Dec. 4, 1956 V. E. HEYWOOD 2,772,611

ENVELOPE MAKING METHOD AND MECHANISM

Filed June 16, 1951 5 Sheets-Sheet 1

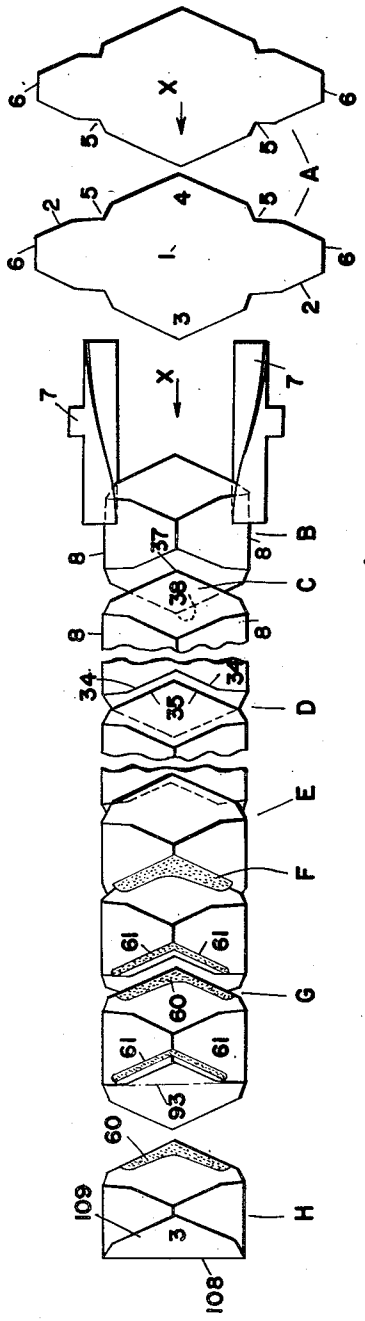


Fig. 1.

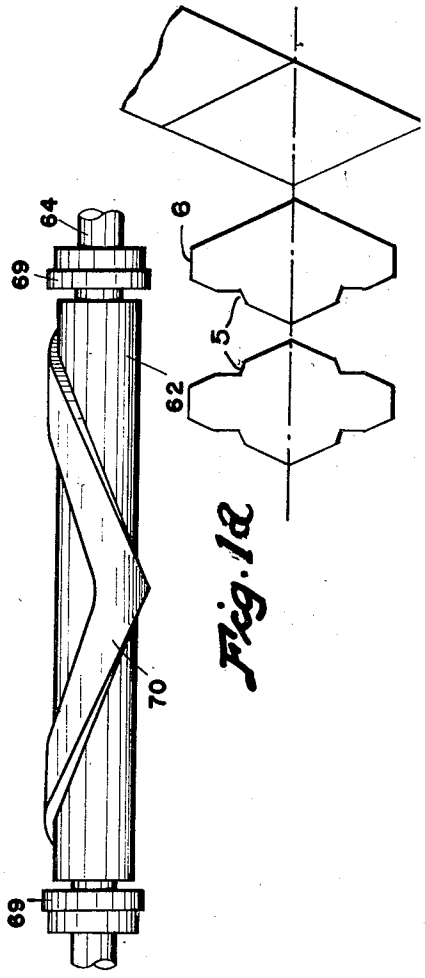


Fig. 1a

Fig. 6

INVENTOR
VINCENT E. HEYWOOD
BY Geo. H. Kennedy Jr.
ATTORNEY

Dec. 4, 1956 V. E. HEYWOOD 2,772,611

ENVELOPE MAKING METHOD AND MECHANISM

Filed June 16, 1951 5 Sheets-Sheet 2

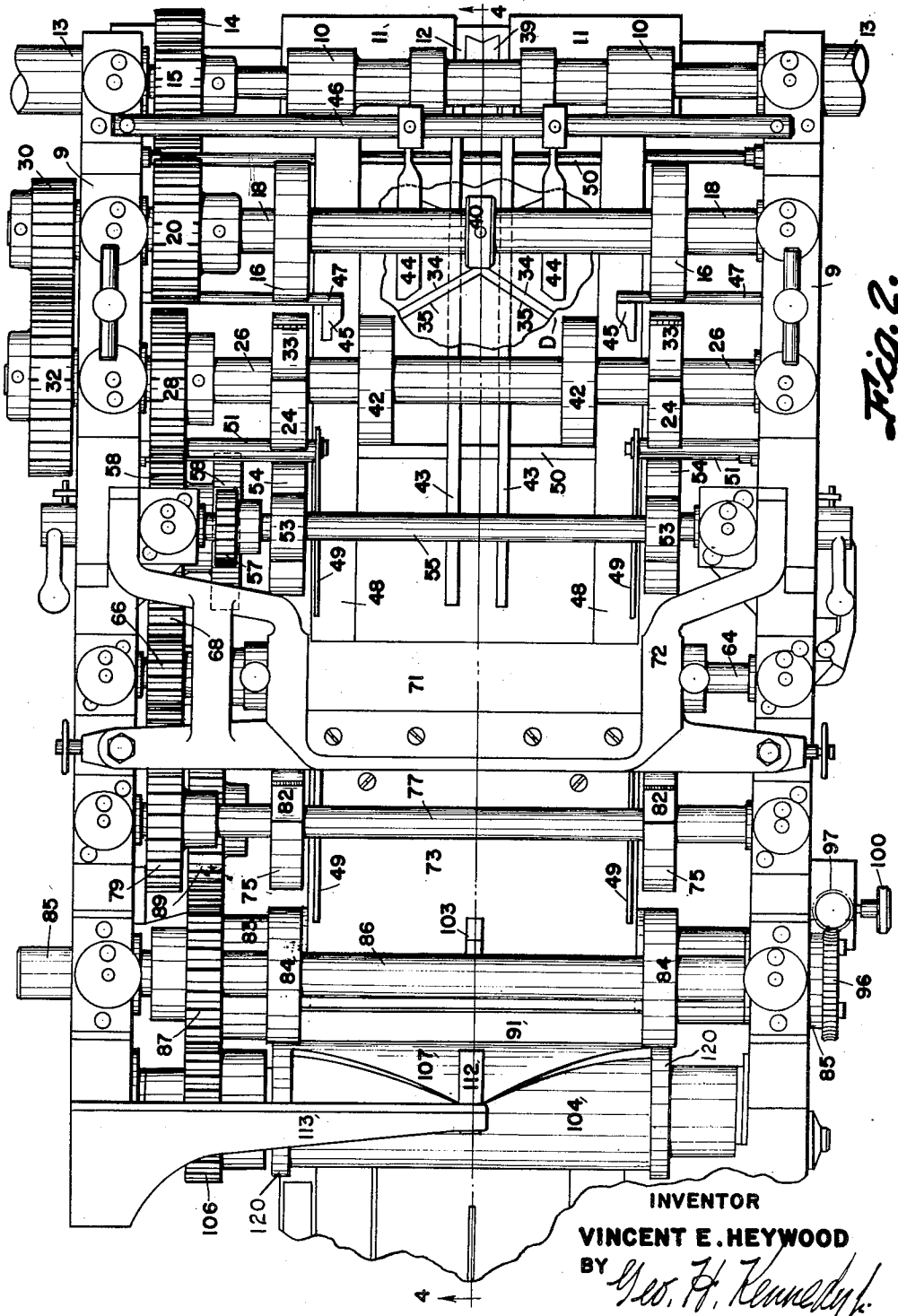


Fig. 2.

INVENTOR
VINCENT E. HEYWOOD
BY Geo. H. Kennedy Jr.
ATTORNEY

ENVELOPE MAKING METHOD AND MECHANISM

Filed June 16, 1951 5 Sheets-Sheet 3

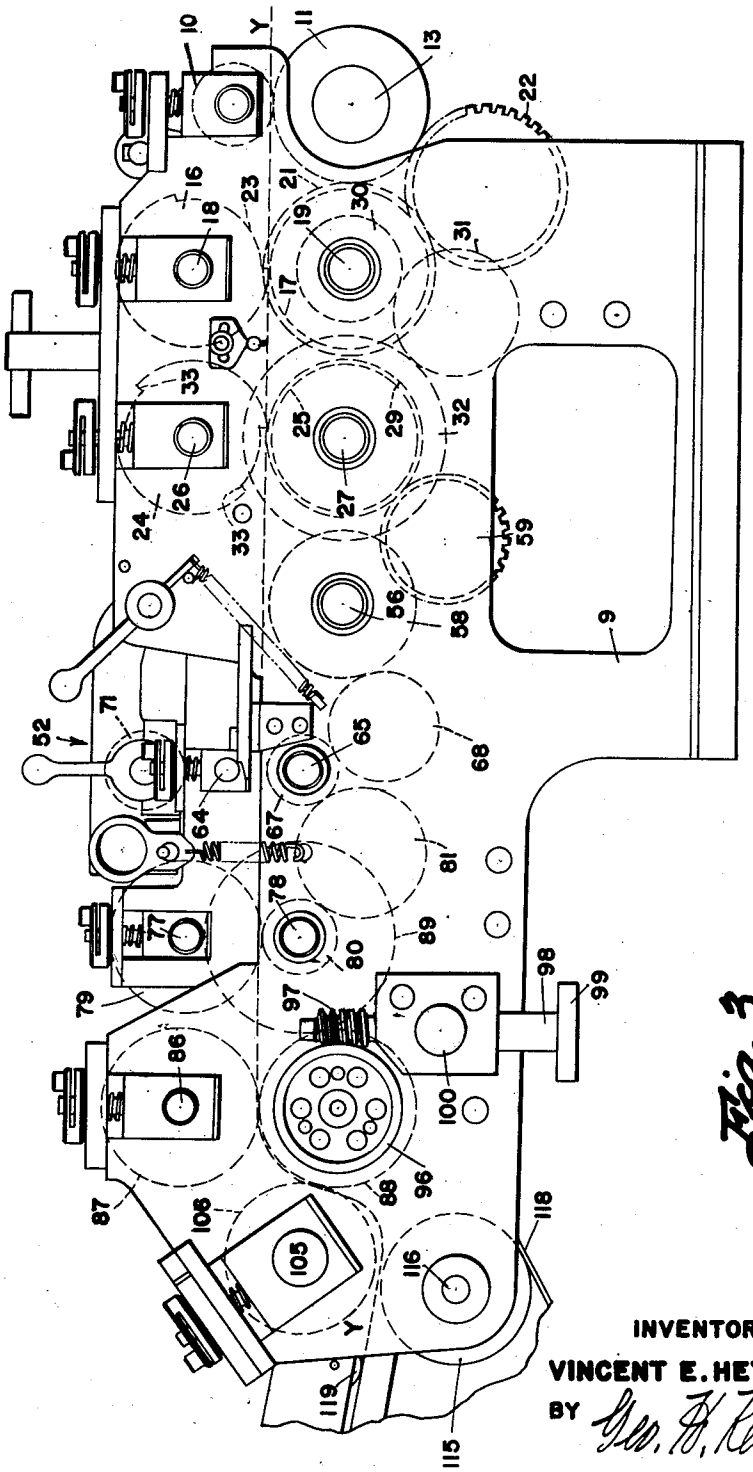


Fig. 3.

INVENTOR
VINCENT E. HEYWOOD
BY Geo. H. Kennedy Jr.
ATTORNEY

Dec. 4, 1956 V. E. HEYWOOD 2,772,611

ENVELOPE MAKING METHOD AND MECHANISM

Filed June 16, 1951 5 Sheets-Sheet 4

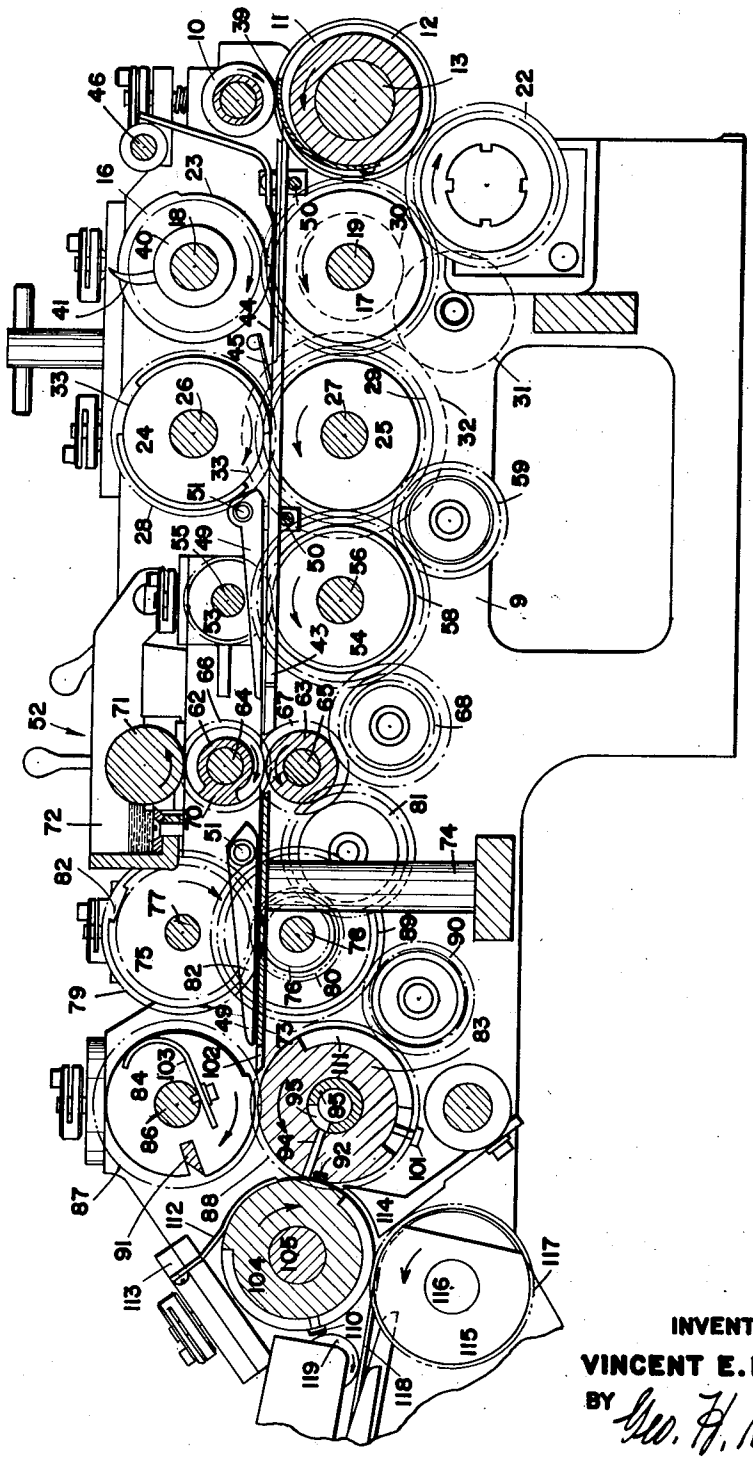


Fig. 4.

INVENTOR
VINCENT E. HEYWOOD
BY Geo. H. Kennedy Jr.
ATTORNEY

Dec. 4, 1956 V. E. HEYWOOD 2,772,611

ENVELOPE MAKING METHOD AND MECHANISM

Filed June 16, 1951 5 Sheets-Sheet 5

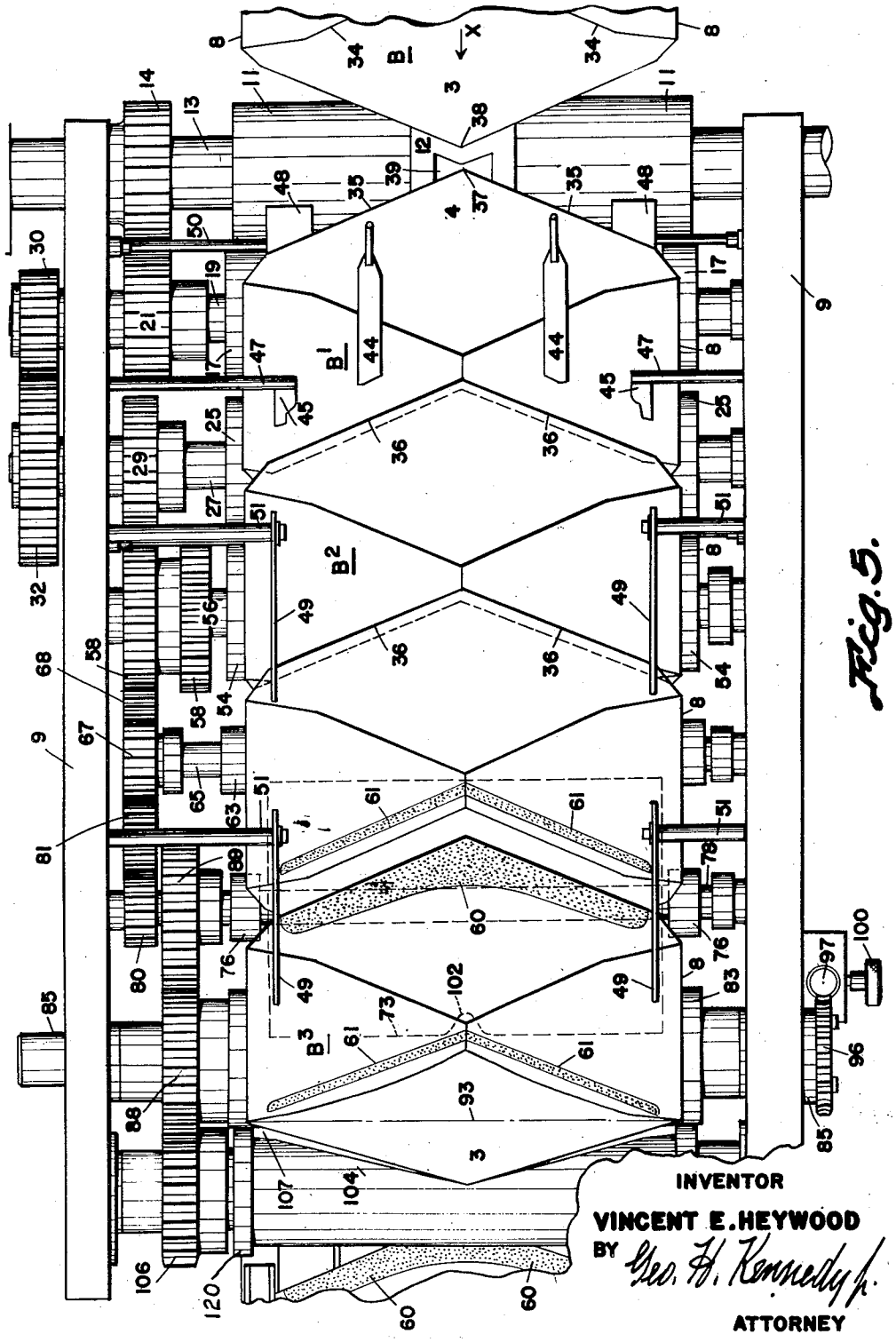


Fig. 5.

United States Patent Office

2,772,611

Patented Dec. 4, 1956

2,772,611

ENVELOPE MAKING METHOD AND MECHANISM

Vincent E. Heywood, Worcester, Mass., assignor to United States Envelope Company, Springfield, Mass., a corporation of Maine

Application June 16, 1951, Serial No. 231,950

49 Claims. (Cl. 93—62)

This application is a continuation-in-part of my copending application for Method of Manufacturing Envelopes, filed April 2, 1949 as Serial No. 85,133, which was allowed December 6, 1951, and is now abandoned.

This invention relates in general to envelope manufacture, and in particular to new and highly advantageous methods and means for applying to successive envelope blanks, during their rotary machine manufacture into envelopes, the adhesive areas which, in each completed envelope, serve respectively (1) to stick the seams of its pocket-forming flaps, and (2) to supply the usual wettable coating of sealing gum or glue on its pocket-closing flap, frequently called the seal flap.

Modern envelope-making machines of the rotary type, especially those used for making "triangular flap" or "diagonal seam" envelopes, have output capacities, or rates of envelope production, in a range of from 250 to 350 envelopes per minute. However, an envelope production rate in this range (250 to 350 envelopes per minute) is very far below (actually several times lower than) the rate at which it is practicable and feasible, in any such rotary machine, to perform on the successive blanks in process, the two flap-folding operations which are essential to their conversion into envelopes, these operations being an initial infolding of each blank's side flaps, and a subsequent folding over of its back or bottom flap into adhesive seam connection with its side flaps.

Furthermore, an envelope production rate in the above stated range (250 to 350 envelopes per minute) is also very far below (actually many times lower than) the rate at which it is practicable and feasible to gum or glue the successive blanks' trailing seal flap margins, in any rotary machine which employs, for the progressive en masse gumming of said margins, the so-called coating or spreading process of seal flap gumming. This process, used in numerous rotary machines, is old and well known in the art, being shown and described in United States Patent No. 2,132,227 of Winkler et al., and in many other patents.

But these long-existing potentialities of numerous prior rotary machines for very much higher rates of envelope production, afforded alike by this coating or spreading process of seal flap gumming, and by the very rapid rates at which the two essential flap folding operations can be performed, have heretofore gone entirely for naught, and have never been of the slightest avail or benefit. This is because of the fact that elsewhere, in every rotary envelope-making machine, the successive blanks, in order to receive their seam-sticking glue, have always been moved in spaced relation past the usual rotary seam glue imprinting device, at the very highest blank speeds (250 to 350 blanks per minute), at which are performed thereon the two essential flap folding operations. Under these conditions, with said seam glue imprinting device needing to rotate in step with this highest speed of blank movement through the machine, the effect on said rotary seam glue imprinting device of centrifugal force (which is directly proportional to the square of the speed) has always been the significant limiting factor, in every rotary machine, on the permissible speed of blank movement therethrough, and thus has been an ever-effective "bottleneck" on the envelope production rates of all such machines. That is to say, whenever a conventional rotary machine is speeded up, to appreciably exceed its factory-rated output capacity (of 250 to 350 envelopes per minute), tiny glue particles in a mist or spray, which are thrown off centrifugally by the speeded-up seam glue imprinting device, will always accumulate on nearby blank contacting machine surfaces exposed between the passing spaced apart blanks, to quickly foul up the machine's operation and necessitate its stoppage.

By the same token, a second production "bottleneck" of exactly the same nature as described above, has been present in all prior rotary envelope-making machines which are required to supply the blanks' seal flap margins with shaped or contoured areas of visible gumming, non-uniform in width. For, as stated in the aforesaid United States Patent No. 2,132,227, the coating or spreading process of seal flap gumming can never be used for this shaped or contoured gumming of seal flap margins. Instead, in any such rotary machine, the successive blanks, in order to receive these shaped or contoured areas of seal flap gumming, have always been moved in spaced-apart relation, past a second rotary glue imprinting device, rotating at the same high speed as the above mentioned seam glue imprinting device, and thereby imposing the same limitation as the latter, on permissible blank speed through the machine, and accordingly on the machine's rate of envelope production.

The instant invention, both for seam glue imprinting and for shaped or contoured seal flap glue imprinting, effectually overcomes these production "bottlenecks" of all prior rotary envelope-making machines. In accordance with the invention, the successive blanks, with their side flaps infolded, are progressively collected, for movement past the rotary glue imprinting device or devices, in a shallowly shingled or overlapped assembly which exposes each blank's seam glue receiving side flap margins in close proximity to the adjacent blank's seal flap margin; and since the blank speed established by this shingling operation is always very appreciably lower than the highest blank speed at which the two essential flap folding operations are performed, the glue imprinting device or devices, rotating in step with this blank assembly's reduced speed, will not reach a speed at which any centrifugal throw off of glue takes place, until said highest blank speed (which determines the envelope production rate of the machine) is far in excess (frequently two or three times greater than) the highest blank speed (of 250 to 350 blanks per minute) that has heretofore been the "ceiling" or limit of achievement, in conventional rotary envelope-making machines. This fact, coupled with the ability of the shingled blank assembly to cope successfully, as hereinafter described, with considerable centrifugal glue throw-off from the imprinting device or devices, makes it possible, in the rotary machine manufacture of envelopes, to reach production rates as high as 900 or 1000 envelopes per minute.

These extremely high rates of envelope production can be obtained with any blanks, regardless of shape or outline, such as are employed for the manufacture of the familiar "diagonal seam" or "triangular flap" envelopes, as well as of double side seam envelopes. But with substantially rhombic (including substantially square) blanks, this invention obtains, over and above its outstanding achievement of drastically increased rates of envelope production, an equally far-reaching advantage in the ease, economy and simplicity with which it secures the

very highest quality and perfection of the shaped or contoured seal flap gumming of each blank.

In that respect, as regards prior rotary machines adapted for shaped or contoured seal flap gumming, the demand that these shaped or contoured glue imprints shall extend fully and uniformly in every case to the extreme or utmost edge of each envelope's seal flap, has generally been met by resort to "overgumming," i.e. arranging for the shaped rotary seal glue imprinting die or segment to slightly overlap each seal flap edge, with resulting deposit of its excess glue at every imprinting operation, on an underlying platen roller. Thus, in all such "overgumming" operations heretofore performed, elaborate provisions have had to be made (as described in my Patent No. 2,568,629 of September 18, 1951) for washing off this excess glue, after each and every imprinting action of the die, to prevent such glue from being smeared by the platen roller onto the surfaces of subsequently following blanks. All such glue thus washed off has of course been entirely wasted and has never been reclaimable.

The instant invention eliminates entirely these wasteful and complicated procedures of previous "overgumming" practice, when operating on substantially rhombic (including substantially square) blanks, being blanks whose seal flap edges have the same angularity as the lower edges of their infolded side flaps. This is because the selfsame shallow shingling operation which exposes in close proximity the two different glue receiving areas of adjacent blanks, is availed of, in the case of these symmetrical blanks, to establish a very slight overlap of each blank's trailing seal flap edge upon the parallel lower edges of the next blank's infolded side flaps. Under these conditions, when the invention employs, for the shaped or contoured gumming of the successive seal flap margins of the slow speed blank assembly, a conventional rotary "overgumming" glue imprinting die or segment, the latter's excess glue, instead of being wasted, and needing at each imprinting operation to be washed off, is imprinted along said overlaps upon adjacent marginal areas of the next blank's infolded side flaps, where it serves in every case as the seam sticking media of the envelope produced from said next blank.

Other and further advantages of the invention will be apparent from the following detailed description thereof, taken in connection with the accompanying drawings. These drawings, for depicting the invention in its most advantageous light, show its use with blanks of substantially rhombic or diamond shape, in order to reap all of the benefits, above set forth, from the use of a shingle two-purpose rotary glue imprinting device which, in the act of "over-gumming" each seal flap margin, provides the seam sticking glue for the next blank.

But wholly apart from this achievement (with blanks of certain shapes), of seal flap "overgumming," in the entire absence of any glue wastage or any glue wash-off complication, the invention effectually overcomes, for seam glue imprinting and for contoured seal flap gumming of triangular flap blanks of practically any shape, the very restrictive production "bottlenecks" which have heretofore always existed in conventional rotary envelope making machines. Thus any such rotary machines to which the principles of this invention are applied can be operated to give rates of envelope production two or three times greater than the rates (250 to 350 envelopes per minute) which have heretofore been recognized as the maximum envelope output capacities of such machines.

In the accompanying drawings:

Fig. 1 is a diagrammatic view, illustrating, in sequence from right to left, certain of the operations that are performed by my invention on the envelope blanks in process.

Fig. 1*a* is a diagrammatic view illustrating one method of producing such blanks.

Fig. 2 is a top plan view of certain mechanism embodying my invention.

Fig. 3 is a side elevation of the mechanism of Fig. 2.

Fig. 4 is a sectional view on line 4—4 of Fig. 2.

Fig. 5 is a view similar to Fig. 2, but with upper parts, above the plane of blank travel, removed.

Fig. 6 is a large scale view of the two-purpose "overgumming" rotary glue imprinting device which is used with substantially rhombic blanks.

Like reference characters refer to like parts in the different figures.

The drawings show my invention as applied to the manufacture of envelopes from a succession of substantially diamond-shaped blanks, each of which, as indicated at A, Fig. 1, consists of a rectangular body portion **1**, having opposite similar side flaps **2, 2** and opposite similar bottom and seal flaps **3** and **4** respectively. A succession of such flat blanks A, A may be fed one by one from a supply stack, not shown. Or, such blanks may be continuously produced, as indicated diagrammatically in Fig. 1*a*, for concurrent delivery to and fabrication in the mechanism of this application, by successive diagonal cutoffs of a traveling paper web followed by suitable notchings **5** and trimmings **6** of the severed diamond shaped pieces, substantially as described in my United States Patent No. 2,696,255 of December 7, 1954, Blank-Forming Method and Mechanism for Envelope Making Machines.

In any case, the successive blanks A are forwarded flatwise, initially in spaced relation, in a direction (arrow X, Fig. 1) at right angles to the extension therefrom of their side flaps **2, 2**, such movement (produced by any suitable rollers, belts, or the like, not shown) carrying the successive spaced blanks A in turn past suitable side flap folders **7, 7**, shown diagrammatically in Fig. 1 as of the conventional "plowshare" type. Such folders operate in a manner well known in the envelope-making art, to fold over each moving blank's side flaps **2, 2** against its body portion **1**, as shown at B, Fig. 1. In this partly-folded substantially six-sided condition, the successive spaced partly-folded blanks B, moving parallel (arrow X, Fig. 5) to their side edge folds **8, 8** are delivered one by one in rapid succession to the right-hand end of the mechanism illustrated by Figs. 2, 3, 4 and 5 hereof, through which said blanks continue their flatwise advance, substantially in the plane of the line Y, Y of Fig. 3, and in the particular manner now to be described.

The mechanism illustrated by Figs. 2, 3, 4 and 5 has longitudinal side frame members **9, 9** which provide support at their right-hand ends for cooperating upper and lower high speed blank forwarding rolls **10** and **11**, the latter at its central portion being of reduced diameter, as shown at **12**, for a purpose to be hereinafter described. Said lower roll **11** is here shown as secured to a suitably journalled drive shaft **13** whose rotation may be derived, through gearing not shown, from that of the preceding rolls or other forwarding means that deliver the successive spaced partly-folded blanks B to the rolls **10** and **11**. Said shaft **13** carries a gear **14** with which meshes a gear **15** on the upper roll **10**, whereby the two rolls **10** and **11** are rotated in unison so as to impart to each blank delivered thereto a leftward movement at relatively high speed.

For continuing such initial high speed blank movement, but preferably by engagement only with the outside edge folds **8, 8** of each blank, the mechanism provides, adjacent to rolls **10, 11**, two laterally spaced pairs of narrow upper and lower blank forwarding rolls **16, 17** whose respective shafts **18** and **19** are suitably journalled in the side frame members **9, 9**. Said shafts carry intermeshing gears **20** and **21** respectively, the latter of which is driven from shaft **13** in the desired counterclockwise direction by means of an interposed idler gear **22** (Fig. 4) that meshes with the gear **14** on drive shaft **13**. The peripheral or surface speeds of the spaced pairs of nar-

row rolls **16**, **17** are such that the initially imparted high speed blank feed-in movement is maintained during the bight of said rolls on each blank's side edge folds **8**, **8**. However, it is to be noted that each upper roll **16** is relieved, as shown at **23**, Fig. 4, for somewhat over 90° of its periphery, so as to discontinue the high speed propulsion by said rolls **16**, **17** of any such partly-folded blank B, when it has moved far enough leftward for its side edge folds **8**, **8** to come under the influence of the next-encountered blank forwarding devices, which, as hereinafter described, are adapted to continue each blank's leftward movement at a greatly reduced speed which is approximately only one-half of its former speed.

This abrupt slowdown of each blank's leftward movement is accomplished by spaced pairs of narrow upper and lower feeding rolls **24**, **25**, which are preferably operative, like the pairs of rollers **16** and **17**, on the side edge folds **8**, **8** of each blank. The respective shafts **26** and **27** of rolls **24** and **25** are suitably journalled in the side frame members **9**, **9** and carry intermeshing gears **28** and **29** respectively. As best shown in Figs. 4 and 5, an extension of high speed shaft **19** carries a pinion **30** which, through an idler gear **31**, drives a large gear **32** carried by an extension of shaft **27**, whereby to rotate said shaft **27** in the desired counterclockwise direction at approximately one-half the speed of the shaft **19**. Thus each partly-folded blank, after having been moved leftward at the initial high speed of blank feed-in to the approximate position represented at B', Fig. 5, has its speed of leftward movement cut approximately in half when its side edge folds **8**, **8** encounter the pairs of slow speed rolls **24**, **25**. In this connection it is to be noted that each upper roll **24** is relieved, as shown at **33**, **33** on its periphery, in a manner so related angularly to the reliefs **23** of the high speed rolls **16**, that the transition from high speed blank movement to low speed blank movement is always accomplished smoothly, without any buckling of the blank.

This speed reduction obtains in every case the partial overtaking of each partly-folded blank by the next following blank, and this of course regardless of the blank's shape, or whether with "triangular flap" blanks, as provided for manufacture into "diagonal seam" envelopes, the blanks are of the illustrated substantially rhombic shape, or are of some variant shape, for instance with back flaps considerably deeper than their seal flaps. In the case of any triangular flap blanks, this partial overtaking causes overlapping of the successive blanks in such a manner as to bring leading side flap edges **34**, **34** of each following blank's infolded side flaps into close proximity with the trailing seal flap edge **35** of the preceding blank, in order to obtain the exposure in juxtaposed relation, for glue imprinting purposes, of the two different glue receiving marginal flap areas of any two adjacent blanks. This exposure in juxtaposed relation of both such areas makes it necessary for each following partly-folded blank, moving at high speed, to be projected beneath the slowed-down preceding blank; and this is accomplished just after each blank's slow down occurs (approximately at position B', Fig. 5), at which time the apex **37** of its trailing seal flap **4** is about to be quickly overtaken by the apex **38** of the fast moving next blank's leading back or bottom flap **3**.

To avoid any possibility of collision between such respective blank apexes **37** and **38**, and to insure passage of the latter beneath the former, the reduced portion **12** of high speed roll **11** is equipped, as herein shown, with a leaf spring member **39**, fastened at its forward end to said reduced portion **12** and with its free end projecting slightly beyond the effective periphery of roll **11**, in an angular position such as to give a slight upward kick to each slow moving seal flap apex **37**, just before it is overtaken by the fast moving bottom flap apex **38** of the next blank. In this way it is made certain that each leading apex **38** will always be projected beneath the slowed-down blank's trailing apex **37**, in the manner indicated at C in Fig. 1.

The above described slow down of each blank by rolls **24**, **25** enables the next following blank, advancing at high speed, to have this overtaking action relative to the slower moving preceding blank until such following blank has its own speed sharply reduced from seizure of its side edge folds **8**, **8** by said slow speed rolls **24**, **25**. This seizure is arranged in every case to occur, just as the following blank's leading side flap edges **34**, **34** catch up with or overtake the trailing seal flap edges **35**, **35** of the preceding slowed down blank. In other words, referring to Fig. 5, during the time that any partly-folded blank is moving at slow speed from approximate position B' to approximate position B^2, the following partly-folded blank (from approximate position B, Fig. 5) will be moving by virtue of its high feed-in speed, as continued by high speed rolls **10**, **11** and **16**, **17**, approximately twice as far or into position B', at approximately which point it takes over the slow speed of the preceding blank, and continues thereafter to move at such slow speed, in unison with said preceding blank and with those ahead of it. Thus is continuously and progressively established, for subsequent seam and/or seal glue imprinting purposes, as hereinafter described, the shallowly shingled or overlapped blank assembly shown generally at E in Fig. 1.

This blank assembly E, regardless of the exact shape or outline of its constituent partly-folded blanks, has these outstanding characteristics, viz., (1) it exposes right next to each other the two different glue receiving areas of any two adjacent blanks thereof, so that a single glue imprinting station (see **52**) past which said shingled assembly is moved can serve for seal glue imprinting as well as for seam glue imprinting, and (2) its speed of advance, as established by the above described overtaking operation, is very appreciably lower, in every case, than the highest speed of blank movement through the machine, this last being the speed at which the successive spaced apart blanks undergo initially, as above described, the infolding of their side flaps **2**, **2**, and subsequently, as hereinafter described, the folding over of their respective back or bottom flaps **3**, into adhesive seam connection with their side flaps.

Because of this much reduced speed at which the shallowly shingled blank assembly E is advanced past gumming station **52**, the latter's glue imprinting device or devices, which rotate in step with said assembly, will not attain a speed at which any centrifugal throw off of glue takes place, until the above mentioned highest blank speed (which establishes the envelope production rate of the machine) is two or three times greater than the maximum speed of blank movement (250 to 350 blanks per minute) through conventional rotary envelope making machines. And even if the instant machine's production rate is so drastically increased as to cause some centrifugal throw-off of glue from the relatively slow rotating glue imprinting device or devices at station **52**, still such thrown-off glue particles cannot collect on any of the nearby machine surfaces along which the successive blanks are moving, so as to foul up the machine's operation and necessitate its stoppage. This is because such machine surfaces, instead of being exposed, as in all conventional rotary machines, by the spacing between successive blanks when the latter are being imprinted with glue, are in this instance covered at all times by the shingled or overlapped blank assembly E, whose constituent blanks, without any harmful effect, can receive and carry off the small amounts of glue spray or mist thus thrown off.

By virtue of the several factors above set forth, a machine in accordance with the present invention can achieve production rates as high as 800 to 1000 envelopes per minute, from practically all types of "triangular flap" envelope blanks. If such "triangular flap" blanks are

of substantially rhombic (including substantially square) shape, as herein shown (with seal flap edges of the same angularity as lower edges of their infolded side flaps), the above described overtaking or shallow shingling operation (which creates the blank assembly E) is availed of to establish, for a purpose hereinafter appearing, a very slight overlap (see 36, 36 Fig. 5) of the leading edges 34, 34 of each following blank's infolded side flaps, by the seal flap edge 35 of the preceding blank of said shingled assembly E. The creation of these overlaps 36, 36 involves another possibility of collision between the underneath fast moving blank and the overlying slow moving blank, which occurs when leading edges 34, 34 of the former's infolded side flaps 2, 2 have been moved up, in each overtaking operation, into close proximity to the trailing slow moving seal flap edges 35, 35 of the preceding blank, as indicated at D in Figs. 1 and 2. To avoid any collision between such edges 34, 34 and 35, 35, and to insure unobstructed passage of the former beneath the latter, the upper high speed shaft 18 carries at its central portion a collar 40, having radially projecting therefrom a forwardly curved spur or hook 41. The latter's angular position is such that in being moved forwardly and upwardly by the high speed clockwise rotation of shaft 18, said hook will overtake from below the trailing seal flap apex 37 of the preceding slow moving blank, and will temporarily curl said seal flap upwardly against a pair of spaced disks 42, 42 on the slow speed shaft 26. During such momentary upward deflection, the side flap edges 34, 34 of the fast moving blank move forward, so that they are always covered by the edges 35, 35 of the preceding blank's seal flap, upon release of the latter by the spur 41.

During the above described progressive shallow shingling of the successive partly-folded blanks B, the latter's central portions and extended bottom and seal flaps 3 and 4 are supported against undue downward sagging by a pair of horizontal longitudinally extending rails 43, 43 which, as shown, are spaced sufficiently far apart so as to permit a blank thereon to undergo centrally a momentary slight downward deflection, when contacted from above by the rotating hook or spur 41. The infolded side flaps of each fast moving blank B, prior to the above described placement of their proximate edges beneath the preceding blank's seal flap edge, may be held down, against any lifting tendency due to air currents or the like, by pairs of overlying plates 44, 44 and 45, 45. The plates 44, 44 are here shown as supported from a cross bar 46 extending between the side frame members 9, 9. The plates 45, 45 which stabilize said infolded side flaps just before their edges 34, 34 pass under the trailing seal flap of the preceding slow moving blank, may be carried, as here shown, by suitable rods 47, 47 extending inwardly from each side frame 9. Before, during and after the shallow shingling operation performed, as above described, on the partly-folded blanks B, the latter are kept in their horizontal path of travel (line Y, Y, Fig. 3) by underlying skids 48, 48 and by a series of overlying plates or guides 49, 49. The skids 48, 48 are supported adjacent to the respective pairs of rolls 16, 17 and 24, 25 upon cross bars 50, 50 extending between the side frames 9, 9 and the overlying plates 49, 49 are supported adjacently above the blanks by means of rods 51, 51 extending inwardly from the side frames 9, 9.

These and other suitable constraints against any undue blank deflection, up or down, are operative both ahead of and beyond the mechanism's single gumming station, designated generally by the numeral 52, and through which the blanks in shallow shingled assembly (see Fig. 5 and E of Fig. 1) are propelled, at the reduced rate of speed established by the pairs of rolls 24, 25. For so slowly feeding the blanks in shingled assembly to and through the gumming station 52, the mechanism provides pairs of upper and lower reed rolls 53, 54, here

shown as engaging with the side edge folds 8, 8 of the shingled blanks. The respective shafts 55 and 56 of rolls 53 and 54 are suitably journalled in the side frame members 9, 9 and carry intermeshing gears 57 and 58 respectively. Gear 58, as shown in Fig. 2, is a double gear, having its other portion in mesh with an idler gear 59 (Figs. 3 and 4) which is driven from the gear 29 of low speed shaft 27. The shaft 56 thus rotates counterclockwise at the same reduced speed as shaft 27, and the gearing is proportioned to give both rolls 53, 54 the same relatively low peripheral or surface speeds as the rolls 24, 25, so as to preserve and keep intact the precise shingled relationship (viz., the successive overlaps 36, 36) which, for the illustrated case of substantially rhombic blanks, is established progressively as above described by conjoint action of fast rolls 16, 17 and slow rolls 24, 25.

At the gumming station 52, each successive zone or region of overlap 36, 36 of the slow speed shingled blank assembly receives a single adhesive imprint, in over-gumming relation to each passing seal flap margin; thus each such imprint is common, as shown at F, Fig. 1, to both of the blanks involved in the overlap. That is to say, each single glue imprint F covers a shaped or contoured marginal area (see stippling 60, Fig. 5) of a preceding blank's seal flap, plus immediately adjacent narrow areas (stippling 61, 61, Fig. 5) which on the following blank's infolded side flaps, lie just rearwardly of the latter's then-overlapped edges 34, 34. For so "overgumming" each seal flap of the slow moving shingled blank assembly, the gumming station 52 provides conventional over-gumming means, in the form of an upper roller 62, having a raised and preferably contoured glue imprinting surface 70, Fig. 6, slightly wider than the desired area 60 of seal flap gluing, and a cooperating platen roller 63. Said parts are carried by upper and lower shafts 64 and 65, which are suitably journalled in the side frame members 9, 9, and carry intermeshing gears 66 and 67 respectively. Lower shaft 65 is rotated in the desired counterclockwise direction by drive of its small diameter gear 67 from an idler gear 68 (Figs. 3 and 4) which is in mesh with the larger gear 58 on slow speed shaft 56. As best shown in Fig. 6, the upper shaft 64, beyond the ends of member 62 carries narrow rolls 69, 69 of the same diameter as the surface of revolution generated by said member's contoured segmental glue imprinting surface 70. Said surface of revolution, and the elements 63 and 69 as well, has a circumferential length which is the same as the spacing apart of the seal flap margins, in the shingled blank assembly E.

By the above-described gearing, the shafts 64 and 65 are rotated faster than shaft 56, so as to give the small diameter blank engaging portions 70, 63 and 69 of shafts 64 and 65 the same relatively slow peripheral or surface speeds as the previous rolls 24, 25 and 53, 54. It will thus be seen that rolls 69, 69, by engagement with the side edge folds 8, 8 of each blank, cooperate with the underlying platen roller 63 in continuing the leftward travel of the shingled blank assembly E through the gumming station 52 at the same reduced rate of speed imparted thereto by the previous rolls 24, 25 and 53, 54.

At gumming station 52, the contoured segmental glue imprinting surface 70 moves through a circumferential path whose length is the distance apart in the shingled blank assembly E of the successive seal flap margins of its constituent overlapped blanks. At each rotation of shaft 64, the shaped arcuate surface 70 is coated with wet glue in the usual manner from its contact with a suitably rotated overhead glue roll 71 mounted in a glue tub 72, and the timing is such that said surface 70 then makes rolling contact with a seal flap margin of the advancing shingled blank assembly, to deposit along said margin the desired shaped or contoured glue im-

print 60. The final phase of each such rolling contact, by virtue of the extra or "overgumming" width of surface 70, extends in every case (see F, Fig. 1) beyond the extreme edge of each blank's seal flap margin and onto the next blank's infolded side flaps 2, 2, to give the latter, just inwardly of their then-overlapped leading edges 34, 34, the narrow glue imprints 61, 61.

Thus the extra wide applicator surface 70 obtains a full gumming to the extreme edge of each blank's seal flap, but always deposits its excess glue (totally wasted and needing to be washed off in all previous "overgumming" practice) in seam-sticking position on pocket-forming flaps of the next blank, the latter thus serving always, in effect, as an "anti-smut" sheet, to prevent any fouling of platen roller 63. It is particularly to be noted that these successive duplex gumming operations at station 52 are performed on blanks which are traveling, as heretofore described, at a relatively slow speed which is approximately only half the speed at which the spaced blanks are traveling when entering the present mechanism, and also when leaving same, as hereinafter described, as spaced-apart glued and folded envelopes. In consequence, there is ample leeway in my mechanism for these blank entering and envelope exit speeds to be materially and even drastically stepped-up to give an extremely high rate of envelope production, without encountering at gumming station 52 the centrifugal glue throw-off that sharply limits the envelope production rate of all prior rotary envelope-making machines, because of need for the latter's revolving glue-imprinting devices to have peripheral speeds corresponding to the maximum speed of blank travel through such machines.

In my mechanism, no such production bottleneck is present, because of the relatively-low peripheral speeds which the revolving glue-imprinting segment 70 needs to attain, in order to keep pace with the slow speed of travel of the shingled blank assembly E; by the same token, there is no such rapid rotation of glue roll 71 as might produce undue churning or aeration of the glue supply in tub 72. Moreover, even with my machine's envelope production rate stepped-up so drastically as to cause a certain amount of centrifugal glue throw-off from imprinting surface 70, there is still no opportunity for such glue to accumulate on and foul up the various nearby surfaces along which the blanks are moved, such as the rails 43, the skids 48, and also a table 73, supported on posts 74, just beyond the gumming station 52. This is because such surfaces, instead of being exposed as in prior rotary machines by spaces between the advancing blanks, are covered at all times by the shingled assembly E whose successive blanks receive and carry off, without detriment thereto, any such minute glue particles.

For maintaining the shallow shingled relation of the gum-imprinted blanks as they pass from gumming station 52 onto table 73, my invention provides another slow speed forwarding means, here shown as cooperating pairs of narrow upper and lower rolls 75 and 76, for engaging the blanks' side edge folds 8, 8 beyond the ends of the glue imprints 60 and 61, 61 thereon and beyond the side edges of table 73. Said rolls 75 and 76 have the same low peripheral or surface speeds as the rolls 24, 25, 53, 54, and 69, 63 and are carried by upper and lower shafts 77 and 78 which are suitably journalled in the side frames 9, 9, and carry intermeshing gears 79 and 80 respectively. Shaft 78 whose rolls 76, 76 are of the same small diameter as the platen roll 63 is rotated in the desired counterclockwise direction at the same speed as shaft 65 by drive of its gear 80 from an idler gear 81, which is in mesh with gear 67 on said shaft 65.

The large diameter upper rolls 75, 75 of this final reduced speed forwarding means have their peripheries relieved, as shown at 82, 82. Said reliefs 82, 82 are operative in turn to release each leading blank of shingled assembly E from the bite of the slow speed forwarding rolls 75, 76, substantially at the instant that said blank's side edge folds 8, 8 are seized by the next-encountered blank forwarding rolls which operate, as hereinafter described, at high peripheral or surface speeds, corresponding substantially to those of the initial blank forwarding rolls 10, 11 and 16, 17, so as to obtain delivery from the mechanism, of glued and folded blanks at the same rapid rate as said blanks are fed thereto.

For so speeding up, one after another, the successive glue-imprinted blanks, and restoring their initial spaced relation, the mechanism provides at the forward end of table 73, a large diameter lower roller 83, and for cooperation therewith a pair of large diameter upper spaced apart narrow roll segments 84, 84. The latter's peripheries are relieved, except for matching bit portions of approximately 90° extent, whose forward edges at each revolution engage an arriving blank along its side edge folds 8, 8, beyond the freshly gummed areas 60 and 61, 61 thereof. The lower roller 83 is journalled for rotation on a normally stationary shaft 85, here shown as hollow for a purpose to be hereinafter described; shaft 85 extends transversely of and beyond the side frame members 9, 9. The upper roll segments 84, 84 are carried by a shaft 86, suitably journalled in said side frames. The shaft 86 and roller 83 carry intermeshing gears 87 and 88 respectively. The lower shaft 78 of the last low speed rolls 75, 76, carries, in addition to its small gear 80, a large diameter gear 89 which, through an idler gear 90 in mesh with gear 88 on roller 83, drives the roller 83 counterclockwise, and imparts thereto and to roll segments 84, 84 a peripheral or surface speed which is substantially double that of the roll elements 24, 25, 53, 54, 62, 63, and 75, 76 of the slow speed section of the machine.

The high speed blank forwarding means 83, 84, 84 is so timed and spaced with relation to the previous slower rolls 75, 76 that each blank's side edge folds 8, 8 are released by one set of reliefs 82, 82 of rolls 75 just as the forward ends of said side edge folds are seized by roller 83 and roll segments 84, 84. The result is to speed up the so-released blank, and to draw it away, progressively, from the slower moving shingled blank assembly E; at B^3 in Fig. 5 is shown a speeded-up completely glued blank in process of being separated (see G, Fig. 1) from the partly-glued blank just behind it in the slow speed section of the machine. Completion of such separation enables each blank, upon folding over of its bottom flap 3 to overlap the seam-sticking glue 61, 61, on its infolded side flaps 2, 2, to be rapidly delivered in envelope form to a traveling dryer chain, or other suitable mechanism, not shown, for the drying of the wet glue 60 on its seal flap 4.

Any suitable mechanism may be employed for folding over the bottom flaps of the successive glue imprinted blanks drawn forward, one after the other at high speed by roller 83 and roll segments 84, 84. As here shown, such folding mechanism is in part combined with and incorporated in the high speed delivery devices 83, 84, 84. For this purpose, the roll segments 84, 84 at the forward or leading edges of their bite portions, carry between them a transverse scoring blade 91, which is adapted at each revolution, to register with and thrust against a yieldable insert 92, of rubber or the like, extending lengthwise of the surface of the underlying roller 83. By such means, each blank, substantially at the instant of its seizure by high speed forwarding means 83, 84, 84, is given the score line 93, definitive of the desired fold of its leading bottom flap 3, the latter, previous to such seizure and scoring, having been pushed between and beyond the then-inoperative parts 83, 84, 84 by the action of final low speed forwarding rolls 75, 76.

Just back of its score line 93, each blank is suctionally gripped by the roller 83, the latter for this purpose having lengthwise thereof, behind the yieldable insert 92, the slit or slits 94 whose inner ends communicate periodically, through a port or opening 95, with the interior of shaft 85. Said shaft interior is connected to any suitable source of suction, such as a vacuum pump, not shown. The

blank B^3 shown in Fig. 5 has been thus suctionally gripped, just behind its score line **93**, and drawn downwardly, by rotation of roller **83**, toward the line of bite between said roller **83** and an adjacent pressing roller **104**; reflecting this partial downward bending of blank B^3, its side edge folds **8**, **8** appear as slightly foreshortened, compared to those of the other unbent blanks of Fig. 5. To adjust the angular position of port **95**, for close and accurate timing of the seizure and release of successive blanks by roller **83**, the hollow shaft **85** carries a worm wheel **96** with which meshes a worm **97** on a vertical shaft **98**. The latter provides a handle **99** by which it may be turned to obtain, during operation of the machine, any necessary angular adjustment of the shaft **85**, following which the shaft **98** may be locked against turning movement by a locking screw **100**.

The pressing roller **104**, as hereinafter described, has clockwise rotation (see Fig. 4). Collision between said roller's upper portion and each arriving blank's oppositely moving bottom flap **3** is prevented by a guard member **112**, overlying said roller, and attached to a bracket **113** on one side frame **9**. In addition, each arriving bottom flap **3** may be deflected upwardly by a projection **101** on roller **83**, said projection in the rotation of roller **83** passing through a notch **102** formed in the forward edge of table **73**. The above described downward bending of each blank body **1** about the roller **83** tends to throw said blank's trailing seal flap **4** upwardly toward the shaft **86**; in order to keep the seal flap glue **60** from making contact with said shaft **86**, the latter carries a curved guard **103** adapted to engage each seal flap **4** inwardly of its marginal glue **60**.

Each blank's downward movement by roller **83** carries it, score line **93** foremost, into the line of bite between roller **83** and the pressing roller **104**, whereupon the suctional grip of roller **83** on said blank is released. The pressing roller **104** is carried on a shaft **105** which is suitably journalled in the side frame members **9**, **9** and which carries a gear **106** in mesh with the gear **88** of roller **83**. The action of rollers **83** and **104** converts each score line **93** into a definite fold **108**, Fig. 1, for the bottom of each envelope's pocket. The effective contact surface of roller **104** has a substantially triangular terminal portion, as shown at **107** in Fig. 2, which corresponds to and registers with each blank's bottom flap **3**, the latter being thereby pressed at its edges against the wet glue imprints **61**, **61**, to complete each envelope's adhesive seam, as shown at **109** in Fig. 1.

The pressing roller **104** at its ends has narrow circular blank forwarding portions **120**, **120**, substantially flush with the triangular portion **107**, but elsewhere said roller's periphery is suitably relieved, to avoid any contact therewith of the wet glue **60** on each successive envelope's trailing seal flap **4**. A further safeguard against such contact is provided by said roller's projection **110** (see Fig. 4) which is so located as to keep each passing seal flap **4** from swinging toward the roller **104**, and which in the joint rotation of rollers **83** and **104**, is received at each revolution in the former's relieved portion **111**, Fig. 4.

Each seamed envelope, in the condition shown at H, Fig. 1, has its rapid movement continued by the bite on its side edges **8**, **8**, of roller **83** and the end portions **120**, **120** of roller **104**. A suitable stripper **114**, Fig. 4, is so positioned as to guide or deflect each such envelope, advancing bottom fold **108** foremost, into the narrow lines of bite between said roller portions **120**, **120** and an underlying pair of disks **115**, **115**, which are mounted on a shaft **116** that carries a gear **117** in mesh with the gear **106** of shaft **105**. A travelling belt **118**, against which the envelope edge portions **8**, **8** are pressed by suitable overlying narrow rollers **119**, may then be employed to receive the envelopes and deliver them in rapid succession to the fingers of a travelling dryer chain, not shown.

The described mechanism is readily adaptable to the production of envelopes of different sizes, merely by adjusting, toward or away from center line 4—4 of Fig. 2, the positions of the several sets of forwarding rollers **16**, **17**, **24**, **25**, **53**, **54**, **75**, **76**, etc., on their respective shafts. For such changes in envelope size, the only parts requiring replacement are the glue applying roller **62** and the roller **104**.

From the foregoing, it is clear that my invention, in its illustrated preferred embodiment, when operating on wholly symmetrical diamond-shaped blanks, such as shown by the drawings herein, will convert such blanks, at speeds of production never before achieved, into envelopes of the highest quality. In all such envelopes the contoured seal flap gumming extends uniformly to the flap's extreme edge, by virtue of the described novel procedures and devices which obtain "overgumming" of each blank's seal flap, in the entire absence of the usual glue wastage, and of the usual complications attendant upon washing off of the excess glue.

But my invention is not limited, except as specified in the appended claims, to operation on blanks of wholly symmetrical diamond shape, nor to the achievement always of the described perfection of the seal flap gluing. For it is clear that the principles of my invention, insofar as they overcome or mitigate the production bottlenecks of all prior rotary envelope-making machines and methods, are of general application, and are extremely useful in achieving greatly increased speeds of envelope production from blanks of other than the herein illustrated symmetrical diamond shape. For such purposes, it is merely required, as described above, that the illustrated glue applying and folding rollers **62** and **104** respectively be replaced by roller elements of appropriate form and shape to meet the glue applying and back flap folding needs of the particular shapes of blanks being operated upon.

I claim:

1. In envelope making mechanism, means for folding over the side flaps of successive substantially rhombic blanks advancing flatwise in spaced relation, means for overtaking each so-folded blank by the next-following so-folded blank but only to an extent such that lower edges of the folded-over side flaps of the one are slightly overlapped by the seal flap edge of the other, and means for thereafter separately applying to each seal flap of the so-overlapper blanks a marginal adhesive imprint, in overgumming relation to said seal flap's edge, whereby the excess adhesive of each application is received on the adjacent blank's folded-over side flaps, for subsequent sticking thereto of said blank's bottom flap.

2. In envelope making mechanism, means for folding over the side flaps of successive substantially rhombic blanks advancing flatwise in spaced relation, with their seal flaps trailing, means for overtaking each so-folded blank by the one next following but only to an extent such that leading edges of the latter's folded-over side flaps are slightly overlapped by the former's trailing seal flap edge, and means for thereafter separately applying to each seal flap of the so-overlapped blanks a marginal contoured adhesive imprint, in over-gumming relation to said seal flap's edge, whereby the excess adhesive of each application is received on the following blank's folded-over side flaps for subsequent sticking thereto of said following blank's bottom flap.

3. In envelope making mechanism, means for folding over the side flaps of successive substantially rhombic blanks advancing flatwise in spaced relation, means for overtaking each so-folded blank by the next-following so-folded blank but only to an extent such that lower edges of the folded-over side flaps of the one are slightly overlapped by the seal flap edge of the other, means operative during each overtaking action for preventing collisions between the flaps of the respecttive overtaking and overtaken blanks, and means for separately applying to each seal flap of the so-overlapped blanks a marginal im-

print of contoured gumming, in over-gumming relation to said seal flap's edge, whereby the excess gum of each application is received on the following blank's folded-over side flaps for subsequent sticking thereto of said following blank's bottom flap.

4. In envelope making mechanism, means for folding over the side flaps of successive substantially rhombic blanks advancing flatwise in spaced relation, with their seal flaps trailing, means for overtaking each so-folded blank by the one next following but only to an extent such that leading edges of the latter's folded-over side flaps are slightly overlapped by the former's trailing seal flap edge, means operative at the start of each overtaking action to deflect upwardly the trailing seal flap of the preceding blank, for entry beneath same of the following blank's leading bottom flap, and means for separately applying to each seal flap of the so-overlapped blanks a marginal imprint of contoured gumming, in over-gumming relation to said seal flap's edge, whereby the excess gum of each application is received on the following blank's folded-over side flaps for subsequent sticking thereto of said following blank's bottom flap.

5. In envelope making mechanism, means for folding over the side flaps of successive substantially rhombic blanks advancing flatwise in spaced relation, with their seal flaps trailing, means for overtaking each so-folded blank by the one next following but only to an extent such that leading edges of the latter's folded-over side flaps are slightly overlapped by the former's trailing seal flap edge, means operative near the finish of each overtaking action to deflect upwardly the trailing seal flap of the preceding blank, for entry beneath same of leading edges of the following blank's folded-over side flaps, and means for separately applying to each seal flap of the so-overlapped blanks a marginal imprint of contoured gumming, in over-gumming relation to said seal flap's edge, whereby the excess gum of each application is received on the following blank's folded-over side flaps for subsequent sticking thereto of said following blank's bottom flap.

6. In envelope making mechanism, means for folding over the side flaps of successive substantially rhombic blanks advancing flatwise in spaced relation, with their seal flaps trailing, means for overtaking each so-folded blank by the one next following but only to an extent such that leading edges of the latter's folded-over side flaps are slightly overlapped by the former's trailing seal flap edge, means operative at the start of each overtaking action to deflect upwardly the trailing seal flap edge of the preceding blank, for entry beneath same of the following blank's leading bottom flap, means operative near the finish of each overtaking action to deflect upwardly the trailing seal flap edge of the preceding blank for entry beneath same of leading edges of the following blank's folded-over side flaps, and means for separately applying to each seal flap of the so-overlapped blanks a marginal imprint of contoured gumming, in over-gumming relation to said seal flap's edge, whereby the excess gum of each application is received on the following blank's folded-over side flaps for subsequent sticking thereto of said following blank's bottom flap.

7. In envelope making mechanism, means for folding over the side flaps of successive substantially rhombic blanks advancing flatwise in spaced relation, means for progressively changing the spaced relation of the advancing partly-folded blanks to a relatively shallow shingled or stepped relation, wherein each blank's seal flap slightly overlaps the bottom edges of an adjacent blank's folded-over side flaps, a glue applying station through which the blanks, in said shingled assembly are advanced, and means at said station, rotating in timed relation to said assembly's advance for applying separately, to each seal flap margin of said assembly a contoured area of gumming, in over-gumming relation to the edge of said seal flap, whereby the excess gum of each application is received on the adjacent blank's folded-over side flaps for subsequent sticking thereto of its bottom flap.

8. In envelope making mechanism, means for folding over the side flaps of successive substantially rhombic blanks advancing flatwise in spaced relation, means for progressively changing the spaced relation of the advancing partly-folded blanks to a relatively shallow shingled or stepped relation, wherein each blank's seal flap slightly overlaps the bottom edges of an adjacent blank's folded-over side flaps, a glue applying station through which the blanks, in said shingled assembly are advanced, means at said station, rotating in timed relation to said assembly's advance, for applying separately, to each seal flap margin of said assembly a contoured area of gumming, in over-gumming relation to the edge of said seal flap, whereby the excess gum of each application is received near the bottom edges of the adjacent blank's folded-over side flaps, means beyond said station for withdrawing successively from said assembly the leading blank thereof, and means for thereafter folding over each withdrawn blank's bottom flap into seam-forming contact with the adhesive received on its folded-over side flaps.

9. In envelope making mechanism, means for folding over the side flaps of successive substantially rhombic blanks advancing flatwise in spaced relation at relatively high speed, means for reducing each so-folded blank's speed, after a predetermined movement of same at said high speed, to obtain such overtaking of same by the next-following so-folded blank as to dispose bottom edges of one blank's folded over side flaps beneath the seal flap edge of the other blank, means for advancing the successive so-overlapped blanks at said reduced speed, and means in the region of said reduced speed advance for applying separately to each seal flap margin a contoured area of gumming, in over-gumming relation to said seal flap's edge, whereby the excess gum of each application is received on the following blank's infolded side flaps for subsequent sticking thereto of said blank's bottom flap.

10. In envelope making mechanism, means for folding over the side flaps of successive substantially rhombic blanks advancing flatwise in spaced relation at relatively high speed, means for reducing each so-folded blank's speed, after a predetermined movement of same at said high speed, to obtain such overtaking of same by the next-following so-folded blank as to dispose bottom edges of one blank's folded over side flaps beneath the seal flap edge of the other blank, means for advancing the successive so-overlapped blanks at said reduced speed, means in the region of said reduced speed advance for applying separately to each seal flap margin a contoured area of gumming, in over-gumming relation to said seal flap's edge, whereby the excess gum of each application is received near the bottom edges of the following blank's folded-over side flaps, means operative on each blank after the gumming of its seal flap to increase its speed of advance, thereby to withdraw it from the next-following blank, and means for thereafter folding over such withdrawn blank's bottom flap into seam-forming contact with the adhesive received on its folded-over side flaps.

11. In envelope manufacture, for the application of seal flap adhesive and seam-sticking adhesive to a succession of substantially rhombic blanks, the improvement which consists in folding inwardly each blank's side flaps while they are advancing flatwise in spaced relation, progressively changing the spaced relation of the advancing partly folded blanks to a shallowly shingled or stepped relation, wherein each blank's seal flap slightly overlaps the bottom edges of an adjacent blank's infolded side flaps, preventing during such change any collisions between the flaps of the respective blanks, and producing at each zone of said slight flap overlap of the advancing so-shingled blanks a single adhesive imprint, common to both blanks, whereby one has its seal flap gummed fully to the edge and the other receives

adhesive for subsequent sticking of its bottom flap to its infolded side flaps.

12. In envelope manufacture, for the application of seal flap adhesive and seam-sticking adhesive to a succession of substantially rhombic blanks advancing flatwise in spaced relation, with their seal flap portions trailing, the improvement which consists in folding inwardly each blank's side flaps, progressively changing the spaced relation of the advancing partly folded blanks to a shallowly shingled or stepped relation, wherein each blank's seal flap slightly overlaps the bottom edges of the next blank's infolded side flaps, preventing during such change any collisions between the flaps of the respective blanks, and producing at each zone of said slight flap overlap of the advancing so-shingled blanks a single adhesive imprint, common to both blanks, whereby one has its seal flap gummed fully to the edge and the other receives adhesive for subsequent sticking of its bottom flap to its infolded side flaps.

13. In the manufacture of envelopes from a succession of substantially rhombic blanks advancing flatwise in spaced relation, the improvement which consists in folding inwardly the side flaps of each blank, progressively assembling the party-folded blanks in a shallowly shingled or stepped relation, wherein each blank's seal flap slightly overlaps the bottom edges of an adjacent blank's infolded side flaps, preventing during such assembly any collisions between the flaps of the respective blanks, causing the so-shingled blank assembly to receive at each zone of said slight flap overlap a single adhesive imprint common to the two blanks thereof, whereby one blank's seal flap is gummed to its extreme edge and the other blank's infolded side flaps receive seam-sticking adhesive, and progressively disassembling the so-gummed blanks and restoring their spaced relation to permit each blank's bottom flap to be folded into pocket-forming engagement with the adhesive on its infolded side flaps.

14. In the manufacture of envelopes from a succession of substantially rhombic blanks advancing flatwise in spaced relation, with their seal flap portions trailing, the improvement which consists in folding inwardly the side flaps of each blank, progressively assembling the partly-folded blanks in a shallowly shingled or stepped relation, wherein each preceding blank's trailing seal flap slightly overlaps the bottom edges of the next blank's infolded side flaps, preventing during such assembly any collisions between the flaps of the respective blanks, causing the so-shingled blank assembly to receive at each zone of said slight flap overlap a single adhesive imprint common to the two blanks thereof, whereby the preceding blank's seal flap is gummed to its extreme edge and the following blank's infolded side flaps receive seam-sticking adhesive, and progressively disassembling the so-gummed blanks and restoring their spaced relation to permit each blank's bottom flap to be folded into pocket-forming engagement with the adhesive on its infolded side flaps.

15. In the manufacture of envelopes, from a succession of substantially rhombic blanks advancing flatwise, bottom flaps foremost, in spaced relation, the improvement which consists in successively folding inwardly each blank's side flaps, progressively assembling the advancing partly-folded blanks in a shallowly shingled or stepped relation, to slightly overlap each blank's trailing seal flap upon the bottom edges of the following blank's infolded side flaps, preventing during such assembly any collision between the flaps of the respective blanks, producing at each zone of said slight flap overlap of said assembly a single adhesive imprint common to the two blanks thereof, to supply one blank with seal flap adhesive and the other with seam-sticking adhesive, progressively restoring the spaced relation of the so-gummed blanks, and causing each blank's bottom flap to be folded into seam-forming relation with said last-mentioned portion of said common adhesive imprint.

16. In the manufacture of envelopes, for application of seal flap adhesive and seam-sticking adhesive to the blanks thereof, the improvement which consists in folding over the side flaps of successive advancing spaced apart blanks having seal flap edges of substantially the same angularity as the lower edges of their folded over side flaps progressively overtaking each partly-folded blank by the one next following, to an extent that slightly overlaps the seal flap edge of one upon lower edges of the other's infolded side flaps, and depositing at each such zone of said slight flap overlap of the advancing blanks a single adhesive imprint common to both blanks of said zone, whereby one blank has its seal flap gummed to the extreme edge and the other receives adhesive for sticking the seams of its side and bottom flaps.

17. In the manufacture of envelopes, for application of seal flap adhesive and seam-sticking adhesive to the blanks thereof, the improvement which consists in folding over the side flaps of successive advancing spaced apart blanks having seal flap edges of substantially the same angularity as the lower edges of their folded over side flaps progressively shingling the so-folded blanks to a depth such that each blank's seal flap edge slightly overlaps the lower edges of the adjacent blank's folded over side flaps, and moving the blanks in such shingled assembly past a single rotary adhesive imprinting device, to receive therefrom successive spaced adhesive imprints at and common to said overlapped edge portions of adjacent blanks.

18. In envelope making mechanism, means for folding over the side flaps of a succession of substantially rhombic blanks, means for progressively shingling the so-folded blanks but only to a depth such that each blank's seal flap edge slightly overlaps the lower edges of the adjacent blank's folded-over side flaps, means for applying successive spaced imprints of glue to said shingled assembly in regions at and common to said slightly overlapped edge portions of adjacent blanks thereof, means for progressively de-shingling the so-glued blanks, and means operative thereafter on each blank to fold over its bottom flap against the glue on the marginal portions of its folded over side flaps.

19. In the manufacture of envelopes, for application of seal flap adhesive and seam-sticking adhesive to the blanks thereof, the improvement which consists in folding in the side flaps of a succession of advancing spaced apart blanks having seal flap edges substantially parallel to lower edges of their infolded side flaps, assembling the so-folded blanks progressively in a shallow shingled relation such that lower edges of each blank's infolded side flaps are slightly overlapped by the seal flap edge of the adjacent blank, and overgumming each of the successive seal flaps of said shingled blank assembly, whereby the excess gum of each overgumming operation is received on narrow areas near said lower edges of the adjacent blank's infolded side flaps, for adhering said blank's bottom flap thereto.

20. In envelope making mechanism, means for folding over the side flaps of a succession of substantially rhombic blanks, means for progressively assembling the so-folded blanks in a shingled relation of only such depth that each blank's seal flap slightly overlaps the lower edges of the adjacent blank's folded over side flaps, and rotary glue imprinting means operating in timed relation to the movement past same of said shingled assembly for imprinting thereon successive contoured adhesive areas, each in over-gumming relation to the margin of the respective seal flaps of said assembly's constituent blanks, whereby to deposit the excess gum at each operation thereof, on narrow areas near the lower overlapped edges of the adjacent blank's folded over side flaps, for subsequent adhesion thereto of said blank's bottom flap.

21. The improvement in the manufacture of envelopes which consists in advancing in spaced relation a succession of substantially rhombic envelope blanks each with its

side flaps folded over upon the blank body and with its bottom and seal flaps extended, assembling said blanks in a shallowly shingled relation with the seal flap of each blank disposed over the bottom flap of an adjacent blank so that the edge of the seal flap just overlaps the bottom edge portions of the folded over side flaps of the adjacent blank, and successively applying to the seal flap of each blank while the blanks are so shingled a swath of gum of sufficient width so as to gum the margin of the seal flap and be received on the folded over side flaps of the adjacent blank so as to provide gummed areas on each blank for adhesively securing its bottom and seal flaps to the envelope body.

22. The improvement in the manufacture of envelopes which consists in advancing in spaced relation a succession of substnatially rhombic envelope blanks each with its side flaps folded over upon the blank body and with its bottom and seal flaps extended, assembling said blanks in a shallowly shingled relation with the seal flap of each blank disposed over the bottom flap of an adjacent blank far enough for the edge of the seal flap to just overlap the bottom edge portions of the folded over side flaps of the adjacent blank, successively applying to the seal flap of each blank while the blanks are so shingled a swath of gum of sufficient width so as to gum the margin of the seal flap and be received on the folded over side flaps of the adjacent blank, separating the shingled blanks, and then folding each bottom flap over its envelope body so that its marginal portion will be disposed upon the gummed portion of its associated side flaps.

23. The improvement in the manufacture of envelopes which comprises advancing in spaced relation a succession of substantially rhombic envelope blanks bottom flap foremost and in a direction parallel to the side flap folds, each envelope blank having its side flaps folded over upon the blank body and its bottom and seal flaps extended, while so conveying the blanks assembling them in a shallowly shingled relation with the seal flap of each blank disposed over the bottom flap of an adjacent blank so that the edge of the seal flap just overlaps the bottom edge portions of the folded over side flaps of the adjacent blank, and successively applying to the seal flap of each blank while the blanks continue to move in a forward direction and in a shingled relation, a swath of gum of sufficient width so as to gum the margin of the seal flap and be received on the bottom portions of the folded over side flaps of the adjacent blank thereby to provide two spaced gummed areas on each blank for adhesively securing its bottom and seal flaps to the envelope body.

24. The improvement in the manufacture of envelopes which comprises advancing in spaced relation a succession of substantially rhombic envelope blanks bottom flap foremost and in a direction parallel to the side flap folds, each envelope blank having its side flaps folded over upon the blank body and its bottom and seal flaps extended, while so conveying the blanks assembling them in a shallowly shingled relation with the seal flap of each blank disposed over the bottom flap of an adjacent blank so that the edge of the seal flap just overlaps the bottom edge portions of the folded over side flaps of the adjacent blank, successively applying to the seal flap of each blank, while the blanks continue to move in a forward direction and in a shingled relation, a swath of gum of sufficient width so as to gum the margin of the seal flap and be received on the bottom portions of the folded over side flaps of the adjacent blank, separating the shingled blanks during their forward movement, and then successively folding the bottom flap of each blank over its associated blank body so that its marginal portion will adhere to the gummed area of the folded over side flaps.

25. In the manufacture of envelopes which includes the successive steps of advancing a continuous web of envelope material, severing said web along successive oblique lines thereby to form separate unconnected envelope blanks each in substantially rhombic form, advancing said blanks in spaced relation in a path which diverges from the web path at an obtuse angle so that each blank will be forwarded bottom flap foremost and in a direction parallel to a diagonal connecting the apices of the bottom and seal flaps, and successively folding the oppositely disposed side flaps of each blank over its body portion; the combination therewith of the successive steps which include assembling said blanks in a shallowly shingled relation with the seal flap of each blank disposed over the bottom flap of an adjacent blank so that the edge of the seal flap just overlaps the bottom edge portions of the folded over side flaps of the adjacent blank, successively applying to the seal flap of each blank, while the blanks continue to move in a forward direction and in such shingled relation, a swath of gum of sufficient width so as to gum the margin of the seal flap and be received on the bottom portions of the folded over side flaps of the adjacent blank, separating the shingled blanks during their forward movement, and then successively folding the bottom flap of each blank over its associated blank body so that its marginal portion will adhere to the gummed area of the folded over side flaps.

26. In envelope manufacture, for the application of seal flap adhesive and seam-sticking adhesive to a succession of substantially rhombic blanks advancing flatwise in spaced relation, the improvement which consists in folding inwardly each blank's side flaps, changing the spaced relation of the advancing partly folded blanks to a shallowly shingled or stepped relation, wherein each blank's seal flap slightly overlaps the bottom edges of an adjacent blank's infolded side flaps, and producing at each zone of slight flap overlap of the advancing so-shingled blanks a single adhesive imprint, common to both blanks, whereby one has its seal flap gummed fully to the edge and the other receives adhesive for subsequent sticking of its bottom flap to said infolded side flaps.

27. In envelope manufacture, for the application of seal flap adhesive and seam-sticking adhesive to a succession of substantially rhombic blanks advancing flatwise in spaced relation, with their seal flap portions trailing, the improvement which consists in folding inwardly each blank's side flaps, changing the spaced relation of the advancing partly folded blanks to a shallowly shingled or stepped relation, wherein each blank's seal flap slightly overlaps the bottom edges of the next blank's infolded side flaps, and producing at each zone of slight flap overlap of the advancing so-shingled blanks a single adhesive imprint, common to both blanks, whereby one has its seal flap gummed fully to the edge and the other receives adhesive for subsequent sticking of its bottom flap to said infolded side flaps.

28. In the manufacture of envelopes from a succession of substantially rhombic blanks advancing flatwise in spaced relation, the improvement which consists in folding inwardly the side flaps of each blank, then assembling the partly-folded blanks in a shingled or stepped relation, wherein each blank's seal flap slightly overlaps the bottom edges of an adjacent blank's infolded side flaps, causing the so-shingled blank assembled to receive at each zone of slight flap overlap a single adhesive imprint common to the two blanks thereof, whereby one blank's seal flap is gummed to its extreme edge and the other blank's infolded side flaps receive seam-sticking adhesive, and thereafter disassembling said blanks and restoring their spaced relation to permit each blank's bottom flap to be folded into pocket-forming engagement with the adhesive on said infolded side flaps.

29. In the manufacture of envelopes from a succession of substantially rhombic blanks advancing flatwise in spaced relation, with their seal flap portions trailing, the improvement which consists in folding inwardly the side flaps of each blank, then assembling the partly-folded blanks in a shingled or stepped relation, wherein each

blank's seal flap slightly overlaps the bottom edges of the next blank's infolded side flaps, causing the so-shingled blank assembly to receive at each zone of slight flap overlap a single adhesive imprint common to the two blanks thereof, whereby one blank's seal flap is gummed to its extreme edge and the other blank's infolded side flaps receive seam-sticking adhesive, and thereafter disassembling said blanks and restoring their spaced relation to permit each blank's bottom flap to be folded into pocket-forming engagement with the adhesive on said infolded side flaps.

30. In the manufacture of envelopes, from a succession of substantially rhombic blanks advancing flatwise, bottom flaps foremost, in spaced relation, the improvement which consists in successively folding inwardly each blank's side flaps, progressively assembling the advancing partly-folded blanks in a shingled or stepped relation, to slightly overlap each blank's seal flap edge upon the bottom edges of the following blank's infolded side flaps, producing at each zone of slight flap overlap of said assembly a single adhesive imprint common to the two blanks thereof, to supply one blank with seal flap adhesive and the other with seam sticking adhesive, then restoring the spaced relation of said blanks, and causing each blank's bottom flap to be folded into seam-forming relation with said last-mentioned adhesive.

31. In mechanism for making envelopes from a succession of substantially diamond-shaped blanks, a rotary overgumming adhesive applicator for the seal flap margins of said blanks, means for folding inwardly the side flaps of the successive blanks during their advance in spaced relation, means for reducing, at the same point in each blank's movement, its speed of advancement, to establish a shallow shingled relation of only such depth as to overlap the edge of each blank's seal flap upon the proximate edges of an adjacent blank's folded-over side flaps, means for coordinating the rotation of said applicator to the reduced speed movement past same of the so-shingled blanks for the gumming of each seal flap to its extreme edge, and for the deposit of said applicator's excessive adhesive upon the adjacent blank, near its overlapped proximate side flap edges, and means for progressively de-shingling said blanks, and folding their respective bottom flaps against the adhesive on their folded-over side flaps.

32. In mechanism for making envelopes from a succession of substantially diamond-shaped blanks, a rotary overgumming adhesive applicator for the seal flap margins of said blanks, means for folding inwardly the side flaps of the successive blanks during their advance in spaced relation, means for reducing, at the same point in each blank's movement, its speed of advancement, to establish a shallow shingled relation of only such depth as to overlap the edge of each blank's seal flap upon the proximate edges of an adjacent blank's folded-over side flaps, means for coordinating the rotation of said applicator to the reduced speed movement past same of the so-shingled blanks for the gumming of each seal flap to its extreme edge, and for the deposit of said applicator's excess adhesive upon the adjacent blank, near its overlapped proximate side flap edges, means operating on each blank beyond said applicator to space it from the following blanks, and means for thereafter folding the bottom flap of each so-spaced blank against the adhesive on its folded-over side flaps.

33. In envelope manufacture, for the application of seal flap adhesive and seam-sticking adhesive to a succession of blanks advancing flatwise in spaced relation, the improvement which consists in folding inwardly each blank's side flaps, changing the spaced relation of the advancing partly folded blanks to a shallowly shingled or stepped relation wherein the seal flap margin of each blank and the proximate seam forming margins of the next blank's infolded side flaps are exposed in juxtaposed relation, and imprinting with adhesive the successive pairs of juxtaposed different marginal flap areas of the so-shingled blank assembly, to provide at each imprinting operation, the seal flap adhesive for one blank and the seam-sticking adhesive for the other.

34. In envelope manufacture, for the application of seal flap adhesive and seam-sticking adhesive to a succession of blanks advancing flatwise in spaced relation, the improvement which consists in folding inwardly each blank's side flaps, reducing, at the same point in each blank's movement, its speed of advancement, to establish a shallowly shingled or stepped relation wherein the seal flap margin of each blank and the proximate seam-forming margins of the next blank's infolded side flaps are exposed in juxtaposed relation, and imprinting with adhesive, during the reduced speed advancement of such so-shingled blank assembly, the successive pairs of so-juxtaposed different marginal flap areas to provide at each imprinting operation, the seal flap adhesive for one blank and the seam-sticking adhesive for the other.

35. In envelope manufacture, for the application of seam-sticking adhesive to a succession of blanks advancing flatwise in spaced relation, the improvement which consists in folding inwardly each blank's side flaps, reducing, at the same point in each partly folded blank's movement, its speed of advance, to establish a shallowly shingled or stepped relation wherein the seal flap margin of each blank and the proximate seam-forming margins of the next blank's infolded side flaps are exposed in juxtaposed relation, and imprinting with adhesive, during the reduced speed advancement of such so-shingled blank assembly, each blank's said marginal side flap areas, to provide the seam-sticking adhesive thereof.

36. In envelope manufacture, for the application of shaped or contoured areas of adhesive to the seal flaps of a succession of blanks, advancing flatwise in spaced relation, the improvement which consists in folding inwardly each blank's side flaps, reducing, at the same point in each partly folded blank's movement, its speed of advancement, to establish a shallowly shingled or stepped relation wherein the seal flap margin of each blank and the proximate seam-forming edges of the next blank's infolded side flaps are exposed in juxtaposed relation, and imprinting with adhesive, during the reduced speed advancement of such so-shingled blank assembly, the successive spaced-apart marginal seal flap areas thereof.

37. In envelope making mechanism, means for advancing a succession of blanks in spaced relation, means for folding inwardly each blank's side flaps, means for reducing at the same point in each so-folded blank's movement its speed of advancement, to establish a stepped or shingled relation wherein each blank's seal flap and the proximate seam-forming edges of the next blank's infolded side flaps are exposed in juxtaposed relation, and a rotary glue imprinting segment having a peripheral speed corresponding to said reduced speed of blank advancement for imprinting shaped areas of glue upon the successive seal flap marginal areas of said shingled blank assembly.

38. In envelope making mechanism, means for advancing a succession of blanks in spaced relation, means for folding inwardly each blank's side flaps, means for reducing at the same point in each so-folded blank's movement its speed of advancement, to establish a stepped or shingled relation wherein each blank's seal flap edge and the proximate seam-forming edges of the next blank's infolded side flaps are exposed in juxtaposed relation, and a rotary glue imprinting segment having a peripheral speed corresponding to said reduced speed of blank advancement for imprinting seam-sticking glue on each blank, along the aforesaid seam-forming edges of its infolded side flaps.

39. In envelope making mechanism, means for advancing a succession of blanks in spaced relation, means for folding inwardly each blank's side flaps, means for reducing at the same point in each so-folded blank's movement its speed of advancement, to establish a stepped

or shingled relation wherein each blank's seal flap and the proximate seam-forming edges of the next blank's infolded side flaps are exposed in juxtaposed relation, and a rotary glue imprinting segment having a peripheral speed corresponding to said reduced speed of blank advancement for imprinting glue on the successive pairs of juxtaposed different marginal flap areas, whereby at each operation thereof to imprint seal flap glue on one blank and seam-sticking glue on the other blank.

40. In mechanism for making envelopes from a succession of blanks advancing in spaced relation at high speed, means for folding inwardly the lateral pocket-forming flaps of successive so-advancing blanks, means for so slowing down, at the same point in each so-folded blank's movement, its speed of advance, as to create a slow-moving shallowly shingled blank assembly that exposes the seam forming margins of each blank's infolded lateral flaps in close proximity to the adjacent blank's seal flap margin, means for imprinting with adhesive the successive so-exposed seam forming margins, means operative on each blank, after such application thereto of adhesive, to restore its high speed advancement and its spaced relation to the next-following blank, and means operative on each blank during its restored high speed advancement for folding inwardly its lower pocket-forming flap into adhesive-seam connection with the imprinted marginal areas of said previously-folded lateral pocket-forming flaps.

41. In mechanism for making envelopes from a succession of blanks advancing in spaced relation at high speed, means for folding inwardly the lateral pocket-forming flaps of successive so-advancing blanks, means for so slowing down, at the same point in each so-folded blank's movement, its speed of advance, as to create a slow-moving shingled or overlapped blank assembly wherein corresponding marginal areas of each blank's infolded flaps are left uncovered by the adjacent blank of said assembly, means for imprinting with adhesive the successive so-uncovered areas of said slow-moving blank assembly, means operative on each blank, after such application thereto of adhesive, to restore its high speed advancement and its spaced relation to the next-following blank, and means operative on each blank during its restored high speed advancement for folding inwardly its lower pocket-forming flap into adhesive-seam connection with the imprinted marginal areas of said previously-folded lateral pocket-forming flaps.

42. In envelope making mechanism, means for advancing a succession of blanks at high speed in spaced relation, with their bottom and lateral pocket-forming flaps extended, means operative on each blank during its said high speed advance to fold inwardly its lateral pocket-forming flaps, means for changing, at the same point in each so-folded blank's movement its speed of advancement, for progressive creation of a shallowly shingled blank assembly wherein marginal areas of each blank's infolded lateral pocket-forming flaps are left exposed in close proximity to the preceding blank's seal flap margin, adhesive imprinting means, rotating in step with said changed speed, for producing adhesive imprints on the successive so-exposed marginal flap areas of the blanks of said assembly, means operative on each foremost blank of said assembly, after such application thereto of adhesive, to restore its high speed advancement and its spaced relation to the next-following blank, and means for then folding inwardly the bottom pocket-forming flap of each blank, into adhesive seam connection with its previously infolded lateral pocket-forming flaps.

43. In the manufacture of envelopes from a succession of blanks advancing in spaced relation at high speed, the improvement which consists in folding inwardly the lateral pocket-forming flaps of each such blank, so slowing down, at the same point in each so-folded blank's movement, its speed of advance as to create a slow-moving shallowly shingled blank assembly wherein seam-forming marginal areas of each blank's infolded lateral flaps are left exposed in close proximity to the preceding blank's seal flap margin, imprinting with adhesive, at the slowed down speed of said blank assembly, the successive so-exposed marginal areas of its blanks' lateral pocket-forming flaps, restoring to each blank, after such adhesive application, its high speed advancement and its spaced relation to the next-following blank, and folding inwardly, during each blank's restored high speed advancement, its lower pocket-forming flap, to obtain adhesive seam connection thereof with the imprinted marginal areas of its previously-folded lateral pocket-forming flaps.

44. In the manufacture of envelopes from a succession of blanks advancing in spaced relation at high speed, the improvement which consists in folding inwardly the lateral pocket-forming flaps of each such blank, so slowing down, at the same point in each so-folded blank's movement, its speed of advance as to create a slow-moving shingled blank assembly wherein corresponding marginal areas of each blank's infolded lateral flaps and of the adjacent blank's seal flap are exposed in juxtaposed relation, imprinting with adhesive the successive pairs of said so-exposed flap areas of the slow-moving blank assembly, restoring to each blank, after such adhesive application, its high speed advancement and its spaced relation to the next-following blank, and folding inwardly, during each blank's restored high speed advancement, its lower pocket-forming flap, to obtain adhesive seam connection thereof with the imprinted marginal areas of its previously-folded lateral pocket-forming flaps.

45. In the manufacture of envelopes from a succession of blanks advancing at high speed in spaced relation with their bottom and lateral pocket-forming flaps extended, the improvement which consists in folding inwardly during each blank's high speed advance its lateral pocket-forming flaps, reducing at the same point in each so-folded blank's movement its speed of advancement, thereby to create with the next-following so-folded blank a shallowly shingled or overlapped relation that exposes corresponding marginal areas of each blank's infolded lateral pocket-forming flaps in close proximity to the seal flap margin of the preceding blank, imprinting with adhesive, at said reduced speed of the so-shingled blanks, the so-exposed marginal areas of each blank's lateral pocket-forming flaps, restoring to each blank, after such application thereto of adhesive, its high speed advancement and its spaced relation to the next-following blank, and folding inwardly, during each blank's restored high speed advancement, its bottom pocket-forming flap to obtain adhesive seam connection thereof with the adhesive-imprinted margins of its previously-folded lateral pocket-forming flaps.

46. In envelope making mechanism, means for advancing a succession of blanks at high speed in spaced relation, means for folding in the side flaps of successive so-advancing blanks, pairs of narrow rolls operative on the opposite side edge folds of each blank to continue its advance, but at such a lower speed, that its overlap with the blank next following exposes in juxtaposed relation the seam-forming margins of one blank's infolded side flaps, and the seal flap margin of the other blank, means for imprinting with adhesive the so-exposed areas of the slow moving overlapped blanks, narrow rolls operative on the side edge folds of each blank beyond said adhesive applications to restore its high speed advancement and its spaced relation to the next-following blank, and means operative on each blank during its restored high speed advancement for folding inwardly its lower pocket-forming flap into adhesive seam connection with the margins of its previously-infolded side flaps.

47. In envelope making mechanism, means for advancing a succession of blanks at high speed in spaced relation, means for folding in the side flaps of successive so-advancing blanks, pairs of narrow rolls operative on the opposite side edge folds of each blank to continue its advance, but at such a lower speed that its overlap with the

blank next following exposes corresponding marginal areas of each blank's infolded side flaps, means for imprinting with adhesive the so-exposed side flap areas of each slow moving blank, narrow rolls operative on the side edge folds of each blank beyond said adhesive applications to restore its high speed advancement and its spaced relation to the next-following blank, and means operative on each blank during its restored high speed advancement for folding inwardly its lower pocket-forming flap into adhesive seam connection with the margins of its previously-infolded side flaps.

48. In mechanism for making envelopes from a succession of blanks advancing flatwise, seal flaps trailing, in spaced relation, means for folding inwardly the side flaps of the successive so-advancing blanks, means for thereafter so slowing down each blank's advance as to produce a shingling or overlap with the next blank that exposes in juxtaposition the seal flap margin of one and the seam forming edges of the other's infolded side flaps, rotary glue-imprinting means past which the slowed down so-shingled blanks are moved, and means for operating said glue imprinting means in timed relation to the slowed down movement past same of the so-shingled blanks, for the deposit of a portion of its adhesive on each seal flap margin and for the deposit of another portion of its adhesive along the seam forming edges of the next blank's infolded side flaps.

49. In mechanism for making envelopes, a pair of spaced apart blank forwarding sections for the high-speed movement of successive blanks in spaced relation, the first said section having means for folding inwardly the side flaps of the so-spaced blanks, and the second said section having means for folding inwardly each blank's back or bottom flap, to overlap margins of its previously infolded side flaps, a low speed blank forwarding section between said two high-speed sections, for progressively collecting and forwarding the successive blanks, with side flaps infolded, in a shallowly shingled assembly which exposes each blank's said side flap margins in close proximity to the adjacent blank's seal flap margin, and a glue imprinting device, rotating in step with the relatively low speed imparted to said shingled blank assembly by said low speed blank forwarding section, for imprinting with glue each seal flap and the adjacent edges of the so-exposed side flap margins of each blank, before the latter is separated from said assembly by said second high speed blank forwarding section.

References Cited in the file of this patent

UNITED STATES PATENTS

1,121,126	Novick	Dec. 15, 1914
1,943,985	Novick	Jan. 16, 1934
1,985,859	Goder	Dec. 25, 1934
2,087,345	Heywood	July 20, 1937