

Sept. 16, 1958

V. E. HEYWOOD

2,851,934

MANUFACTURE OF ENVELOPES

Filed July 10, 1957

2 Sheets-Sheet 1

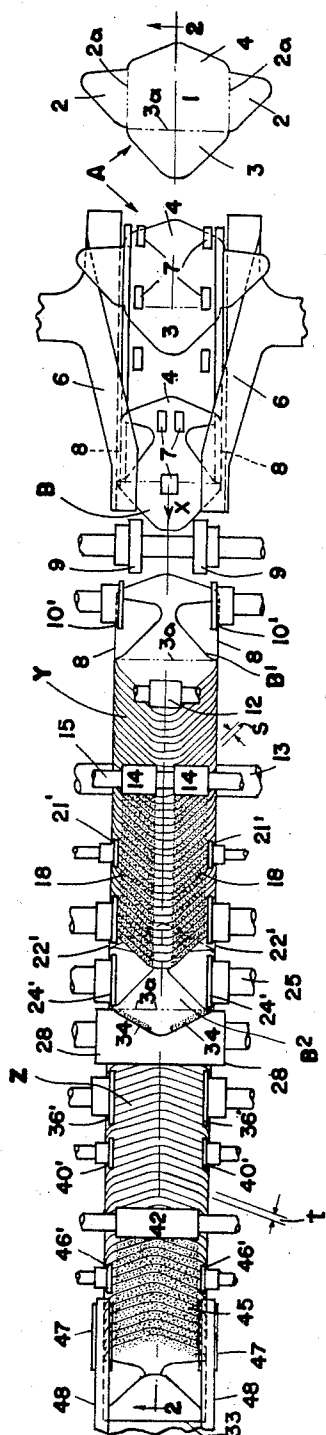


Fig. 1.

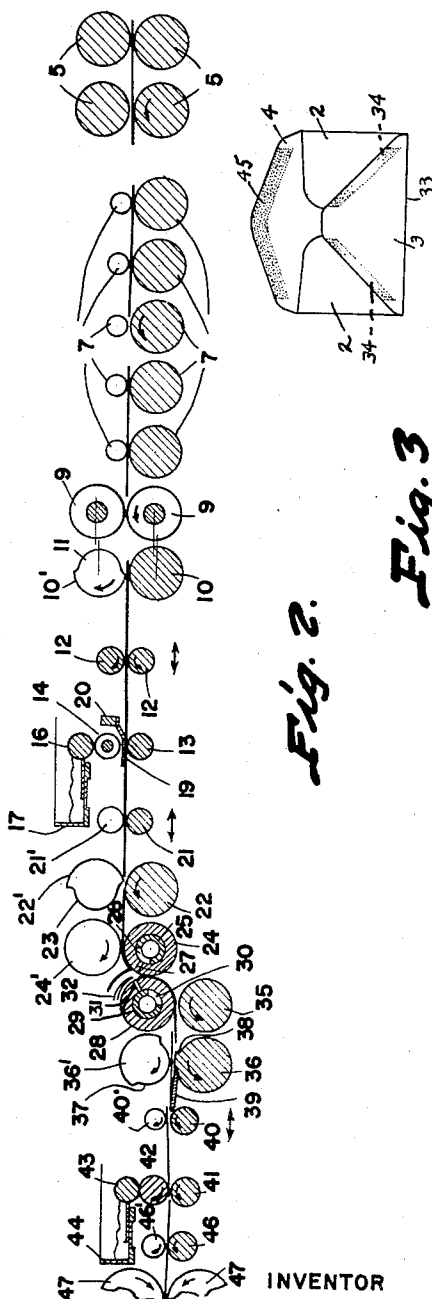


Fig. 2.

Fig. 3.

INVENTOR
VINCENT E. HEYWOOD
BY
Edward F. Kennedy Jr.
ATTORNEY

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2 Sheets-Sheet 2

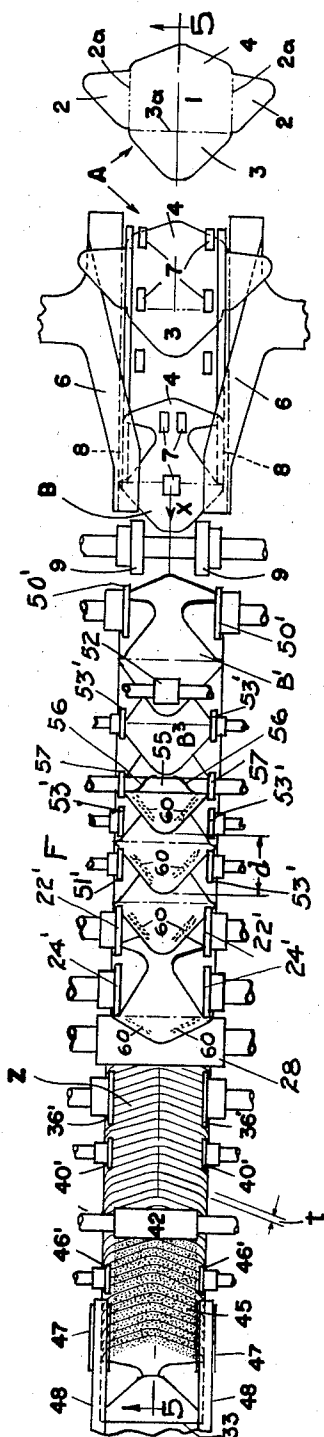


Fig. 4.

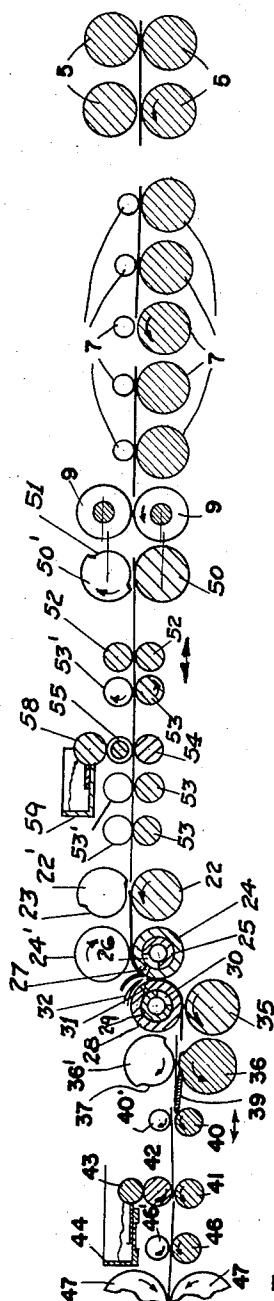


Fig. 5.

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

2,851,934

MANUFACTURE OF ENVELOPES

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

Application July 10, 1957, Serial No. 670,981

8 Claims. (Cl. 93—62)

This application is a continuation-in-part of my co-pending application Serial No. 375,091 for Manufacture of Envelopes, which was filed August 19, 1953, now abandoned.

The present invention, like that of my United States Patent No. 2,772,611, dated December 4, 1956, for Envelope Making Method and Mechanism, deals with methods and means by which to obtain very rapid production of envelopes, through the elimination, in their continuous or rotary machine manufacture, of a certain production "bottleneck" which has heretofore always operated against any appreciable stepping up of such a machine's rate of envelope production.

This production "bottleneck" of all previous rotary envelope-making machines results, as described in my aforesaid patent, from a sequence of operations that requires the successive envelope blanks to receive their imprints of seam-sticking glue whilst advancing rapidly in individualized or spaced-apart relation at the maximum speed of blank travel attained in the machine. That is to say, in all previous rotary machines, a definite limit or ceiling on blank speed (and thus on the machine's rate of envelope production) is imposed by the effect of centrifugal force on the rotating segments or dies that are conventionally employed to imprint the seam-sticking glue, since such segments or dies must operate at peripheral speeds that keep pace with the maximum speed of blank travel through the machine. Thus it follows, with any appreciable stepping up of such a conventional rotary machine's rate of envelope production, that minute glue particles thrown off centrifugally from the speeded up rotary dies or segments, will invariably accumulate on blank-contacting machine surfaces exposed between the advancing spaced-apart blanks, to quickly foul up the machine's operation, and necessitate its stoppage.

In the method and apparatus of my aforesaid patent, notwithstanding the leeway for much faster envelope production afforded by the relatively low peripheral speed of its rotary seam glue imprinting device, the latter's tendency to throw off glue centrifugally is still a production limiting factor, especially when envelopes of large size or being made.

Moreover, the advantageous "overgumming" of seal flaps, by the two-purpose rotary glue imprinting device of said patent, can be achieved only when the blanks are of substantially rhombic or diamond shape, presenting seal flap edges of the same angularity as the seam forming edges of their side flaps.

On the other hand, in rotary machine envelope manufacture by the novel flap holding and blank gluing sequences and arrangements of the present invention, no corresponding limitations are imposed, either on the machine's rate of envelope production, or on the size or shape of the blanks which are converted thereby into envelopes.

Other and further objects and advantages of the instant invention will be made apparent by the following detailed

description thereof taken in connection with the accompanying drawings, in which:

Fig. 1 is a plan view illustrating one form of the envelope making method and apparatus of my invention, but omitting, for the sake of clearness, certain glue receptacles and glue transfer rolls.

Fig. 2 is a vertical sectional view on the line 2—2 of Fig. 1 and showing also the elements omitted from Fig. 1.

Fig. 3 is a larger scale view of one of the envelopes produced by my invention, from blanks such as shown at the right-hand end of Fig. 1.

Figs. 4 and 5 are views, similar to Figs. 1 and 2 respectively, of another form of my invention, Fig. 5 being a section on the line 5—5 of Fig. 4.

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

My invention achieves extremely high speed envelope manufacture from flat blanks of any conventional shape, such as shown in Figs. 1 and 4 by the blanks A, A, each providing beyond its usual rectangular body portion 1 the opposite triangular side flaps 2, 2, and the opposite dissimilar bottom and seal flaps 3 and 4 respectively. It is contemplated that a succession of these or other appropriate blanks will be rapidly fed one by one, either from a supply stack, or, in the case of substantially rhombic shapes, from suitable cut-off devices operable on a traveling paper web. In any case, the successive blanks, such as A, A, by the action of suitable feed rolls or the like (not shown except at 5, 5 Figs. 2 and 5) are advanced rapidly, in spaced relation, to the illustrated mechanism, each with its bottom or back flap 3 leading, and with its inside surface uppermost; preferably each blank A, during its said advance, receives lines of scoring 2a and 3a at the bases of its side and bottom flaps.

The initial operation here, the same as in my aforesaid patent, is to fold inwardly the side flaps 2, 2 of each of the advancing spaced blanks A. For this purpose the mechanism, in the path of the rapidly advancing spaced blanks, provides conventional "plowshare" folding devices 6, 6 (see Figs. 1 and 4) having suitably arranged lower and upper feed rolls 7, 7 which continue each blank's advance at the same high speed imparted by the rolls 5, 5. The "plowshare" folders 6, 6 operate in the usual and well known manner to obtain, by each blank's movement therethrough, the inward folding on score lines 2a, 2a of its side flaps 2, 2 against its body portion 1 to give it the parallel side edge folds 8, 8, as shown by the blanks B and B', Figs. 1 and 4. In this partly folded condition, the successive spaced blanks, moving parallel to their side edge folds 8, 8, have their advance in the same direction (arrow x) continued by suitable high speed forwarding rolls 9, 9, operating at substantially the same peripheral speed as the preceding rolls 5, 5 and 7, 7.

In the form of my invention shown by Figs. 1 and 2, the successive spaced partly-folded blanks next encounter cooperating spaced sets of high speed rolls and low speed rolls (here shown at 10, 10' and 12, 12 respectively) which function as hereinafter described to collect said blanks progressively, for seam glue applying purposes, in the keep shingled slow speed blank assembly shown at Y in Fig. 1. Close or deep shingling of envelope blanks is not, per se, new—having long been used, both with unfolded and partly-folded blanks, in the well known coating or spreading process of seal flap gumming, as exemplified by the patents of Novick No. 1,121,125, Pflanze No. 1,385,468, Novick No. 1,943,985 and Winkler et al. No. 2,132,227.

The purpose and effect of such prior art close shingling is to dispose in adjacent relation, for continuous en masse gumming, the inside marginal surfaces of the blanks' trailing seal flaps. When this close shingled blank as-

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sembly, for continuous seal flap gumming, is established, the margins of the respective blanks' leading back flaps, on the opposite or under side of the assembly, will also be exposed in similar adjacent relation. But such adjacency of the back flap marginal areas is of no avail, for flap gumming purposes, because it is of the outside surfaces, rather than of the inside surfaces, of said back flap margins. However, in the instant blank assembly Y, as hereinafter described, the adjacency is of the inside marginal surfaces of the respective blanks' leading back or bottom flaps 3, 3.

For the progressive formation of the illustrated blank assembly Y, each partly folded blank B emerging from high speed rolls 9, 9 has its advance continued by an adjacent high speed blank forwarding means, here shown as consisting of a lower roll 10, and a cooperating pair of upper narrow rolls or discs 10', 10', the latter engaging with each blank along its opposite side edge folds 8, 8. Said narrow rolls 10', 10' are appropriately relieved, as shown at 11, Fig. 2, so as to release each blank and discontinue its high speed advance, at the instant that its leading bottom flap 3 encounters and is seized in the bite of a pair of slow speed blank forwarding rolls 12, 12. The latter, as a unit, are made adjustable (see arrows Fig. 2) toward and away from rolls 10, 10', to accommodate the spacing to blanks of longer or shorter dimension, measured in the direction of blank travel through the mechanism.

Rolls 12, 12 have a peripheral speed which is only a very small fraction of the peripheral speed of the preceding rolls 5, 5, 7, 7, 9, 9 and 10, 10'. Thus each partly folded blank B, as it encounters the rolls 12, 12, has its speed of advance so drastically reduced that it is almost entirely overtaken by the next following fast moving blank, before the latter, in turn, is slowed down by said rolls 12, 12. In other words, while such a following fast moving blank is being advanced by rolls 9, 9 and 10, 10' from position B to position B' (see Fig. 1) the preceding blank, under the influence of the slow rolls 12, 12, will have moved forward only the short distance represented on Fig. 1 by the shingle dimension "S."

The latter is the width of the narrow marginal inside surface area of each blank's leading bottom flap 3 which is not overtaken by the next following blank, in the above described successive overtaking operations. Each such overtaking occurs in the absence of edgewise collision between the respective slow moving and fast moving blanks, and always with the latter projected forward in overlying or topside relation to the former, by reason of high speed rolls 10, 10', being arranged to operate, as shown in Fig. 2, at a slightly lower level than the preceding high speed rolls 9, 9.

Thus by conjoint action of rolls 9, 9, 10, 10' and 12, 12, the successive partly folded blanks B, B are progressively collected in a slow moving closely shingled or stepped assembly, as indicated at Y in Fig. 1. Therein each blank, except for an exposed narrow area of width "S" along the inside margin of its leading bottom flap 3, is overlain and covered by the next following blank.

Beyond the range of forward adjustment of the shingling rolls 12, 12, are provided suitable roller elements which continue the slow speed advance of the shingled blank assembly Y, and which serve also to spread or roll seam sticking glue onto the exposed narrow bottom flap margins of its constituent partly folded blanks. These roller elements comprise a lower roll 13 and a cooperating upper roll which, for seam gluing of blanks such as A, A with non-meeting side flaps, is made in two spaced sections 14, 14, mounted on a common shaft 15. The roller elements 13, 14 have the same low peripheral speed as the shingling rolls 12, 12, so as to continue the latter's slow speed advance of the closely shingled blank assembly Y.

The peripheral surfaces of the two upper roll sections

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14, 14 are continuously supplied with seam sticking glue by a conventional glue transfer roll 16, associated with a glue supply tub 17, as shown in Fig. 2. This glue, by the slow rotation of the spaced roll sections 14, 14, is continuously and progressively spread onto the adjacently exposed inner surfaces of leading bottom flap margins of slow moving blank assembly Y in two parallel stripes, as indicated by the stipling 18, 18 in Fig. 1. Any tendency of said bottom flap margins to be deflected upwardly, as by adhesion to the glue spreading rolls 14, 14 can be counteracted and overcome, as shown in Fig. 2, by a suitable spring member 19 stationarily supported at 20 and adapted to bear lightly on the unglued central portions of said margins between said glue stripes 18, 18.

As shown in Fig. 1 the so-glued blanks remain in the closely shingled assembly Y for a considerable distance beyond the rolls 13, 14, since no blank can be de-shingled (i. e. pulled away at high speed from the front of said assembly) until its trailing seal flap 4 has passed beyond the slow speed rolls 13, 14. Initial elements of a suitable high speed blank de-shingling means are shown at 22, 22', in spaced relation to the slow speed rolls 13, 14. In the intervening space I provide suitable slow speed forwarding means for preserving and maintaining the closely shingled blank assembly Y and for continuing its advance at the same slow speed imparted thereto by the rolls 12, 12 and 13, 14. This intermediate slow speed forwarding means consists, as here shown, of a lower roll 21 and a pair of aligned cooperating narrow rolls or discs 21', 21', the latter engaging the shingled blanks along their overlapped side edge folds 8, 8, beyond the outer edges of the rolled on seam gluing 18. Said slow speed rolls 21, 21' are arranged for adjustment as a unit (see arrows; Fig. 2), toward or away from the high speed de-shingling elements 22, 22', in the same manner and for the same purpose as the corresponding adjustment above described of the shingling rolls 12, 12, toward or away from the high speed blank forwarding rolls 10, 10'.

The initial elements of my aforesaid high speed de-shingling means comprise, as here shown, a lower roll 22 and a cooperating pair of narrow upper rolls or discs 22', the latter engaging each arriving blank by its side edge folds 8, 8, beyond the outer ends of its marginal bottom flap gumming. Said narrow rolls 22' are appropriately relieved, as shown at 23, Fig. 2, to obtain intermittently the one by one seizure and speed up of successive front blanks of assembly Y, as each, by said assembly's slow travel, is moved into seizure position, in the interval during which the reliefs 23 are opposite the roll 22. Each seized blank's speed up is very drastic, since rolls 22, 22' operate at the same high peripheral speed as the preceding blank forwarding rolls 5, 5, 7, 7, 9, 9, and 10, 10', thereby in this progressive de-shingling of the blanks to restore to each in turn its original high speed of advance and its spaced relation to the blank next following.

This same high peripheral speed is also imparted to immediately adjacent roller elements, consisting as here shown of a lower drum or cylinder 24 and a pair of cooperating narrow rolls or discs 24' for seizing and forwarding each speeded up blank by its side edge folds 8, 8, before the latter are released by the reliefs 23 of the preceding narrow high speed rolls 22'. Said elements 24, 24' besides participating, as above described, in these successive high speed de-shingling operations, at the leading end of blank assembly Y, are also involved in the ensuing folding over of each de-shingled blank's marginally glued bottom flap 3, on its score line 3a. This folding operation, for which each blank is conditioned by being individualized through its high speed pull out from the shingled assembly Y, may be performed, as here shown, by an arrangement similar in character to

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that disclosed for bottom flap folding in my aforesaid Patent No. 2,772,611.

That is to say, the drum or cylinder 24 is shown in Fig. 2 as mounted, for its high speed rotation, on a stationary hollow shaft 25, whose interior is connected to any suitable source of suction, such as a vacuum pump, not shown. Stationary hollow shaft 25 has a longitudinal port 26, of substantially 90° circumferential extent, with which is adapted to register periodically the inner end of a passage 27 extending radially through the cylinder 24, and terminating on its periphery in an elongated slit or slits, for the suction seizure, on each revolution of said cylinder, of a so-individualized fast moving blank.

The high speed counterclockwise rotation of cylinder 24 is so timed to the high speed blank travel, that each blank is suction seized at or just behind its score line 3a, by the terminal slit or slits of passage 27, as the latter, substantially at the top of its travel, comes into communication with the port 26 of shaft 25. The blank B² is shown in Figs. 1 and 2 as having been thus suctionally seized and drawn downwardly, by the cylinder's rotation, toward the line of bite between said cylinder 24 and an adjacent pressing and forwarding cylinder 28, which rotates clockwise at the same high peripheral speed as that of cylinder 24.

Cylinder 28 is mounted, for its high speed rotation on a stationary hollow shaft 29, also connected to said source of suction, and providing a longitudinal port 30, of substantially 90° circumferential extent, with which is adapted to register the inner end of a radial passage 31 of cylinder 28. Said passage 31 terminates on said cylinder's periphery in an elongated slit or slits for the suction seizure, on each revolution of said cylinder, of each individualized blank which, as above described, is drawn downwardly by the cylinder 24.

The respective ports 26 and 30 of hollow shafts 25 and 29 are so positioned, as shown in Fig. 2, that suction through passage 31 becomes available, for blank seizure by cylinder 28, substantially coincidental with the cut-off of suction through passage 27, to release such blank from the cylinder 24. The transfer of each blank, from cylinder 24 to cylinder 28 occurs as their respective suction passages 27 and 31 come into opposing substantial alignment, with the passage 31 seizing the blank in the same location as passage 27, viz. at or just behind its score line 3a. As each blank moves downwardly (see B²) with cylinder 24, its forwardly projecting glued bottom flap 3, ahead of said score line, is deflected upwardly, away from contact with the oppositely traveling surface of cylinder 28, by engagement with a suitable stationary guard plate 32 (see Fig. 2).

Such deflection tends to bend upwardly each bottom flap 3 on its suctionally gripped score line 3a, said bending, in the case of blank B², Fig. 1, being reflected by a foreshortening of its bottom flap 3. Said bending increases, and ultimately becomes a pronounced transverse fold (see 33, Figs. 1 and 3) as the downward high speed movement, first by cylinder 24 and then by cylinder 28, carries each blank, score line 3a leading, between said two cylinders. The latter's pressing action accentuates said fold, and then is exerted on each individualized blank, to obtain an effective overlapped adhesive seam connection for pocket-forming purposes, between its bottom flap's marginal wet gluing 34 and the proximate edges of its previously infolded side flaps 2, 2.

With each individualized blank thus converted in succession by the folding in of its bottom flap 3, to a pocketed element, moving downwardly, fold 33 leading on cylinder 28, its release from said cylinder's suction passage 31 takes place on the latter's passage, at the bottom of its travel, beyond the port 30. This transfers the advance of each pocketed element (a complete envelope except for seal flap gluing) to the bite between cylinder 28 and a cooperating lower roll 35 which rotates counterclockwise at the same high peripheral speed as

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said cylinder. It will be understood that successive pocketed elements arriving one after another between cylinder 28 and roll 35 are projected forward in spaced relation at the same high speed of movement as the successive flat blanks A, A are fed to the mechanism by the rolls 5, 5, 7, 7 and 9, 9.

My invention contemplates applying of glue to the trailing seal flaps 4, 4 of these pocketed elements (complete envelopes with unglued seal flaps) by the prior art spreading or coating process, substantially in the manner disclosed in the aforesaid Novick Patent No. 1,121,125. For the required close shingling, to bring into adjacency the inside marginal areas of the respective trailing seal flaps 4, 4, each pocketed element emerging from rolls 28, 35 has its advance continued by adjacent high speed forwarding means, here shown as consisting of a lower roll 36 and a cooperating pair of upper narrow rolls or discs 36', 36' for engaging each element along its opposite side edge folds 8, 8. Said narrow rolls 36', 36' are appropriately relieved, as shown at 37, Fig. 2, so as to release each pocketed element, and discontinue its high speed advance, substantially at the instant that its side edge folds 8, 8 encounter and are seized by low speed shingling devices, here shown as consisting of a lower roll 40 and a cooperating pair of upper narrow rolls or discs 40', 40', for engaging the successive pocketed elements by their side edge folds 8, 8. Slow speed rolls 40, 40' as a unit are made adjustable toward and away (see arrows, Fig. 2) from the high speed rolls 36, 36', to accommodate the spacing to pocketed elements of longer or shorter dimension, measured in the direction of their travel through the mechanism.

Rolls 40, 40' have a peripheral speed which is only a very small fraction of the peripheral speed of the preceding rolls 36, 36'. Thus each pocketed element, as it encounters the rolls 40, 40' has its speed of advance so drastically reduced that it is almost entirely overtaken by the next following fast moving pocketed element, before the latter in turn is slowed down by the rolls 40, 40'. In this overtaking or shingling action, provision is made for each fast moving pocketed element to be projected beneath the preceding slowed down pocketed element, by disposing the bight of slow rolls 40, 40' at a slightly higher level than the bight of fast rolls 36, 36' (see Fig. 2), and providing an upwardly sloping guide or skid 39 between said roll pairs to direct the bottom edge folds 33 of successive pocketed elements between the rolls 40, 40'. Additionally, for the same purpose, the lower high speed roll 36 is formed centrally with a raised projection 38 which, following release of each pocketed element by the reliefs 37, is adapted to elevate said element's trailing seal flap 4, so that the leading bottom edge fold 33 of the next following fast moving pocketed element will always be projected, by rolls 28, 35, beneath said trailing seal flap.

Thus by conjoint action of rolls 28, 35, 36, 36' and 40, 40', the successive spaced apart pocketed elements are progressively collected in a slow moving closely shingled or stepped assembly, as indicated at Z in Fig. 1. Therein each pocketed element overlies and covers the next following pocketed element except for an exposed narrow area, of shingle dimension "r," along the inside margin of the latter's trailing seal flap 4. Beyond the range of forward adjustment of rolls 40, 40' I provide suitable means for rolling or spreading glue, for envelope sealing purposes, upon the adjacent exposed trailing seal flap margins of the pocketed elements of the slow moving shingled assembly Z. Such means, as shown, consists of a lower roll 41 and an upper roll 42, both operating at the same low peripheral speed as the shingling rolls 40, 40' to continue the latter's slow speed advance of the shingled assembly Z.

The periphery of upper roll 42 is continuously supplied with seal flap glue by a conventional glue transfer roll 43, associated with a glue supply tub 44, as shown in

Fig. 2. This glue, by the slow rotation of roll 42 is continuously and progressively spread onto the exposed trailing seal flap margins of the slow moving assembly Z, in a wide band or stripe, as indicated by the stippling 45 in Fig. 1. Thus each pocketed element of said assembly Z has the inside margin of its seal flap appropriately coated with glue; the drying of such seal flap glue may be obtained by leaving the so-completed envelopes in the illustrated shingled relation Z for an appropriate length of time, and by directing heated air, if need be, onto the gluing 45. For such purposes, I have shown a lower roll 46 and cooperating upper narrow rolls or discs 46', 46', the latter contacting the shingled assembly Z beyond its gluing 45. Said rolls 46, 46' have the same low peripheral speed as the shingling rolls 40, 40', thereby to maintain intact the shingled assembly Z and to deliver same progressively at slow speed to a suitably elongated drying conveyor. The latter's receiving end is here indicated by conventional lower and upper pairs of pulleys 47, 47, which, in conjunction with other pulleys, not shown, carry the usual narrow lower and upper pairs of elongated endless traveling belts 48, 48, adapted to contact opposite surfaces of the overlapped envelopes along their side edges, beyond the wet gluing 45 on their seal flaps, to convey them, in shingled assembly, through a drying tunnel or the like, not shown.

In the form of my invention shown by Figs. 4 and 5, the successive spaced apart partly folded blanks B, B, beyond the high speed forwarding rolls 9, 9, undergo as before a topside shingling operation in which each blank is partially overtaken and overlapped by the one next following. But this topside shingling is here used to collect the blanks for seam gumming, not in a close order assembly such as shown at Y in Fig. 1, but rather in the shallowly shingled assembly shown in Fig. 4 at F, which assembly F, except for its being produced by topside overtaking of each blank, is similar to the shallowly shingled blank assembly shown at E in Fig. 1 of my aforesaid Patent No. 2,772,611.

For the progressive formation of the illustrated blank assembly F, each partly folded blank B emerging from high speed rolls 9, 9 has its advance continued by adjacent high speed forwarding means, here shown as consisting of a lower roll 50 and a cooperating pair of upper narrow rolls or discs 50', 50', the latter engaging with each blank along its opposite side edge folds 8, 8. Said narrow rolls 50', 50' are appropriately relieved, as shown at 51, Fig. 5, so as to release each blank and discontinue its high speed advance, at the instant that its leading back or bottom flap 3 encounters and is seized in the bite of a pair of slower speed blank forwarding rolls 52, 52. The latter, as a unit, are made adjustable (see arrows Fig. 5) toward and away from the rolls 50, 50', to accommodate the spacing to blanks of longer or shorter dimension, measured in the direction of blank travel through the mechanism.

The rolls 52, 52 have a peripheral speed which is somewhat less than one-half of the peripheral speed of the preceding rolls 5, 5, 7, 7, 9, 9 and 50, 50'. Thus each partly folded blank B, as it encounters the rolls 52, 52, has its speed of advance so reduced that it is overtaken for about one-half of its length by the next following fast moving blank B, before the latter, in turn, is slowed down by said rolls 52, 52. In other words, while such a following fast moving blank is being advanced by rolls 9, 9 and 50, 50' from position B to position B' (see Fig. 4) the preceding blank, under the influence of the slower rolls 52, 52 will have moved forward slightly less than one-half as far, i. e., to a position B², Fig. 4, wherein its trailing seal flap 4 and parts of its infolded side flaps 2, 2 are overlain by the forward portion of the following blank B'.

Thus it is by these successive overtakings that the partly folded blanks are collected progressively in the illustrated shallowly shingled assembly F, which advances

through the mechanism, at the slow speed imparted by the shingling rolls 52, 52, for the imprinting, as herein-after described, of seam glue along marginal areas of its constituent blanks' leading back or bottom flaps 3, 3. Each such overtaking occurs in the absence of edgewise collision between the respective slow moving and fast moving blanks, and always with the latter projected forward in overlying or topside relation to the former, by reason of high speed rolls 50, 50' being arranged to operate, as shown in Fig. 5, at a slightly lower level than the preceding high speed rolls 9, 9.

To obtain constant advance of blank assembly F, at the same reduced speed imparted by shingling rolls 52, 52, the mechanism has three sets of suitably spaced low speed forwarding rolls, which have engagement or bite with the assembly's successive blanks along the latter's side edge folds 8, 8. Each of these sets of low speed rolls consists of a lower roll 53 and a pair of aligned cooperating upper narrow rolls or discs 53', 53', all having the same low peripheral speed as the shingling rolls 52, 52, so as to keep the assembly F intact during the imprinting of seaming glue along the successive blanks' leading back flap margins, which margins in said assembly are spaced apart by the reduced distance *d*, Fig. 4.

The seam glue imprinting means is here shown as interposed between the first and second sets of low speed forwarding rolls 53, 53'. Said imprinting means comprises a lower or platen roll 54, and an upper shaft 55 of smaller diameter than said platen roll 54. Said shaft 55 is formed with a pair of spaced narrow raised helical ribs 56, 56 of opposite inclination, such that each rib's outer surface, by the rotation of shaft 55, moves in a circumferential path whose length is the reduced distance *d* (Fig. 4) that separates the successive leading back flap margins of the overlapped blanks of assembly F. Outwardly of the helical ribs 56, 56, the shaft 55 is formed with narrow collars or flanges 57, 57, for cooperation with the platen roll 54, to maintain the slow speed advance of assembly F, by engagement with its constituent blanks along their side edge folds 8, 8.

At each rotation of shaft 55, the outer surfaces of its helical ribs 56, 56 receive wet glue from their contact with a rotating overhead glue roller 58 (Fig. 5) which is mounted in a suitable glue supply tub 59. The timing is such that the glue thus picked up by ribs 56, 56 is transferred, by their ensuing further rotation, to the next arriving blank's leading back flap margin, so as to deposit thereon, slightly inwardly of the edge, a pair of convergent seam glue imprints as shown at 60, 60, Fig. 4.

Beyond the final (left-hand) set of slow speed forwarding rolls 53, 53', each foremost blank, of assembly F, is, in its turn, seized, speeded up, and pulled away from said assembly by the same high speed de-shingling means 22, 22' as are employed in Figs. 1 and 2 for de-shingling the successive foremost blanks of the blank assembly Y in said first-described form of my invention. Beyond said high speed de-shingling means 22, 22' of Figs. 4 and 5, the successive blanks are handled and converted into envelopes in exactly the same fashion, and by exactly the same means, as described above for Figs. 1 and 2. Since said handling and converting means in Figs. 4 and 5 are designated by the same reference characters as are used in Figs. 1 and 2, it is not necessary here to describe the same in further detail.

Any suitable gearing, not here shown, may be employed to impart to the several rolls their respective high peripheral speeds, and low peripheral speeds, as herein specified. Also, the illustrated mechanism, in addition to its adjustments above described for various lengths of blanks, can readily be accommodated to the handling of different widths of blanks, merely by adjusting, toward or away from center line 2—2 of Fig. 1 (or center line 5—5 of Fig. 4), the positions of the several sets of narrow forwarding rolls 10', 21', 22', 24', 36', 40', 46', 50' and 53' on their respective shafts.

Under all conditions, and regardless of the shape or size of the blanks being handled, my invention makes possible the rotary machine manufacture of envelopes at much higher rates of production than ever achieved heretofore. This results from my herein described sequence of envelope making operations which obtains all blank gluing, both for seal flap and seam sticking purposes, without any limiting effect whatsoever on the speed of blank movement to and through the machine.

Actually, the envelope production rate, in the preferred form of my invention shown in Figs. 1 and 2, is limited only by the speed at which it is practicable and feasible to perform on the blanks in process the two described flap folding operations, viz., for each blank, the initial infolding of its side flaps, and the subsequent folding over of its marginally glued back or bottom flap into adhesive seam connection with its side flaps. In other words, the rate of envelope production suffers no limitation or curtailment whatsoever, from the operations of applying to successive blanks (1) the seam sticking glue and/or (2) the seal flap glue. This is because of the fact that the gluing is applied, progressively and en masse, to inside seam flap margins as well as to inside seal flap margins of the successive blanks, with the latter collected, for each glue applying operation, in a slow speed closely shingled or stepped assembly that exposes only the desired glue-receiving inside flap margins to the action of the gluing roller or wiper.

I claim:

1. In the manufacture of envelopes from a succession of flat blanks advancing at high speed in spaced relation with their bottom flaps leading, the improvement which consists in folding inwardly the side flaps of the successive so-advancing spaced blanks, so progressively collecting the successive so-folded blanks in a low speed closely shingled assembly as to expose in adjacent relation, for continuous en masse gluing, the inside surfaces of the respective blanks' leading bottom flap margins, progressively spreading glue, by the low speed advance of said assembly, upon the so-exposed adjacent inside marginal surfaces of said leading bottom flaps, speeding up in succession each so-glued blank to restore its initial high speed of advance and its spaced relation to the blank next following, folding inwardly the bottom flaps of the successive speeded-up blanks, to produce, by adhesion of said bottom flaps to the previously infolded side flaps, a succession of pocketed elements, so progressively collecting the successive pocketed elements in a low speed closely shingled second assembly as to expose in adjacent relation, for continuous en masse gluing, the inside surfaces of the respective elements' trailing seal flap margins, and progressively spreading adhesive by the slow speed advance of said second assembly, upon the adjacent so-exposed trailing seal flap margins of the so-shingled pocketed elements.

2. In the manufacture of envelopes from a succession of flat blanks advancing at high speed in spaced relation with their bottom flaps leading, the improvement which consists in folding inwardly the side flaps of the successive so-advancing spaced blanks, so progressively collecting the successive so-folded blanks in a low speed closely shingled assembly as to expose in adjacent relation, for continuous en masse gluing, the inside surfaces of the respective blanks' leading bottom flap margins, progressively spreading glue, by the low speed advance of said assembly, upon the so-exposed adjacent inside marginal surfaces of said leading bottom flaps, speeding up in succession each so-glued blank to restore its initial high speed of advance and its spaced relation to the blank next following, folding inwardly the bottom flaps of the successive speeded-up blanks, to produce, by adhesion of said bottom flaps to the previously infolded side flaps, a succession of pocketed elements, so progressively collecting the successive pocketed elements in a low speed closely shingled second assembly as to expose in adjacent relation, for continuous en masse gluing, the inside surfaces of the

respective elements' trailing seal flap margins, progressively spreading adhesive by the slow speed advance of said second assembly, upon the adjacent so-exposed trailing seal flap margins of the so-shingled pocketed elements, and continuing the slow speed advance of said second assembly for the drying of the adhesive on said seal flaps.

3. In envelope making mechanism, means for advancing flat blanks at high speed in spaced relation, with their bottom flaps leading, means operative on each so-advancing blank to fold inwardly its side flaps, means for so progressively collecting the successive so-folded blanks in a low speed closely-shingled assembly as to expose in adjacent relation, for continuous en masse gluing, the inside surfaces of the respective blanks' leading bottom flap margins, means for progressively spreading glue, by the slow speed advance of said assembly, upon the so-exposed adjacent inside bottom flap margins of the successive shingled blanks, means for restoring in succession to each so-glued blank its high speed advance and its spaced relation to the blank next following, means for folding inwardly in succession the bottom flaps of the speeded-up blanks to produce, by adhesion of said bottom flaps to the previously infolded side flaps, a succession of pocketed elements, means for so progressively collecting the successive pocketed elements in a low speed closely-shingled second assembly as to expose in adjacent relation, for continuous en masse gluing, the inside surfaces of the respective elements' trailing seal flap margins, and means for progressively spreading glue, by the slow speed advance of said second assembly, upon the adjacent so-exposed trailing seal flap margins of the so-shingled pocketed elements.

4. In envelope making mechanism, means for advancing flat blanks at high speed in spaced relation, with their bottom flaps leading, means operative on each so-advancing blank to fold inwardly its side flaps, means for so progressively collecting the successive so-folded blanks in a low speed closely-shingled assembly that each blank, except for the margin of its leading bottom flap is overlain by the next-following blank, means for progressively spreading glue, by the slow speed advance of said assembly, upon the so-exposed adjacent bottom flap margins of the successive shingled blanks, means for restoring in succession to each so-glued blank its high speed advance and its spaced relation to the blank next following, means for folding inwardly in succession the bottom flaps of the speeded-up blanks to produce, by adhesion of said bottom flaps to the previously infolded side flaps, a succession of pocketed elements, means for so progressively collecting the successive pocketed elements in a low speed closely-shingled second assembly that each element, except for the margin of the trailing seal flap of its blank, underlies the preceding element, means for progressively spreading adhesive, by the slow speed advance of said second assembly, upon the adjacent so-exposed trailing seal flap margins of the so-shingled pocketed elements, and means for continuing the slow speed advance of said second assembly for the drying of the adhesive on said seal flaps.

5. In the method of making envelopes from a succession of flat blanks advancing in spaced relation with their bottom flaps leading, the improvement which comprises folding inwardly the side flaps of the successive so-advancing spaced blanks, successively retarding the advancing so-folded blanks such that each blank is superimposed upon the preceding blank to the extent that only the leading marginal edges of the bottom flaps are uncovered, spreading glue on the so-exposed leading marginal edges of said bottom flaps, successively accelerating the advancing so-folded and so-glued blanks so as to provide another spaced relationship between successive blanks, folding inwardly the bottom flap of each blank in succession so as to form a succession of pocketed elements, successively retarding the advancing pocketed elements such that each element, except for the exposed marginal edge of its trailing seal flap, underlies the preceding element,

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and spreading glue upon the so-exposed trailing seal flap margins.

6. In an envelope making machine, means for advancing flat envelope blanks in spaced relation with their bottom flaps leading, means for folding inwardly the side flaps of each advancing blank, means for successively retarding the so-folded blanks such that each blank is superimposed upon the next preceding blank to the extent that only the marginal edges of the leading bottom flaps are exposed, means for wiping glue on the so-exposed marginal edges of said bottom flaps, means for successively accelerating the so-glued blanks, means for folding inwardly in succession the bottom flaps of said blanks so as to produce a succession of pocketed elements, means for retarding in succession the advancing pocketed elements such that each element, except for the exposed marginal edge of its trailing seal flap, underlies the preceding element, and means for wiping glue upon the exposed marginal edges of said trailing seal flaps.

7. In the manufacture of envelopes from a succession of flat blanks advancing at high speed in spaced relation with their back or bottom flaps leading, the improvement which consists of folding inwardly the side flaps of the successive so-advancing spaced blanks, reducing at the same point in each partly folded blank's movement its speed of advance, such that each blank is superimposed upon the preceding blank, in a progressively formed shingled blank assembly moving at said reduced speed, applying glue, during the slow speed advance of said blank assembly, to the respective inside leading marginal surfaces of the successive back or bottom flaps of said assembly's constituent blanks, speeding up in succession each so-glued blank to restore its initial high speed of advance and its spaced relation to the blank next following, folding inwardly the bottom flaps of the successive speeded-up blanks, to produce, by adhesion of said bottom flaps to the previously infolded side flaps, a suc-

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sion of pocketed elements, so progressively collecting the successive pocketed elements in a low speed closely shingled second assembly as to expose in adjacent relation, for continuous en masse gluing, the inside surfaces of the respective elements' trailing seal flap margins, and progressively spreading adhesive by the slow speed advance of said second assembly, upon the adjacent so-exposed trailing seal flap margins of the so-shingled pocketed elements.

8. In envelope making mechanism, means for advancing flat blanks at high speed in spaced relation with their back or bottom flaps leading, means operative on each so-advancing blank to fold inwardly its side flaps, means for reducing at the same point in each so-folded blank's movement its speed of advancement, such that each blank is superimposed upon the preceding blank in a progressively formed shingled blank assembly moving at said reduced speed, means for applying glue, during the slow speed advance of said blank assembly to the respective inside leading marginal surfaces of the successive back or bottom flaps of said assembly's constituent blanks, means for restoring in succession to each so-glued blank its high speed advance and its spaced relation to the blank next following, means for folding inwardly in succession the bottom flaps of the speeded-up blanks to produce, by adhesion of said bottom flaps to the previously infolded side flaps, a succession of pocketed elements, means for so progressively collecting the successive pocketed elements in a low speed closely-shingled second assembly as to expose in adjacent relation, for continuous en masse gluing, the inside surfaces of the respective elements' trailing seal flap margins, and means for progressively spreading glue, by the slow speed advance of said second assembly, upon the adjacent so-exposed trailing seal flap margins of the so-shingled pocketed elements.

No references cited.