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HIGH-SPEED BANDING OF ENVELOPES AND THE LIKE
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Fig. 3

Fig. 10

Fig. 12

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HIGH-SPEED BANDING OF ENVELOPES AND THE LIKE


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This application is a continuation of our copending joint application Serial No. 777,337, filed Dec. 1, 1958, now abandoned, for a High-Speed Banding Machine, which case was in turn a continuation-in-part of our co-pending joint application Serial No. 457,268, filed Sept. 20, 1954, now abandoned, on the same subject matter.

Our invention relates to high speed banding of envelopes and similar flat articles. This involves progressively assembling the envelope, as fast as produced and delivered, in successive packs of preselected number or size, and wrapping or folding about each pack a narrow paper or like band, whose overlapped ends must be pressed and held together in close adhesive-sticking contact.

For retail merchandising purposes, great numbers of envelopes, of various sizes and types, are supplied in factory-banded packs. For banded high-number packs (containing 25 to 50 or more envelopes) there is a steady but relatively-modest demand. But there is a great and ever-growing demand for banded low-number packs (containing from 4 or 5 to 10 envelopes) as well as for banded medium-number packs (containing from a dozen to about 20 envelopes). Various quantities of envelopes must be factory-banded in these small size and medium size packs, to meet the needs of millions of small-lot purchasers, in chain and/or variety stores, as well as in countless retail outlets for greeting cards, and similar establishments.

Mechanical banding of envelopes is old and well known in the art. It has long been common practice in envelope factories for the entire output of a given envelope-making machine to be delivered directly, as fast as produced, to known counting, pack collecting and band applying mechanisms—for progressive conversion by the latter into a series of banded packs, of preselected number or size.

But under present-day conditions of high-speed envelope manufacture, none of these prior mechanical banders can ever be used, except for the collection and banding of high-number or high-count packs. That is, in modern envelope factories which possess such known mechanical banding equipment, all low-number packs and practically all medium-number packs have had to be banded by hand. This is because no such prior mechanical bender, when properly counted, machine is preset for recurrent collections of these small-number or medium-number packs, can ever keep pace, in its intricate and time-consuming band applying and band end sticking operations, with the very high envelope production rate of any modern envelope-making machine that delivers directly to such a bender.

Production rates of 300 and even more envelopes per minute are regularly attained by conventional modern envelope-making machines. With envelopes being delivered for banding at this high rate (5 or 6 per second), every low-number pack, and practically every medium-number pack, would be collected and in urgent need of being banded, in less time than it takes for any such mechanical bender of the prior art to complete its band folding and band end sticking operations on the preceding pack. Thus in any such prior machine, there is virtually no place for any such quickly-collected pack to go, since the machine's banding station would still be occupied by the preceding pack. It goes without saying that none of these mechanical banders of the prior art can ever hope to keep pace, even for the banding of large or high-number packs, with the far higher rates of envelope production (of the order of 800-1200 envelopes per minute) that are readily achievable with various special methods and means of envelope manufacture, as disclosed respectively in Heywood Patents Nos. 2,772,611 and 2,851,934, and in Kennedy Patent No. 2,811,905.

In many of the known mechanical benders of the prior art an initial partial folding of band material onto each collected pack is obtained, merely by giving to said pack (by suitable pushers or the like) a single limited translatory movement. In this practice (as exemplified by the patents of Hunt No. 1,653,908, Becker No. 1,687,488 and Heywood No. 1,839,413) this single short movement obtains the pack's front face pick-up and transport of an adhesive-tipped band length disposed across the pack path, such that oppositely extending portions of the so-moved band, from encounter with opposed stationary surfaces closely flanking said path, are folded back across opposite leading edges of the pack.

However, in all such and similar prior art banders, this usual pack-and-band movement (itself of brief duration) has always had to be followed by a series of time-consuming motions and counter-motions of various other devices. These subsequently operated devices have included various types of folding, pressing and banding devices, for action on the trailing ends of the band, as well as other pushers or equivalent means for again moving the pack itself, to get it out of the way of the next pack. Sequential to and fro movements of various such devices have usually been needed, first for the performance of their functions, and then to get them out of the way of the next pack's band pick-up movement.

The considerable amount of the time consumed by all these subsequent motions and counter-motions is usually of little consequence, what these prior banders are used for the banding of high-number packs. This is because the several seconds normally required for the collection of any high-number pack gives sufficient time for all such motions and counter-motions, in the banding and evacuating of the preceding pack, to be performed. But under modern conditions of high-speed envelope manufacture, all small or low-number packs and most medium-number packs are always so quickly collected that they never give this margin or leeway for the performance, in such a machine, of these subsequent folding pressing and evacuating operations on the preceding pack. It is this factor, more than anything else, which has precluded any use of the above and similarly organized prior mechanical banders, in the small and medium pack bnding problem, as continuously delivered from conventional modern envelope-making equipment.

Our invention provides a simple but highly effective solution of this high speed banding problem.

According to our invention, each pack's single brief movement (which frontally folds the picked-up band) is itself used, first for the creation and then for the release of opposed pent-up lateral forces (preferably spring forces) against the respective trailing ends of the frontally folded band. These forces, just as each pack is coming to rest, deflect both of its band ends inwardly, on transverse fold lines defined by opposite rear edges of the pack, into an overlapped but unstuck relation behind the pack's rear face.

By so conditioning each pack and leaving it in the line of pack movement, our invention dispenses with all need for any of the usual post-movement actuations and withdrawals of band end folding, pressing and pack evacuating devices, that have always consumed so much time in prior banding mechanisms of this type. It secures the perform-
ance of all of these functions, without any expenditures of time, by the successive band pick-up movements of the next following packs. That is, the final stages of these movements, in displacing and slightly advancing the preceding so-conditioned packs, are all that is needed to press and hold the latters’ already overlapped band ends in prolonged close adhesive-sticking contact with one another.

Our invention thus provides a banding method and apparatus in which, for band end folding and pressing, and for each pack’s evacuation of the banding station, no expenditures of time, over and above those involved in the customary brief band pick-up movements of the successive packs, are ever required.

In other words, our invention establishes for every pack, regardless of size, a banding cycle of minimal split-second duration. This duration is merely the time (less than ¼ of a second) that it takes for any suitable quick-acting pusher devices to give a pack its short band pick-up movement and then get back into pushing position for the next pack.

By virtue of this drastically reduced banding cycle time (well under the normal collection time of the very smallest of packs) our invention makes possible, for the first time, the mechanical small-pack banding of envelopes, as fast as the latter are ever delivered by any conventional high production, envelope making machine. As a matter of fact, our invention, for all ordinary or average small-pack banding, has no difficulty at all in coping and keeping pace, even with the phenomenally high rates of envelope production that are attainable, as aforesaid by the respective inventors of Heywood Patents Nos. 2,772,611 and 2,851,934 and of Kennedy Patent No. 2,811,905.

For the better and more simplified achievement of these outstanding results, our invention as herein shown, collects the rapidly delivered envelopes of every pack in substantially upright edgewise supported condition, and holds them in this condition throughout the ensuing operation that obtains their banding. This allows the adhesive-tipped length of band material which each so-moved pack picks up, to hand down by gravity across the pack path, and thereby dispenses with any need for either the conveyance or the guidance of said band material to the position required for its pick-up.

Also, according to our invention, each pack’s movement from the collection station is effected by said pusher devices which are travelling at maximum forward speed as they engage the pack’s rear face. This insures the pack’s and their own prompt clearance of the collecting station, in the absence of any interference with the closely following delivery to said station of the next pack’s first band. This extremely high speed of our pack pushers has no adverse effect, but impact or otherwise, on any so-moved pack. This is because our pack pushers are substantially upright posts, which preserve their parallelism with each pack’s rear face by virtue of being actuated by a parallel motion driving means.

Other and further objects, advantages and novel features of our invention will become apparent from the following detailed description thereof, taken in connection with the accompanying illustrative drawings, in which:

FIG. 1 is a front elevation view, partly in vertical section, of our banding apparatus in accordance with our invention, in association with suitable devices at the left-hand end of said figure, by which completed envelopes are rapidly delivered to the pack-collecting station of said apparatus.

FIG. 2 is a plan view of lower portions of the banding apparatus shown in FIG. 1, including its drive mechanism.

FIG. 3 is a transverse vertical sectional view of our banding apparatus and its driving devices, substantially in the plane of the section line 3—3 of FIG. 2.

FIG. 4 is a fragmentary view illustrating the superior action of the parallel motion pushing devices which impart to each envelope pack, as soon as collected, its short band pick-up and band folding movement.

FIG. 5 is a fragmentary view, partly in section, illustrating the mechanism which severs each band length and applies adhesive to its upper end.

FIG. 6 is a plan view of the mechanism shown by FIG. 5.

FIG. 7 is a fragmentary view of the band web feeding mechanism and the band length adjusting mechanism as seen from the rear of our envelope banding apparatus.

FIG. 8 is a large scale perspective view of one of a pair of opposed members, spring biased into the pack path, which are triggered sequentially by each pack’s short band pick-up movement, to deflect both band ends inwardly, into overlapped but unstuck relation behind the pack’s rear face.

FIGS. 9, 10, 11 and 12 are a series of diagrammatic views, illustrating in sequence the four transverse folding operations performed on each pick-up band length at successive stages of the single short movement imparted to each pack.

FIG. 13 is a perspective view of one of the banded packs of envelopes produced by our invention.

FIG. 14 is a top plan view of the band web feeding mechanism.

FIG. 15 is a transverse vertical sectional view substantially in the plane of section line 15—15 of FIG. 1.

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

The left-hand ends of FIGS. 1 and 2 show, for successively arriving completed envelopes E, E, a stacking delivery mechanism of the type disclosed by Heywood Patent No. 2,612,088. The essential elements of this envelope stacking mechanism include, as shown, three parallel spaced-apart wheels 1, 1, whose rims are formed with matching sets of flats or lands 2, 2 spaced 120° apart.

The three wheels 1,1 have a common hollow hub 3, whose spokes 4, 4 (three for each wheel) provide full-length radial passages 5, 5. Each radial passage 5 opens at its outer end to one of the lands or flats 2, 2 and at its inner end to the bore of the hub 3.

Said hub 3 is mounted for clockwise rotation upon a stationary hollow conduit 6, whose interior is in constant communication with any suitable source of suction (not shown). Inwardly of the hub’s ends, the outer surface of conduit 6 is cut away or relieved, to provide an arcuate chamber 7, substantially conical with the upper half of the hub’s rotary movement about said stationary conduit 6. This chamber 7, closed at both ends, is subject to the suction or vacuum of conduit 6, through suitable ports 8, 8 connecting said chamber with said conduit’s interior.

As described in the aforesaid Heywood Patent No. 2,612,088, said arcuate chamber 7 has the upper end of the completed envelopes E, E, as projected upwardly by the final seal flap rolling folds (not shown) of said patent, will always meet up with a row of the wheel flats 2, 2. Thereon each envelope is seized and held by the suction exerted through the associated passages 5, 5 for as long as the latter’s inner ends, in the clockwise rotation of hub 3, are passing along the arcuate vacuum space or chamber 7. This condition prevails, as will be seen in FIG. 1, until shortly before each so-conveyed envelope’s leading edge (here the fold of its seal flap) reaches the upper rear end surface of an elongated substantially horizontal plate 9, the latter being an essential part of our novel banding apparatus. At this point (as described in the aforesaid Heywood Patent No. 2,612,088) the suction to the inner ends of the associated suction passages 5, 5 is cut off, thus freeing each envelope for its desired deposit, edgewise, upon the upper rear end of said plate 9. The latter interception of each wheel-conveyed envelope is assured, by its pair of narrow rearward projections 9', 9' which (see FIG. 2) extend between the wheels 1, 1, and carry adjustable upright guards 9a, 9a. Thus each envelope, as delivered edgewise against plate 9, is effectively stripped from said wheels.

The successive edgewise supported envelopes accumulate, one behind the other, on the rear end of supporting
3,350,834 plate 9 with their opposite upper edges slightly spaced from the inner surface of a companion parallel upper guide plate 10. The two plates 9 and 10 (supported independently as hereinafter described) provide suitable means, near their rear ends, for holding the so-accumulating envelopes substantially therefrom. As best shown in FIG. 1, the rear end of support plate 9 has secured to its under side a depending bracket 11, to which is pivoted at 12 a block 13. The latter's front face has secured thereto a resilient spring finger 14 that projects upwardly through an elongated substantially rectangular opening 15 of the plate 9 (see FIG. 2). This spring finger 14 is biased rearwardly, toward the guards 9a, 9b and the peripheries of the envelope delivery wheels 1, 1 by the pull on block 13 of a relatively light coil spring 16, that extends between a pin 17 on said block and a pin 18 projecting downwardly from plate 9.

The guide plate 10 has an elongated rectangular opening 15', of the same width as, but slightly longer than the opening 15 of support plate 9. Projecting downwardly through the rear end of this guide plate opening is a spring finger 19 whose upper end is suitably secured to a block 20. The latter is pivoted at 21 to a bracket 22 that is mounted for limited longitudinal adjustment, upon the rear end of guide plate 10 by a retaining bolt 23 which is received in an elongated slot 24 of said guide plate. This adjustment allows spring finger 19 to be set in an optimum position, for the selected size or thickness of the envelope packs, which, as hereinbefore described, are successively collected (as shown in FIG. 1) between the rear ends of plates 9 and 10. This upper spring finger 19 is biased rearwardly about pivot 21 toward the guards 9a, 9b and the delivery wheels 1, 1 by the pull on block 20 of a light coil spring 25. This spring 25 is connected at one end to an arm 26 on block 20. Its other end can be connected to any stationary suitably located part of our apparatus, and is here shown as connected to the casing of an electronic counter 27, to be hereinafter referred to.

It will be clear from the foregoing that these spring biased fingers 14 and 19 insures an orderly upright accumulation, one behind the other, of the envelopes successively deposited edgewise by delivery wheels 1, 1 on the rear end of plate 9. Said fingers constitute at all times an effective restraint against the natural tendencies of the accumulating envelopes either to topple forwardly or to tilt backwardly. Moreover, for an appreciable part of the usual single-side hand-pick-up movements imparted to each pack P, as soon as collected, said fingers 14 and 19, by their ability to pivot outwardly, maintain their contact with and control over the moving pack. Inasmuch as these fingers are mounted upon their respective plates 9 and 10, their effectiveness is in no way diminished when these plates undergo relative vertical adjustments, in order to accommodate their spacing to the collection and banding of envelopes which differ in their height dimensions from the envelopes E, E that are shown by FIGS. 1, 2 and 3.

For purposes of this spacing adjustment, we prefer to maintain the upper or guide plate 10 at a fixed level and to change, as required, the level of the lower support plate 9. As shown in FIGS. 1 and 15, the upper plate 10 is rigidly attached by bolts or the like (not shown) to the under side of a switch box 28. This switch box is in turn permanently secured to a frontwardly overhanging portion 29 of an upright supporting standard 30. The lower end of standard 30 (see FIGS. 1 and 2) is rigidly bolted to a flat base 31 of our envelope banding apparatus, behind the forward ends of the opposed aperture plates 9 and 10. The upper portions of this standard 30 support, as hereinafter described, devices for intermittently feeding a band material web B, such that its leading endent pass end passes forwardly through the matching apertures 15 and 15' of plates 9 and 10, across the path of each envelope pack P that is advanced between said plates. This standard 30 also supports other devices (see FIG. 5) which are operative on the web's depending portion to sever therefrom and to spot or top with glue, the band lengths that are picked up and transported by the successive packs of envelopes P, P.

An adjustable or level-changing support for our lower apertured plate 9 is provided (see FIG. 3) by a hollow pedestal 32 which is bolted to the base 31 directly below said plate's forward end. The pedestal 32 has upper and lower coaxial bore sections 33 and 33' which receive a post 34. Said post 34 provides an external screw thread 35 with which meshes the internal screw threads of a nut 36. The latter occupies the space within said pedestal between its upper bore section 33 and its lower bore section 33'. Said nut is formed with having its rim knurled, as shown, to facilitate manual turning of said nut, for the raising or lowering, as desired, of the post 34.

A cross bar 38 is secured, as by a suitable bolt 38', to the upper shouldered end of post 34. This cross bar 38 underlies, and has rigidly secured thereto (as by the sub-surface screws 39, 39, FIG. 2) the forward end of our apertured support plate 9, and also the forward ends of a pair of support rails 40, 40 that are equally spaced from opposite sides of said plate. The upper surfaces of these rails 40, 40 are co-planar, and substantially co-extensive longitudinally, with the envelope-parallel supporting surface of plate 9. Thus it is that relatively long (or wide) envelopes, as well as those of average or less length (or width) are all afforded adequate edgewise support. This applies and holds true, not only during said envelopes' upright collection, as above described, at the pack assembly station adjacent to delivery wheels 1, 1, but also during their transport, in upright pack form, along plate 9, and to and through the machine's banding station, as hereinafter described.

Secured to and depending from one end of cross bar 38 is a vertical member 41. The member 41 is received, with appreciable clearance on each side, between a pair of spaced parallel ears 42, 42 that project outwardly from the pedestal 32. Extending through said ears 42, 42, into contact with opposite sides of member 41, are adjustable set screws 43, 43. These set screws are adapted to be moved in or out, in slight degree, in order by their pressure variations on member 41, to correct any slight out-of-level conditions that the plate 9 and rails 40, 40 may develop. Whenever it is desired to raise or lower said plate 9 and rails 40, 40 for the reception and movement thereon of envelopes of lesser or greater height, these set screws 43, 43 are temporarily backed off, so that the desired change of level can be made by turning of the nut 36.

As shown in FIGS. 1 and 2, base 31 supports and has secured thereto an electric motor 44 whose shaft carries a small driving pulley 45. This pulley transmits the motor's clockwise rotation (constant during the operation of our banding apparatus) through a suitable belt or chain 46, to a large slower speed pulley 47. Pulley 47, as shown in FIG. 2, is secured to a hub or sleeve 48, which is mounted for free rotation on suitable bearings 49, 49. The constantly rotating hub 48 and its bearings 49, 49 are concentrically supported upon a transverse single-revolution shaft 50. That is to say, this shaft 50 (by which our banding apparatus is driven) receives intermittent clockwise rotation from hub 48 in a succession of one-revolution steps. Each single revolution of shaft 50 is initiated, as hereinafter described, by the accumulation, at the pack collecting station provided by rear ends of plates 9 and 10 of the preselected number of envelopes that compose each pack P.

As shown in FIG. 3, the front end of shaft 50 extends through and is suitably journaled in an upright bracket 51 that rises from base 31. The other end of shaft 50 extends through and is suitably journaled in a second upright bracket 52 also rising from the base 31. Between bracket 52 and the constantly rotating pulley hub 48,
the shaft 50 is equipped with an electric or magnetic clutch-brake unit 53 of standard (Warner) construction. A unit of this type, as well-known in the art, will establish, when energized, a clutch or driving connection between shaft 50 and the constantly rotating hub or sleeve 48. With regard to the clutching action, it will be understood that a brake unit is holding said shaft stationary. When such a unit 53 is deenergized, the clutch is released, and simultaneously the brake is applied to the driven element (shaft 50) to prevent its over-run, by momentum, beyond the clutch-release position.

An electric eye or photoelectric cell, shown symbolically at 54 in FIG. 1, is arranged to have its beam intercepted by each of the successive envelopes E, E that are delivered to our apparatus by the rotating wheels 1, 1. The resulting successive impulses of cell 54 are sent, in conventional fashion, to the adjacent electronic counter 27, which may be any one of several standard types, all well known in the art. This electronic counter 27 is adjustable, in conventional fashion, so that it can be preset to respond to a selected number of such impulses. Such selected number in this case is the number of envelopes (five, six, or whatever selected quantity) and are required to go into each upright pack P that is collected, as above described, between the rear ends of plates 9 and 10.

At each reception of this selected number of impulses from cell 54, the electronic counter 27 operates a suitable signal switch 55 which de-energizes the clutch-brake unit 53, to inaugurate clockwise rotation of shaft 50 from the constantly rotating hub or sleeve 48. However, at each such energization of clutch-brake unit 53, the shaft 50 makes only a single revolution; this is because said shaft 50 carries at its inner end (see FIGS. 2 and 3) a single revolving cam 55, which at the completion of a single revolution of said shaft, strikes and momentarily opens an adjacent switch 55 in the electrical circuit (not shown) of the clutch-brake unit, electrical circuit (not shown) of the clutch-brake unit 53. The opening of switch 56 immediately de-energizes said clutch-brake unit, whose above described braking action brings shaft 50 to a stop or "rest" position, with the lobe of its cam 55 at a point 360° distant, in the direction of said shaft's rotation, from the switch 56. At each such single revolution of shaft 50, the completed packs P are collected together on the support 30. It will be understood that this band supply roll 76, the narrow band web B unwound therefrom, and the

72, as shown in FIG. 2, are spaced apart on bar 71 by slightly more than the width of the overlying pack supporting plate 9. At their rear ends, the arms 72, 72 provide vertically socketed enlargements 73, 73 which receive and support a matching pair of spaced pack-pushing members 74, 74 that are normally kept in a retracted position, which, when energy is applied to their rear faces, will cause these to be advanced, by virtue of their above-described parallel-motion drive from the shafts 58 and 60.

In the stopped or "rest" position of the one-revolution shaft 50, the upper ends of these posts 74, 74 as shown in FIG. 1, are always slightly to the rear of any envelope pack P that is accumulating, as above described, between the rear ends of the plates 9 and 10. With every such pack's completion, the immediately ensuing single revolution of shaft 50 obtains, by forward movement of said posts' upper ends, the pack's rapid ejection from the collection station, and its further forward movement between plates 9 and 10 for a relatively short distance. The arcuate parallel motion path taken by the upper ends of posts 74, 74 in ejecting and advancing each pack is depicted graphically in FIG. 3 of these drawings, said upper ends, as the posts advance through the spaces between support plate 9 and support rails 40, 40 will have an upward and then a downward wiping engagement with the rearmost envelope of each pack P, since the latter is confined to a straightaway rectilinear path by the lower and upper plate 43 each with a width 10.

As will be clear from FIG. 4, the posts 74, 74, by reason of starting each pack-pushing movement from a position far above the horizontal diameter of their parallel motion circular path, attain their maximum speed almost immediately. This insures each pack's initial forward movement at a very extremely rapid rate, which in every case enables said pack as well as the pushing devices 74, 74, to clear the collecting station and its spring fingers 14 and 19 ahead of the arrival of the next pack's first envelope. On the other hand, toward the completion of each pack's described forward movement, as the upper ends of posts 74, 74 approach the level of support plate 9, there is a gradual reduction of each pack's forward speed, such as to eliminate any danger of its overrunning the position to which it is advanced by said pushing devices 74, 74. It is particularly to be noted that the effective pack advancement rate 74, 74, immediately preceding said pack's comfortably terminating (see FIG. 4) just before their upper ends reach the level of support plate 9 will in every case carry the bottom edge of each pack's rearmost envelope to or just beyond the forward transverse edge 75 (see FIG. 2) of said support plate's opening 15.

This limited forward movement of each pack P is availed of, as is customary in the banding art, for the pick-up and transport of an adhesive- tipped band length disposed across the pack path, such that oppositely extending band portions, from encounter with opposed surfaces closely flanking said path, are folded back transversely across opposed leading edges of said pack. According to our invention, this same pack movement is also used, in a novel and extremely useful fashion, to fold both trailing band ends inwardly, into overlapped but unstruck relation, behind their pack's rear face. However, before dealing with this, at the end of the individual pack construction, it is appropriate to describe the means by which the band material B, as supplied in web form, is intermittently fed downwardly through plate openings 15 and 15', so as to be disposed across the path of each so-moved pack P, and is severed and glue-spotted, at or just before the pack's pick-up action.

As shown in FIG. 1, the band web B (depicted here by broken lines) is provided by a large supply roll 76, whose axle or trunnion 77 is supported by a suitable bracket 78 extending forwardly from the upright standard 30. It will be understood that this band supply roll 76, the narrow band web B unwound therefrom, and the
various pulleys, feed wheels and other devices, as heretofore described, by which said web is handled, are in the same vertical plane and that passes lengthwise through the openings 15 and 15' of plates 9 and 10 respectively. Thus web material B, as fed down through the feed openings, passes through the aperture of plate 9 and 10, across the path of an envelope pack P that is about to be rapidly ejected from the collection station and moved forward between said plates. According to our invention, this pendant band web material, just before being struck by each so-moving pack, is severed at a preselected distance, above the plate 10. Such severances create a new opening of incoming pack’s pick up and transport, individual bands of the proper length to be folded, with ends overlapped, about the respective packs P. Also, each so-severed band length, simultaneously with its secession, receives a spot of moist glue, near its upper end. The devices for so operating recurrently on the leading end of band web B, after each downward feed of same by rolls 84, 100, are depicted in FIGS. 1, 3, 5 and 6.

As shown in FIGS. 1, 3, 5, 6, a rearwardly facing portion of the upright standard 30, underlying the front end of the support plate 29, provides a pair of opposed spaced apart vertical flanges 110, 110. To the standard’s face, beyond the flanges 110, 110, are secured a pair of vertical gibbs 111, 111, thereby to provide a pair of spaced upright guide ways 112, 112 for the support and up-and-down adjustment of a vertical slide member 113, that snugly fits in said guide ways. Between the standard’s flanges, the member 113 provides a lug 114 having a screw-threaded vertical hole 115 therethrough. This hole 115 received the threaded lower end of a vertical rod 116 which extends upwardly through a suitable opening of support plate 79. Secured to rod 116 is a lower collar 117 bearing against the support plate’s under surface, and an upper collar 118 bearing against the support plate’s top surface, thus to hold said rod from moving endwise in the support plate’s opening. Said upper collar 118 is formed with a suitable handwheel 119, by which said rod 116 is turnable, in one direction to raise and in the other direction to lower the slide member 113, relative to the fixed-level upper apertured plate 10 that guides the forward movement of the successive envelope packs.

Integral with this vertical slide 113 is a horizontal support structure, designated as a whole by the numeral 120. Said support structure comprises (see FIG. 6) a longitudinal portion 121 and a transverse tubular portion 122. The longitudinal portion 121 provides two spaced generally upright sides 123 and 124 which overlie and parallel the apertured upper plate 10. The transverse tubular portion 122 (see FIG. 3) houses and journals a shaft 125, whose upper end, beyond said tubular portion, is in approximate overlying relation to a track cam 126, secured to the one-revolution shaft 50.

As shown in FIGS. 1 and 6, the pendent leading end of band web B, passes freely between the spaced sides 123 and 124, just forwardly of a cross bar 127 that connects the upper edges of said sides. The cross bar’s edge which faces the band web B is appropriately sharpened to provide a stationary knife edge 128. Arranged just below said knife edge 128 (see FIGS. 1 and 5), is a small tubular exit passage 129 that leads from a suitably supported glue receptacle 130. This exit passage 129 is normally closed off, by an interior ball valve 131, held firmly to its seat by a coil spring 132.

The sides 123, 124 provide suitable interior ways 123’ 124’ for the support and endwise sliding movement of a ram member 133, whose under surface provides rack teeth 133’. In mesh with said rack teeth is a pinion 134, secured to the feed end of the shaft 125 which extends through the transverse tubular portion 122 of support structure 120. The inner end of shaft 125 carries an arm 135, to the end of which is pivotally connected at 136 the
upper end of a rod 137. This rod 137 is one part of a two-part adjustable length cam rod by which the shaft 125 and its pinion 134 are given a back-and-forth rocking motion by the track cam 126 on single-revolution shaft 50. The other part of said cam rod is an aligned member 138 (see FIGS. 3, 4 and 5) having an elongated split socket portion 139. This socket portion 139, after receiving the lower end of rod 137, is tightened thereon by a suitable clamping device 140.

The lower socketed part of the two-part cam rod 137-138 carries a roller 141 which rides in the track of cam 126. The ram 133 carries a split socket blad 142, B is placed slightly higher than the plane of fixed knife edge 128. In the "rest" position of ram 133 (when roller 141 occupies the concentric portion of track cam 126) the blad 142 is on the opposite side of band web B from the fixed knife edge 128, as is also a pin 143 of said ram, which is directly aligned with the tightly closed ball valve 131 of the glue receptacle's outlet 129. Just before each rapidly advancing pack P encounters the pendent end of band web B across its path, the cam 126 (see FIG. 5) produces a rapid upward movement of arm 135 which, through shaft 125, pinion 134 and track teeth 133, gives ram 133 a sharp upward movement; this is followed by said ram's return to "rest" position. The ram's rearward movement obtains several band of band B over passage of blade 142 across knife edge 128, and simultaneously, the momentum of depression by pin 143 of the bolt 131. By virtue of this last, glue outlet 129 puts a small spot of moist glue (indicated at 144 in FIGS. 10 to 12 inclusive) upon the de- pleted upper end of every so-severed strip B of band material.

The length of the successively severed band strips must always be somewhat greater than the girth of each pack P, in order for the strip's ends (see FIG. 13) to overlap one another. The pack's girth depends upon measure on the height dimension of its constituent en- velopes, E, E. In other words, for banding of packs of relatively high envelopes, the band web feed rolls 84, 100 at each operation must be fed downwardly, past the sever- ing blades 128, 142, a much greater length of the band web than for packs of relatively low envelopes. This need for the severed band strips, B, to be of different lengths, depending upon the height and number of the envelopes in each pack P, is taken care of by the band web feed adjustment shown in FIG. 7. For producing relatively long band lengths, B, the connection 95, 95* between rear segment 98 and front end of said slot 94; for shorter band lengths, B, this connection 95, 95* is shifted toward the outer end of said slot 94.

It will be understood from the foregoing that each glue- tipped band strip B, practically at the instant of being cut and freed from the web B, is picked up and carried for- ward by the front face of a rapidly advancing envelope pack P. This joint pack-and-band movement serves here, similarly as it has in prior banding mechanisms, to produce rearward folds of the band across opposite front edges of its pack. This familiar folding action stems from the encounter of the moving band's opposite extensions (be- yond the pack's front face) with opposed surfaces in close proximity to the pack path. But our invention also uses this same pack-and-band movement, with far-reaching ef- fect, to produce inward folds of the band's two trailing ends. This is done by means of the pack's pressure end 146 contacting said ends in overlapped but unstressed relation behind the pack's rear face.

For this purpose, the forward ends of the lower and upper plate apertures 15 and 15* are equipped (see FIGS. 1, 2 and 9 to 12 inclusive) with opposed lower and upper band folders 145 and 145*, respectively shown below, are yieldably biased into the pack path by means of springs, weights, or the like. Both folders are prefera- billy of the construction shown in large scale by FIG. 8, for the lower folder 145. That is, both folders provide an intermediate generally upright cross bar 146, from whose extend rearwardly a pair of spaced prongs 147, 147*, which taper off in height, from said cross bar's height. However, the two folders are so mounted as to face each other. In other words, the lower folder's cross bar 145 and sloping prongs 147, 147* normally project upwardly into the pack path above the support surface of apertured plate 9, whereas the corresponding parts of upper folder 145* normally project downwardly into the pack path below the inner or guide surface of apertured plate 10.

As shown in FIGS. 1, 4 and 9, the leading end of the packs 147, 147* move down between the prongs 147, 147* of both of the folders 145, 145*. As shown in FIGS. 2 and 8, the respective prongs' inner opposed surfaces 148, 148* are appropriately sloped, so as to serve as guides for the edges of the band material, should the latter tend to get out of alignment, or to go off center. The rear or band-facing surface 149 of each cross bar 146 is also preferably sloped, as shown, to facilitate drawing forward of each band's intermediate portion beyond these cross bars, as each pack's forward travel creates the customary frontal folds (f, f in FIG. 11) of its picked-up band.

On the other hand, each cross bar's opposite or for- wardly facing surface 150 is substantially upright; that is, in the normal folder positions shown by FIG. 9, at the limit of their projection into the pack path, each forward- ly facing cross bar surface 150 occupies a transverse vertical plane just to the rear of the associated flat plate op- ener's forward transverse edge (the edge 75 of lower plate opening 15, and the slightly further forward edge 75' of upper plate opening 15*). Forwardly of these edges 75 and 75*, the respective lower and upper plates 9 and 10 are cut away, to form therein the generally rectangular exterior recesses 151 and 152. Each of these recesses receives, for example, the associated folder's in- tegral forward extension 153 (see FIG. 8). Such exten- sion 153, for each folder, is formed, beyond its cross brace 154, with a pair of aligned holes 155 (one shown in FIG. 8). These holes have a tight immovable fit on a horizontal cross-spline 156 (see FIGS. 1 and 2) which is pivoting mounted in the associated plate, near the front end of its recess 151 or its recess 152, as the case may be.

The cross-spline 156 carrying lower folder 145 has a projecting arm 157 on which an attached suitably anchored spring 158 (FIGS. 1, 2 and 9) pulls downwardly. This serves to yieldably hold the upper folder 145 at its lower limit (FIG. 9) in the path of pack movement. Similarly, the cross-spline 156 carrying upper folder 145* has a projecting arm 159, on which a suitably anchored spring 160 (FIGS. 1 and 15) pulls upwardly. This serves to yieldably hold the upper folder 145* at its lower limit (FIG. 9) in the path of pack movement. It will be ob- vious that, in lieu of the springs 158 and 160, suitable weights (not shown) may be applied to the respective folders 145 and 145*, so as to urge them yieldably, as above described, into the pack path.

As shown in FIG. 10, when any just-severed and glue- spotted band length B is being encountered and picked up by a rapidly advancing pack P, the latter will have already engaged the opposed yieldable folders 145, 145* and started to wedge them apart, by movement along the rearwardly divergent approach surfaces provided by their respective sloping prongs 147, 147*. The gradually in- creasing pressure on prongs 158 and 160 by this wedging apart of the folders imposes a beneficial frictional drag on the band material by the folder cross bars 146, 146*, during the customary formation of the band's frontal folds f, f, by joint movement of pack and band between the plates 9 and 10. This drag keeps the band tautly held by the cross bars, to bulge or bow forwardly from the pack's front face.

However, the prime and very significant utility of these retractable spring-biased folder members 145, 145* is their action on the respective ends of the lower and upper band
extensions d and e, which extend back from the usual front folds f, f. As each pack P nears the limit of its forward movement imparted by the pusher posts 74, 74, it will have pushed back the folder cross bars for passage therebetween, and thereby markedly increased the pull of the folder springs 158 and 160. Then, just as the pack's last envelope has gotten past the lower folder's cross bar 146 (see FIG. 11) the pentup force of spring 158 has snapped said folder upwardly, against the relatively short extremity of band portion d. Said extremity is thereby deflected upwardly by the pack post, as is given by the cross bar's perpendicular front face 159, a transverse line of bend or fold f', defined by the pack's lower rear edge. FIG. 11 also shows the upper folder 145 in the act of being snapped back by the pent-up force of its spring 160 to its lower limit—an action which (see FIG. 12) forcibly deflects downwardly the relatively long trailing glue-tipped extremity of the band length's upward extension e, such as to give same, by virtue of the cross bar's perpendicular front face 150, a transverse line of band or fold f, corresponding to the pack's rear upper edge.

The folds f' and f are made in the above described sequence (rather than simultaneously) because the lower and upper folders 145 and 145' are in exact vertical alignment. Instead, the lower folder 145, as shown throughout the drawings, is very slightly to the rear (or left) of the upper folder 145'. This makes certain that the lower band end receives its upward deflection just prior to downward deflection of the upper band end, so as to dispose said ends in overlapped but unstacked relation behind each pack's rear or trailing face. Because of this slight forward offset of the upper folder 145', it is not always a certainty that the envelope packs, as propelled forward by the posts 74, 74, will get their upper edges past the transverse line of said upper folder 146. Especially is this the case when the envelopes of said packs are few in number, and are made of light weight flimsy paper, such that each so-propelled pack has very little stiffness or resistance to backward bending.

Our invention meets and overcomes any such possibilities, by devices synchronized with the pusher posts 74, 74, that push against each pack's upper portion, to insure the latter's above described triggering of the upper folder 145'. For this purpose, the front end of the previously mentioned transverse shaft 92 carries a pair of spaced brackets 161, 161. Adjustably secured to said brackets are parallel and upwardly extending pusher arms 162, 162, which (see FIG. 3) flank the upper plate 10, and have a rest position (see FIG. 4) above said plate.

To the other end of shaft 92 is secured an arm 163, which has a pivotal connection 163' with the upper end of a cam rod 164. This rod 164 carries near its lower end a roller 165 which, by downward pull on said rod of a suitably anchored spring 167, is held against a cam 166, secured to the one-revolution shaft 50. On each upward movement of rod 164 by cam 166, the shaft 92 is given a sharp counterclockwise rocking. This is of just sufficient amplitude for the tips of arms 162, 162, coming in behind an advancing pack P, to push the latter's upper portion past the upper folder 145', immediately after the lower folder 145 has been triggered, as above described, by the lower part of the pack. The arms then swing back, under the influence of cam 166, to the rest position shown in FIG. 4.

It is quite important, in the use and operation of our banding apparatus, that the band web's downward extension d below the support plate 9 be kept relatively short. Otherwise, there would be a tendency for this extension to be turned upwardly beyond the fold f', to bend or lean backwardly, and thus interfere with the immediately ensuing downward overlapping movement (FIG. 11) of the severed band length's upward extension e. The above-described capacity of the band cut-off mechanism for vertical adjustment, by turning of hand wheel 119, allows this relative shortness of downward extensions d to be established for all required lengths of severed band strips b. At each such adjustment, the two-part cam rod 137, 138 needs of course to be correspondingly lengthened or shortened, as the case may be.

It will be clear from the foregoing description, that during each pack's single short movement (as imparted by pusher posts 74, 74 and if need be by pusher arms 162, 162) its picked-up glue-tipped band length receives not only the customary front folds f, f, but also, by virtue of the load-and-firing action of folder elements 145, 145', the sequential inward folding of its opposite end portions at f' and f, or opposite edges of the pack's rear face. In other words, each pack comes to rest, at the end of its band pick-up movement, with its band ends already deflected inwardly, in overlapped but unstacked relation behind said pack's rear face. This dispenses with all need for the usual post movement actions and withdrawals of band end folding and pressing devices, and other pack shifting devices, that have always consumed so much time in prior banding mechanisms of this type. For merely by leaving each so-conditioned pack in the line of pack movement (see FIGS. 1 and 9-12 inclusive) all of these functions, for the complete banding operation, are performed thereon by the next and following packs, as each of these, in finishing its single short movement, forcibly displaces and pushes ahead all preceding so-conditioned packs, such as to press said already overlapped band ends in prolonged adhesive-sticking contact.

Thus it is, that for each pack's complete banding no expenditures of time, over and above those involved in the customary brief band pick-up movements of the successive packs, are ever required. In short, our invention establishes, for any amount of time, the two conditions that are vital and essential to a mechanical small pack banding of rapidly delivered envelopes—these being (1) that each pack, no matter how brief the period of its collection, can be given its band pick-up movement immediately, without detriment to or interference with the preceding pack's banding operation, and (2) that the net time consumed, in each pack's banding, be no greater than the period of its collection.

Here, this net time consumption, for each pack's banding, is of minimal split-second duration—being merely the time (2/4 of a second or less) that it takes for pushers 74, 74 to give each pack its band pick-up movement and then get back into picking position for the next pack. As a concrete illustration, let it be assumed that the constantly running hub or sleeve 48 is driven from motor 44 at a reduced speed rotation of 240 r.p.m. This speed (four revolutions per second) would mean that each single revolution of our pusher actuating shaft 50 is completed in ¼ of a second.

In this situation, if the wheels 1, 1 are delivering 300 envelopes per minute (a normal or average production rate for a conventional modern envelope-making machine) our invention can readily produce successive banded packs containing as few as two envelopes apiece. This is because our banding cycle time (¼ of a second) is appreciably less than the time (¼ of a second) that it would take for two envelopes, at this 300 per minute delivery rate, to collect at the rear ends of plates 9 and 10.

Furthermore, even if the wheels 1, 1 are delivering 900 envelopes per minute (a production rate attainable as aforesaid by the respective inventions of C. Wood Patents Nos. 2,772,611 and 2,851,934 and of Kennedy Patent No. 2,811,905) our invention can readily produce successive banded packs containing as few as five envelopes apiece. This is because our banding cycle time (¼ of a second) is appreciably less than the time (one third of a second) that it would take for five envelopes,
at this 900 per minute delivery rate, to collect at the rear ends of plates 9 and 10. Our invention's achievement of a series of rapidly repeated small pack banding operations will always take place, even if the electronic counter 27 is given a low-count setting or adjustment. In that situation said counter, for each delivery by wheels 1, 1 of the selected small number of envelopes, will inaugurate one complete revolution of shaft 50. By virtue of this, the collected small pack with its picked-up band, from being pushed between past the band end folders 145, 145', pushes slightly forward the several packs maintained in its path (see FIG. 1) and comes to rest itself, just beyond said folders, with its trailing band ends already folded in and overlapped.

In all such small pack banding, these separate single revolutions of shaft 50 take place in very rapid succession, with only a negligible time interval between them. On the other hand, when counter 27 is set or adjusted for the collection of medium-count or high-count packs, the time intervals between these separate single revolutions of shaft 50 will be appreciably and correspondingly longer, by reason of the time consumed in the collection of every such larger pack. But whatever the pack size, the actual net time expended on its banding operation is always the same. Such time expenditure, in every case, is merely the brief time which the pushers 74, 74 take in rapidly advancing each collected pack's rear face to a point slightly beyond the folders 145, 145', and then getting back, just as rapidly, to their (said pushers') rest or starting position.

The final stage of each pack's rapid advance movement is always against an appreciable resistance or back pressure, due to the inertia of the several preceding banded packs that are always maintained, beyond the folders 145, 145', in the line of pack movement. Since pusher posts 74, 74 (and top pushers 162, 162) have forward throws that carry each pack's rear face slightly beyond the forward upright faces 150, 150 of said folders, this back pressure does not impede, frictionally or otherwise, the previously described snap-back folder movements that deflect each band's trailing ends into the pack path. On the other hand, the instant that pusher posts 74, 74 (and arms 162, 162) start to retreat from their extreme forward positions, this back pressure exerted as a rearward thrust on each newly arrived pack, such as press its inturned band ends against the folder faces 150, 150, and thereby increase the sharpness of their transverse folds f' and f2 across said pack's lower and upper rear edges.

In starting up a series of our banding operations, this beneficial back pressure can be temporarily supplied, if desired, by exertion of suitable rearward hand pressure against the initially delivered banded packs, until enough of them have accumulated, beyond the folders 145, 145' to establish an upright pack delivery condition such as is represented in FIG. 1. Another such starting up expedient, well known in the art, is to dispose on support plate 9, just ahead of said folders, a slideable weighted stop member, of the type shown at 170 in the aforesaid Heywood Patent No. 1,839,152. Such a weighted member, by its frictional resistance to forward movement, supplies the above-mentioned back pressure, and also, by its shape, keeps the initially delivered packs from toppling forward.

The amount of this beneficial back pressure is proportional to the length, beyond folders 145, 145', of the pack-supporting surface. The forward end of support plate 9, as shown in FIG. 1, has pivoted thereto at 168 an extension 169, which receives and supports the foremost banded packs as they move from support plate to the machine's delivery table (not shown). If it be desired for any reason to increase the effective back pressure, this extension 169 can be swung upwardly about its pivot 168, and suitably supported in such higher position. On the other hand, if a decrease in the effective back pressure is desired, said extension 169 can be swung downwardly about its pivot, to limit the pack-supporting surface to the length, beyond folders 145, 145', of the support plate 9.

We claim:

1. In high speed banding of successively-collected packs of envelopes or the like, wherein a limited translatory movement of each pack is used for its front face pick-up, and transport of an adhesive-tipped band disposed across the pack path, such that opposite band extensions beyond said face, from encounter with opposed surfaces closely flanking said path, are folded back over opposite front edges of the moving pack, the improvement which consists in pushing an each pack's said movement the inward deflection of both ends of its so-folded band extensions into overlapped but unstuck relation behind said pack's rear face, leaving each so-conditioned pack in the line of pack movement, and procuring the completion of its banding by pressures thereafter exerted against said band ends by the ensuing band pick-up movements of the next and following packs.

2. In high speed banding of successively-collected packs of envelopes or the like, wherein a limited translatory movement of each pack is used for its front face pick-up and transport of an adhesive-tipped band disposed across the pack path, such that opposite band extensions beyond said face, from encounter with opposed surfaces closely flanking said path, are folded back over opposite front edges of the moving pack, the improvements which consist in also using each packs same movement to trigger the release of opposed lateral forces against the respective ends of its band's so-folded extensions, such as to deflect said ends into overlapped but unstuck relation behind said pack's rear face, maintaining each band-surrounded pack in the line of pack movement, and using the band pick-up movements of the next and following packs, in pushing such band-surrounded pack and its predecessors ahead, to press and hold their already overlapped band ends in prolonged close adhesive-sticking contact with one another.

3. The high speed banding method as defined in claim 2, which includes using an earlier stage of each pack's band pick-up movement to trigger the opposed lateral forces that are later released, by said pack's movement, against the ends of its band.

4. The high speed banding method as defined by claim 3 which includes the release of said band end deflecting forces by arrival of each pack's rear face at a predetermined point in the path of the pack's trailing face.

5. The high speed banding method as defined by claim 2, which includes laterally deflecting the band ends into the pack path on lines of bend or fold defined by opposite edges of the pack's trailing face.

6. The high speed banding method as defined by claim 2, in which the deflecting forces are released sequentially against the respective band ends, such that one end overlaps the other.

7. The high speed banding method as defined by claim 2, which includes collecting and moving the envelopes or like articles of the successive packs in edge-wise-supported substantially upright relation, for pick-up and transport by each so-moved pack of a length of band material that hangs down by gravity across said pack's front face.

8. The high speed banding method as defined in claim 7, which includes severing each gravity pendent length of band material from the leading end of said web, at or just before a moving pack's encounter therewith.

9. In banding apparatus for successively collected packs of envelopes or like articles, of the class having means for giving each pack a limited translatory movement, and means for supplying a band, for front face pick-up and transport by each moving pack, a sealable band, such that opposite band extensions beyond
each pack's front face, from encounter with opposed surfaces closely flanking said path, are folded back over opposite front edges of the moving pack, the combination with such pack moving and band supplying and frontal folding means, of means released into the pack path by and during each pack's said movement for deflecting both ends of its band's said extensions inwardly, into overlapped but unsealed relation behind said pack's rear face, and means for supporting and maintaining each so-conditioned pack in the line of such band pick-up movement that the band pick-up movements of the next and following packs, in pushing said pack and its predecessors, serve to press and hold said overlapped band ends in prolonged sealing contact with each other.

10. Banding apparatus as defined in claim 9, in which the band and deflecting means are a pair of opposed members yieldably biased into the pack path from opposite sides, such as to be pushed out of said path by each pack's initial encounter therewith.

11. Banding apparatus as defined in claim 10, in which said pair of members are spring biased into the pack path.

12. Banding apparatus as defined in claim 10, in which said pair of yieldably biased members provide approach surfaces in the pack path which are rearwardly divergent lengthwise of said path, such as to be wedged apart by each pack's movement between them.

13. Banding apparatus as defined in claim 10, in which the pair of yieldably biased members have flat front end surfaces, crosswise of and perpendicular to the pack path, which, when reached and passed by the moving pack's opposite rear edges, allow said members to spring back into said path, for so deflecting the band's trailing ends.

14. Banding apparatus as defined in claim 13, including means for extending the limited transulatory movement imparted to each pack beyond the perpendicular front end surface of the yieldably biased members.

15. Banding apparatus as defined in claim 14, in which the respective front end surfaces of the pair of yieldably biased members are in slightly offset relation lengthwise of the pack path, such that one member is released for band end deflection just ahead of the other member.

16. Banding apparatus as defined in claim 12, in which the approach surfaces of the yieldably biased members are bifurcated, with sufficient spacing between their bifurcations for free passage breathwise of the band material.

17. Banding apparatus as defined in claim 10, in which the pair of opposed yieldably biased members provide the surfaces closely flanking the pack path which are encountered by opposite band extensions beyond each pack's front face.

18. Banding apparatus as defined in claim 9, including means for collecting and moving the articles of the successive packs in face-to-back edgewise supported substantially upright relation, and means for supplying for pick-up and transport by each pack an upright length of band material having upward and downward extensions beyond the pack's front face.

19. Banding apparatus as claimed in claim 18, including means for securing each band length from the leading pendent end of an intermittently fed band material web, at or just before a moving pack's encounter therewith.

20. Banding apparatus as defined in claim 18, in which the pack path is provided between a pair of vertically spaced substantially horizontal plates, providing pivotal supports exteriorly of said path for the respective yieldably biased members, and having aligned apertures in which said members operate and through which the pendent band material extends.

21. Banding apparatus as defined in claim 20, in which the latter plate is vertically adjustable, to adapt said apparatus to edgewise supported articles of different heights.

22. In banding apparatus for successively collected packs of envelopes or like articles, the class having means for giving each pack a limited translatory movement, and means for supplying across the pack path a front face pick-up and transport by each moving pack, an adhesive-tipped band, such that opposite band extensions beyond each pack's front face, from encounter with opposed surfaces closely flanking said path, are folded back across opposite front edges of the moving pack, the combination with such pack moving and supply being and frontal folding means, of spring means, first loaded and then fired by each pack-and-band movement, for so deflecting each band's trailing ends that they stand in overlapped but unstuck relation at the finish of said movement, behind their pack's rear face, and means for supporting and maintaining each so-conditioned pack in the line of such band pick-up movement for completion of its banding by the pressure against said band ends of the next and following packs, as they finish their respective band pick-up movements.

23. In the banding of successively collected packs of envelopes or like articles, wherein a limited forward movement of each pack obtains its front face pick-up and movement of an elongate adhesive-tipped band, such that oppositely extending band portions, from encountered with opposed surfaces flanking the pack path, are folded back across opposite front edges of the moving pack, the improvement which consists in first creating opposed spring forces by and during an initial stage of each pack's said band pick-up movement, then releasing said forces against the two trailing ends of the so folded band portion by and during an intermediate stage of each pack's said movement such as to deflect said ends inwardly behind said pack's rear face, and using the final stage of each pack's said movement, as it displaces and pushes ahead the preceding pack and its picked-up band to press said band's so-deflected ends into close adhesive-sticking contact with each other, against the rear face of said preceding pack, such that each pack, however brief the period of its collection, can receive its limited forward band pick-up movement as soon as it is collected.

24. The banding method as defined by claim 23, which includes the creation of said opposed spring forces by pack-and-band movement between opposed band contacting surfaces that are spring biased into the pack path from opposite sides thereof.

25. The banding method as defined by claim 24, which includes the release of said opposed spring forces by pack-and-band movement beyond said spring biased surfaces.

26. The banding method as defined by claim 23, which includes creation and release of said band end deflection forces by pack-and-band movement between and past a pair of band contacting surfaces that are spring biased into the pack path from opposite sides thereof.

27. The banding method as defined in claim 23, which includes supporting and maintaining a plurality of said packs, after such inward deflection of their band ends, in the line of pack-and-band movement, such as to prolong the pressing action on each such pack, and to create a back pressure against the final stage of each following pack's forward movement.

28. The banding method as defined by claim 27, which includes relieving said back pressure on each pack, during the band end deflecting action of said opposed spring forces.

29. The banding method as defined by claim 28, which includes using said back pressure, after each inward deflection of said band ends, to give them transverse folds across opposite rear edges of the associated pack.

30. The banding method as defined by claim 27, which includes adjusting said back pressure by varying the effective supporting surface of said plurality of packs.

31. In banding apparatus for successively collected packs of envelopes or like articles, of the class providing means for giving each pack a limited forward movement,
and means for supplying across its path, for front face pick-up and transport thereby, an adhesive-tipped band, such that oppositely extending band portions beyond said face, from encounter with opposed surfaces flanking said path, are folded back across opposite front edges of the moving pack, the combination with such pack forwarding and band supplying means of means yieldably bisected into the pack path, such as to be first pushed back and then released by each pack’s said movement, for deflecting into said path of said release the two trailing ends of each pack’s so-folded band portions in position to be pressed into close adhesive-sticking contact with each other by the final stage of the next pack’s limited forward band pick-up movement.

32. Banding apparatus as defined by claim 31, which includes means for supporting and maintaining a plurality of said packs, after such inward deflection of their band ends, in the line of pack-and-band movement, such as to prolong the pressing action on their band ends, and to create a back pressure against the final stage of each following pack’s forward movement.

33. Banding apparatus as defined by claim 32, which includes means for conveying the articles of each pack in an edgewise-supporting substantially upright position.

34. Banding apparatus as defined by claim 32, which includes means for adjusting said back pressure.

35. Banding apparatus as defined by claim 32, which includes means for varying the effective length of said pack supporting means, whereby to increase or diminish said back pressure.

36. Banding apparatus as defined by claim 31, which includes means for collecting the articles of each pack in edgewise-supporting substantially upright position.

37. Banding apparatus as defined by claim 31, which includes pack forwarding means comprising substantially upright pushing members which have parallel motion in a forward and downward circular arc against each pack’s rear face, such as to move said face to a point beyond said yieldably biased means.

38. Banding apparatus as defined by claim 37, in which the pack advancing action of said upright pushing members is supplemented by pushing action of oscillatory members against the upper rear edge of each pack.

39. A machine for banding packs of thin substantially rectangular articles comprising a pair of elongated parallel guides vertically spaced apart at a distance approximately equal to the width of said articles, accumulating means at one end of said guides for assembling said articles one by one into a pack of a predetermined number, said articles being supported edgewise upon the lower one of said guides, means for counting said articles as they pass to said accumulating means, a banding station located beyond said guiding means intermediate the lengths thereof, transfer means responsive to the action of said counting means to move said pack horizontally from one end of the lower guide through and beyond said banding station, said accumulating means, spaced guides and banding station defining a linear path of pack travel, means at said banding station for feeding a strip of flexible banding material of a predetermined length across the pack at said guides, said feeding means acting in advance of the movement of said pack through said banding station, means at said banding station for folding the upper and lower extremities of the strip of banding material rearwardly away from the leading face of said pack and against the edges thereof and for subsequently folding said upper and lower extremities inwardly in overlapping relation against the trailing face of said pack as said pack transfer means moves said pack through said banding station, said transfer means being adapted upon its movement beyond said banding station to urge said pack against the strip extremities of the preceding pack and means located beyond said banding station for accumulating the completely banded packs from between said plates.

40. Apparatus according to claim 39 wherein said last mentioned means includes means for varying the back pressure means against said pack.

41. Apparatus for banding envelopes or like articles into individual packs of envelopes comprising, counting means, means to accumulate envelopes into a pack, guide means engaging an edge of the pack to guide said pack along a path, means for extending a web of banding material across said pack, web folding means on opposite sides of said path, transfer means to move the pack of envelopes along said path to intercept said web and carrying said web therewith between said folding means to effectuate folding of said web about the leading top and bottom edges of the pack, cyclic drive means operatively connected to said transfer means and to said web extending means, and means responsive to said counting means to initiate a cycle of said cyclic drive means after delivery of a predetermined number of envelopes to said accumulating means, the envelopes while being accumulated and transferred through said folding means moving in substantially the same direction.

42. Apparatus for banding articles according to claim 41 wherein the folding of the web about each pack occurs during the uninterrupted forward advance of said pack by said transfer means.

43. Apparatus as set forth in claim 41, said folding means including means for substantially simultaneously completing folds of the web about the trailing top and bottom edges of the accumulated pack.

44. A method for banding envelopes or like articles comprising counting envelopes or the like articles, then accumulating the counted envelopes into packs, feeding a length of banding web across the path of pack travel, transferring the packs toward the banding web, first folding the banding web across the leading top and bottom edges of the pack, then folding the banding web about the trailing edges of the pack, said accumulating, transferring and folding taking place while the envelopes are being moved in the same direction.

45. A method of high speed banding of envelopes or like articles comprising the steps of counting envelopes, then accumulating the counted envelopes into packs, feeding a length of banding web across the path of pack travel, transferring each accumulated pack toward the banding web, first folding the banding web across the leading top and bottom edges of the pack, then folding the banding web about the trailing edges of the pack, said accumulating, transferring and folding taking place while the envelopes are continuously moved in the same direction.

46. An apparatus for banding envelopes into packs including linear supporting means, means for advancing envelopes one after another with the face side of one envelope facing the opposite side of an adjacent envelope and with the edges thereof moveable along the linear supporting means, means for gathering the envelopes into packs while they are being accumulated on the linear supporting means, means for feeding a strip of banding material to extend across the path of the leading side of a foremost pack, means for receiving the foremost pack therebetween and for bringing the strip across the forward, upper and lower edges of the pack, means for folding the ends of the strip into overlapping relation at the rear side of the pack and means for retracting said band feeding means for advance of a succeeding pack.

47. A method of banding envelopes into packets, including continuously depositing and advancing envelopes in a linear path one after another with the face side of one envelope facing the rear side of an adjacent envelope, containing advance of a foremost envelope in said path to cause a number of envelopes to gather into a pack, separating the pack from the following envelopes which are deposited and advanced in said linear path and advancing the pack along said linear path to a wrapping station, feed-
ing a strip of wrapping material across one side of the pack while retained in said linear path and in sufficient length to extend about the pack and leave overlapping ends, bringing the ends of the strip around to the opposite side of the pack while the pack is retained in said linear path, folding the ends of the strip in overlapping relation and effecting a seal of said overlapped ends to complete a packet of said envelopes, and resisting movement of the completed packets along said linear path to apply pressure of a succeeding packet against the seal of a preceding packet.

48. A method of banding envelopes into packets, including advancing envelopes in a linear path one after another with the face side of one envelope facing the rear side of an adjacent envelope, controlling advance of a foremost envelope to cause the following envelopes to gather into a pack, separating the pack while being advanced in said linear path from the following envelopes which are deposited and advanced in said linear path, continuing advance of the pack in said linear path to a wrapping station, feeding wrapping material across one side of the pack at the wrapping station and while the pack is retained in said linear path, severing a strip from the material of sufficient length to extend about the pack and provide overlapping ends, bringing the ends of the strip across upper and lower edges of the envelopes by movement of the pack in said linear path, folding the ends of the strip around over the opposite side of the pack, and securing the ends of the strip in overlapping relation at said opposite side of the pack without moving the pack from said linear path.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,350,834

November 7, 1967

Vincent E. Heywood et al.

It is hereby certified that error appears in the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 16, lines 67 and 68, for "intermittently-web" read -- intermittently-fed web --; column 17, line 28, for "thave" read -- have --; line 37, for "ase" read -- as --; line 75, for "successively collected" read -- successively-collected --; column 18, line 1, for "articles, the class" read -- articles, of the class --; lines 20 and 73, for "successively collected", each occurrence, read -- successively-collected --; line 24, for "encountered" read -- encounter --; column 19, line 10, for "of said release" read -- by said release --.

Signed and sealed this 3rd day of December 1968.

(SEAL)

Attest:

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Commissioner of Patents