bring the blade edge 68 to a re-

tracted position below the level of arms **24** and **28** and in alignment with the advancing strip sections **39** and the solenoid **66** and armature **69** are so related that energization of solenoid **66** rapidly raises armature **69** and blade **67** to sever the registering strip section **39.** The solenoid **66** is energized with a single pulse when disposed between successive arms **24** and **28** by suitable synchronizing means to raise the blade **67** which severs the strip section **39.**

The operation of the improved apparatus is clear from the above description. As the studs **29** advance along run **17** they are interlaced with the tear strip T by the oscillating arm **34** in the manner earlier explained so that a transverse strip section **38** extends between each pair of studs **29** and is connected at its opposite ends to successive transverse sections **38** by longitudinal strip sections **39.** Adhesive is applied to the advancing sections by applicator roller **41.** The envelope blanks E are delivered by the feed device **49** between belt **43** and strip sections **38** is overlapping relationship, with the lines delineating the closure flaps **57** from the front panels **53** being exposed and coinciding with respective strip sections **38.** With the advance of the envelopes, the adhesive sets to secure strip sections **38** to respective envelope blanks. Thereafter, side wings **54** are raised by guide plates **58** and the longitudinal strip sections **39** are cut by the synchronously actuated blade **67.** The tear strip carrying blanks E are then discharged to conventional apparatus which finishes the folding and glueing of the envelopes in the known manner.

Referring now to FIGS. **7** and **8** of the drawings which illustrate another embodiment of the present invention which differs from that first described only in the mechanism for cutting the longitudinal strip sections **39.** Specifically, there is substituted for the severing devices **64** a cutting mechanism **70** associated with each pair of longitudinally spaced longitudinal strip supporting studs **29** and in other respects the machines are the same and like reference numerals will designate similar elements. In addition the horizontal bracket arms **24** includes a forwardly projecting coplanar leading section **71** which extends beyond the medial point between successive studs **29.**

An aperture **72** is formed in each arm section **71** and affixed to the underface of arm section **71** is a vertical cylindrical housing **73** having a bottom wall **74** with an aperture in vertical axial alignment with aperture **72.** A vertical plunger **76** slideably engages aperture **72** and the bottom wall aperture for axial movement therein and projects above and below arm section **71** and bottom wall **74.** A washer **77** is affixed to plunger **76** below arm section **71** and a helical compression spring **78** is entrapped between washer **77** and bottom wall **74** to bias the plunger **76** to its top position, as shown in FIG. **8.** Formed in the outer face of each plunger **76** is outwardly transversely facing recess **79** having a substantially horizontal blade defining upper edge **80** and a downwardly outwardly inclined bottom edge. In the spring raised position of the plunger **76** the blade edge **80** above the level of the top face of arm section **71** with inner corner of the converging edges of recess **79** being in substantial longitudinal alignment with the outer peripheries of studs **29.**

Disposed shortly above the transversely spaced paths of plunger **76** as they are transported along the sprocket chain upper runs proximate their leading ends are a pair of rotating circular cams **81** which are mounted on drive shafts **82.** Each cam **82** includes a circular face which is disposed above the path of the upper faces of plunger **76** and a raised portion **83,** which when in engagement with a plunger upper face lowers the plunger to depress the blade edge **80** below the top face of arm section **71** in a severing stroke against the bias of spring **74.** The rotation of cam **81** is synchronized in any suitable manner with the advance of sprocket chains so that cam section **83** is in its lowermost position when in vertical alignment with a plunger **76.**

The operation of the machine last described is similar to that first described except in the manner of cutting the strip longitudinal sections. As the advancing studs **29** are interlaced by the tear strip T in the manner described earlier, the longitudinal strip sections **39** are engaged at their intermediate points by respective plunger recesses **76.** When the plungers are advanced into registry with respective cams **81** they are depressed by the cams to effect the cutting the longitudinal strip sections by the blade edges **80.** Upon release by the cams the plungers are spring raised to their upper positions.

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. For example, the oscillating arm **34** may be replaced by a thread guide reciprocated along a suitable track to effect the desired interlacing of the studs **29.**

I claim:

**1.** A machine for producing self-opening envelopes comprising a plurality of longitudinally spaced pairs of transversely spaced studs, means for advancing said pairs of studs along a longitudinal path, neans for applying a continuous tear strip to said advancing studs to interlace said studs in a pattern with said tear strip extending transversely between the studs of each successive pair of studs and longitudinally between successive longitudinally spaced studs alternately along opposite sides of said longitudinal path, means for superimposing successive envelope members on said stud advanced tear strip, said envelope members having body panels and closure flaps, with the lines delineating said body panels and closure flaps extending proximate successive transversely extending tear strip sections conveyed by said studs, and means for securing said successive tear strip sections to successive envelope bodies.

**2.** The machine of claim **1** wherein said tear strip securing means comprises means for applying an adhesive to the stud advanced transversely extending tear strip sections prior to the superimposition of said envelope members thereon.

**3.** The machine of claim **1** including means for severing the sections of said tear stirp extending longitudinally between successive longitudinally spaced studs following the superimposition of said envelope members.

**4.** The machine of claim **1** including pressure means extending along the longitudinal path of said stud pairs for pressing together said envelope members and transversely extending tear strip section.

**5.** The machine of claim **4** wherein said pressure means comprises an endless belt having a longitudinal

run extending along said stud pair longitudinal path between the studs of succesive pairs of studs and means for advancing said belt in the direction of advance of said studs and at substantially the same speed.

**6.** The machine of claim **1** wherein said means for applying said tear strip to said advancing studs comprises a tear strip guide, a tear strip source, means for leading tear strip from said source to said guide and means for periodically reciprocating said strip guide between points transversely outwardly of the studs of each successive pair.

**7.** The machine of claim **6** wherein said strip guide traverses a path initially from a point rearwardly of one stud of a pair to a point forwardly of the other stud of the respective pair.

**8.** The machine of claim **7** wherein said strip guide reciprocating means comprises an arm, said strip guide being mounted proximate a free end of said arm and means for intermittently swinging said arm between points outside the opposite longitudinal paths of said studs with the advance of said studs an increment equal to the distance between successive pairs of studs.

**9.** The machine of claim **1** wherein said envelope members comprise lay flat precut envelope blanks, said body panels defining the envelope front walls and said blanks including laterally extending side flaps, the distance between the studs of each pair being approximately equal to said envelope front wall and said side flaps of said superimposed envelopes projecting laterally from the paths of said studs.

**10.** The machine of claim **9** comprising means including forwardly upwardly inclined guide plates extending along the outside of the paths of said studs for raising said side flaps with the advance of said envelope blanks, and means for severing the longitudinal extending sections of said tear strip between successive studs including transverse blades disposed below said stud paths and said guide plates and means for actuating said blades.

**11.** The machine of claim **3** wherein said severing means comprises normally open blade elements disposed between the longitudinally spaced studs of successive longitudinally spaced pairs thereof and advanced with said studs, and means for closing said blade elements to sever the corresponding tear strip sections extending longitudinally between successive longitudinally spaced studs following the superimposition of said envelope members.

**12.** The machine of claim **11** wherein said blade elements comprise plungers having side recesses formed therein provided with blade defining edges and engaging said longitudinally extending tear strip sections, spring means urging said plungers to a blade open position, and means for axially advancing said plunger to a blade closed strip severing position.

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