July 12, 1960 R. WINKLER ET AL 2,944,812

METHOD AND APPARATUS FOR REGISTERING AND TIMING ENVELOPE BLANKS AND SIMILAR WORK PIECES IN THE PROCESSING THEREOF

Filed May 31, 1957 5 Sheets-Sheet 1

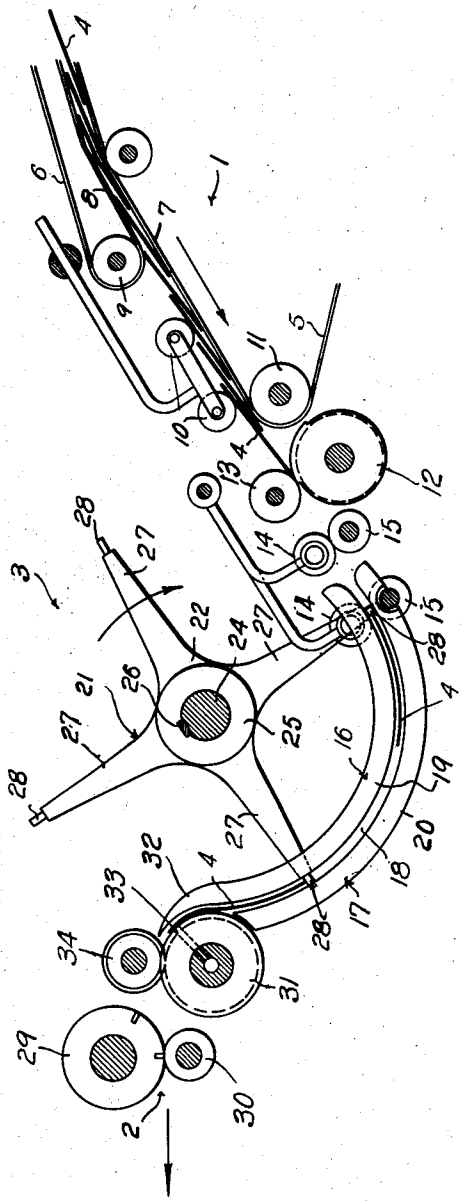


Fig. 1

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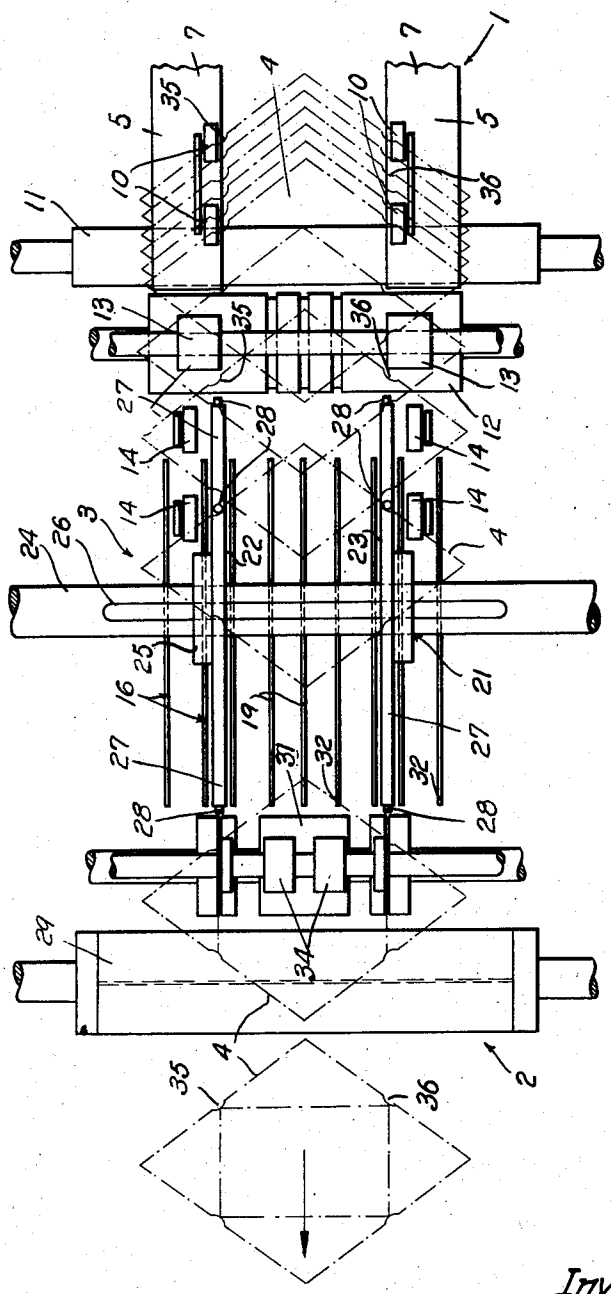


Fig. 2

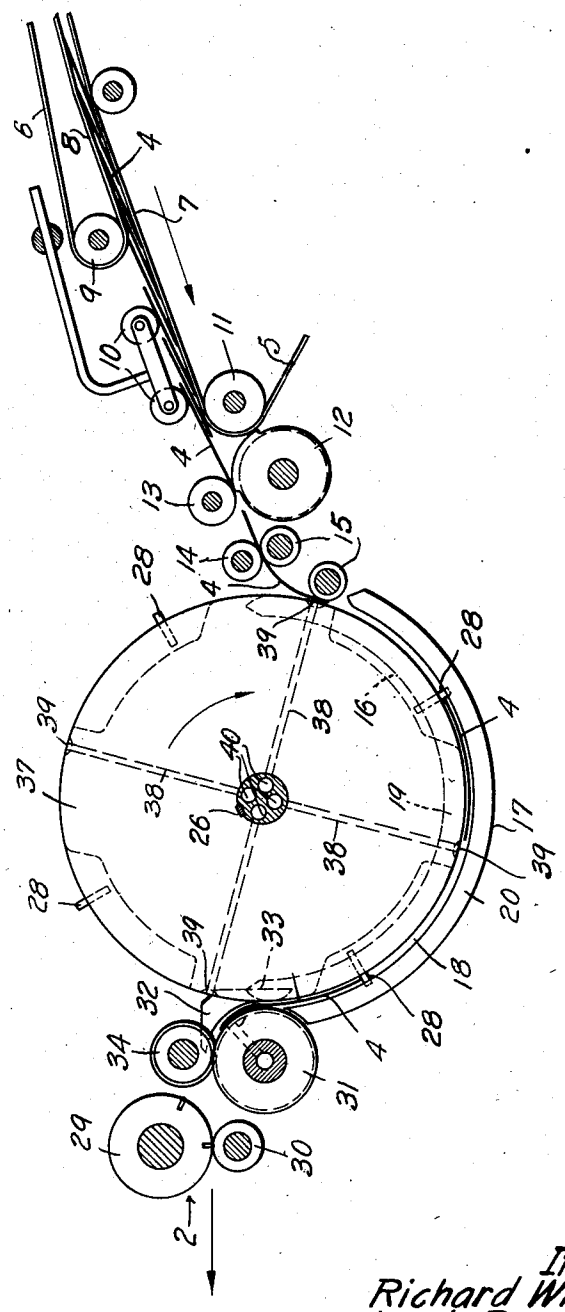
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Fig. 3



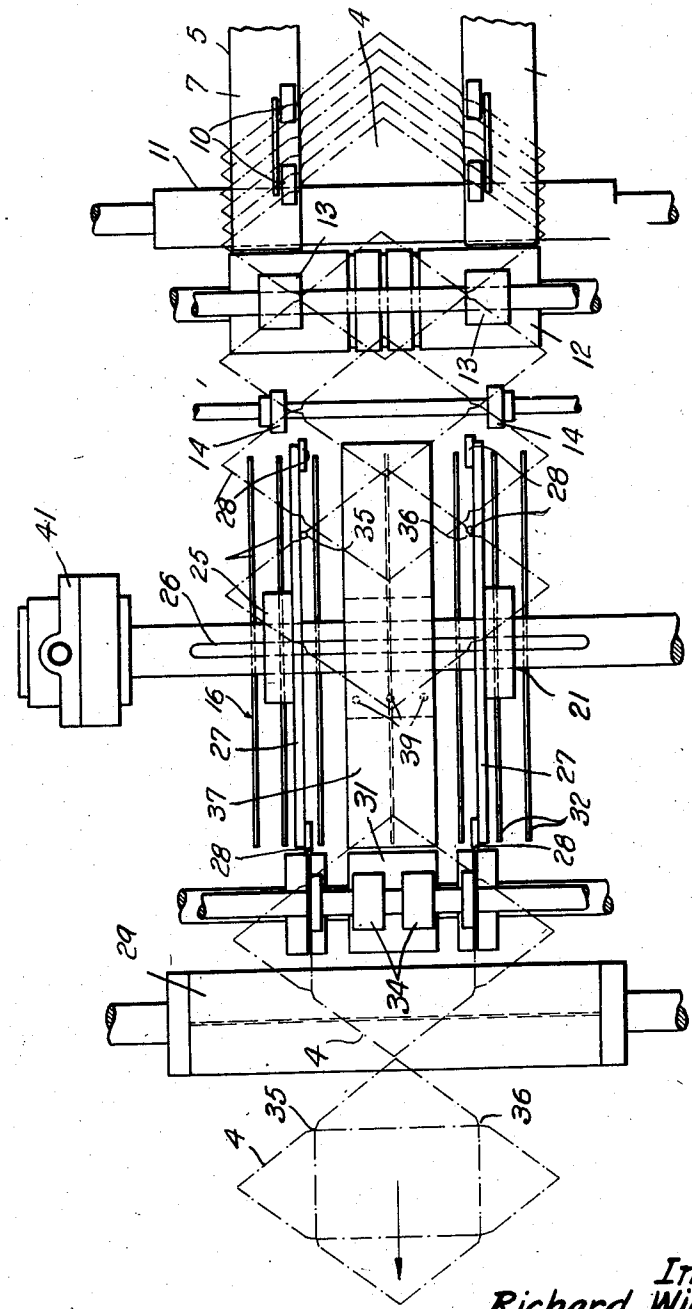
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Fig. 4

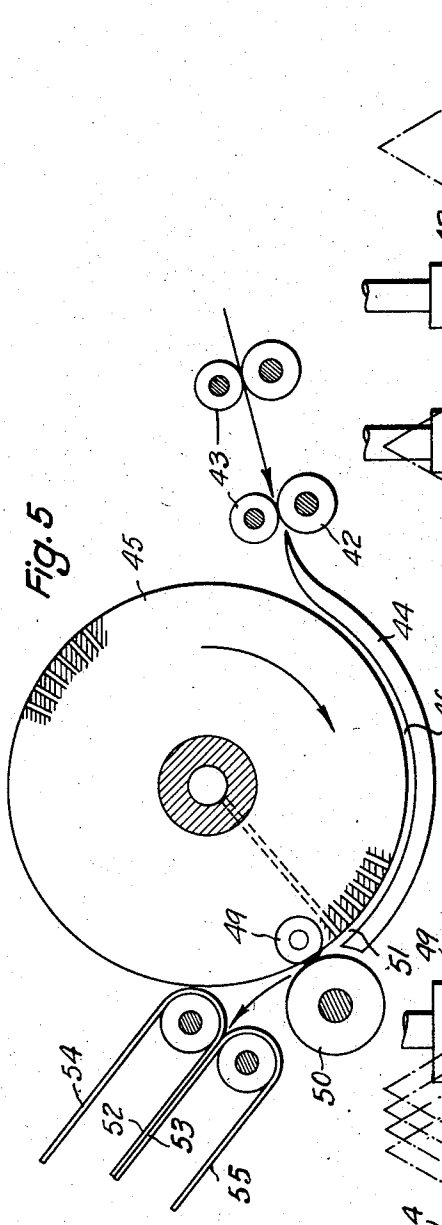


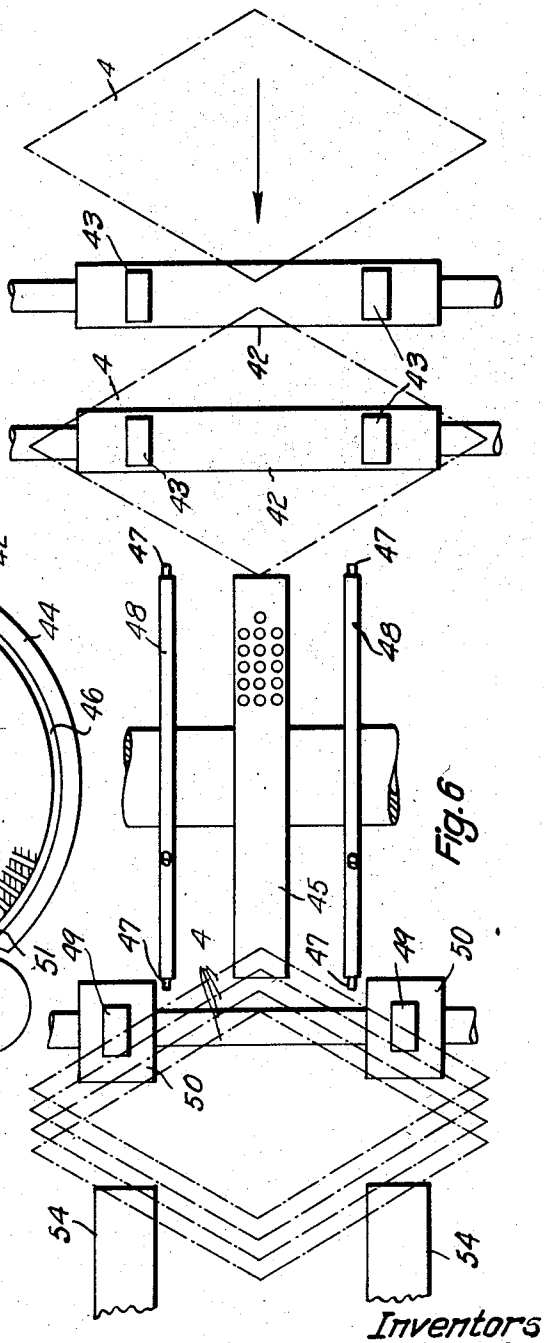
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2,944,812

METHOD AND APPARATUS FOR REGISTERING AND TIMING ENVELOPE BLANKS AND SIMILAR WORK PIECES IN THE PROCESSING THEREOF

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15 Claims. (Cl. 271—1)

This invention relates to a method and apparatus for registering and timing envelope blanks and similar work pieces preparatory to the performance thereon of printing, folding, scoring, or other operations which require substantial accuracy.

Speed of production is an economic requirement in the present manufacture of such articles as envelopes, but the necessity of registering and timing the blanks limits the working speed at which envelope making machines can be operated. Prior to the present invention, registry has been effected by stopping and shifting the blanks into registry with reciprocating pins that move into and out of engagement with front and rear edges of the blanks. This procedure is known as a "4-way pin register," and has the disadvantage of a comparatively slow working speed and the possibility of damage or tearing of the blanks. Another method previously used in registering blanks was to move the blanks in a rectilinear path with the registry taking place by pins spaced apart on chains. However, the flexibility of chains and the stretch to which they are subjected makes it impossible to maintain constant spacing of the blanks, so that deviations occur. Also, a relatively fast speed could be obtained only when the blanks were formed of strong and relatively stiff material. With thin, light weight material the working speed of the envelope machine had to the considerably reduced to obtain registry.

There are also positions in an envelope making machine where it is desired to gather and feed blanks in overlapping relation, which has been previously accomplished by a suction disk and pairs of slowly moving rollers that engage the blanks at their corners. This also limits the speed of the machine to avoid tearing of the corners of blanks formed of light weight and weak papers.

With the above in mind, it is a principal object of the present invention to provide a new method and novel apparatus for timing and registering work pieces such as envelope blanks and the like and which may be operated satisfactorily at high rates of speed so desirable in the manufacture of envelopes and similar articles.

Other objects of the invention are to provide a method and apparatus for correctly registering envelope blanks for feeding thereof in overlapped relation at higher speeds; to provide a simple and highly efficient method and apparatus for registering the blanks while they are free to move in a continuous forward direction; and to provide a timing and registering apparatus which operates successfully on blanks regardless of the strength or thickness of the material and without deformation or tearing of the blanks.

A further object of the invention is to provide a method and apparatus by which the blanks are temporarily stiffened in approximately the direction of travel by subjection of the blanks to centrifugal force and a bending action during registry and timing thereof.

In accomplishing these and other objects of the invention as hereinafter pointed out, we have provided a new

method and improved apparatus, the preferred forms of which are illustrated in the accompanying drawings, wherein:

Fig. 1 is a longitudinal section through a registering apparatus embodying one form of the invention.

Fig. 2 is a plan view of the apparatus illustrated in Fig. 1.

Fig. 3 is a longitudinal section through another form of apparatus which embodies the features of the present invention.

Fig. 4 is a plan view of the form of the invention shown in Fig. 3.

Fig. 5 is a longitudinal section through a further modified form of the invention which is particularly adapted for use in registering blanks for movement in overlapping relation prior to application of gum to sealing flap areas thereof.

Fig. 6 is a plan view of the apparatus shown in Fig. 5.

Referring more in detail to the drawings and first to the form of invention shown in Figs. 1 and 2:

1 designates a portion of an envelope making machine by which envelope blanks are delivered from a processing stage such as the sealing gum drying section of the machine to the first of a series of processing sections or stages, such as a scoring section 2. Interposed between the sections 1 and 2 of the envelope machine is a timing and registering mechanism 3 embodying the features of the present invention and by which the blanks are caused to enter the subsequent operating sections 2 in proper time and position. In the illustrated instance, envelope blanks 4 are carried in the portion 1 of the machine between conveyer belts 5 and 6 from a blank cutout, sealing flap gumming, and gum drying mechanisms (not shown) but which are well understood by those skilled in the manufacture of envelopes. The envelope blanks are carried in overlapped relation between the upper runs 7 of the lower belts 5 and the lower runs 8 of the upper belts 6 and are discharged from under the upper belts to continue for a short distance in lapped relation on the lower conveyer belts 5 when the lower runs of the upper belts turn about a guide roller 9. The blanks are immediately engaged by pressure rollers 10 to hold the blanks in a straightaway direction as the upper runs 7 of the belts 5 turn about a guide roller 11 over which the lower belts operate. The blanks are thus successively advanced in lapped relation with the foremost ends of an upper blank spaced forwardly of the foremost ends of the underlying blank.

The projecting end of a foremost blank is in a position to be engaged between a separating roller 12 and pressure wheels 13. The separating roller 12 is driven at a higher speed than the speed of the conveyer belts, so that when the foremost end of a forward blank is engaged between the pressure wheels 13 and separating roller 12, the foremost blank is completely withdrawn and separated from the following blank before the foremost edge of the following blank reaches the separating roller 12. The first of the envelope blanks 4 are thus separately and successively separated from the advancing line of the overlapping blanks. The advance of the blanks is continued after separation between one or more pairs of feed wheels 14—15 to the timing and registering mechanism 3.

The mechanism 3 includes as a part thereof upper and lower sets of guide rails 16 and 17, the sets being spaced apart to provide a pass 18 therebetween in which the blanks 4 are registered and advanced in timed relation with subsequent processing mechanisms 2 of the envelope making machine. The upper and lower sets of guide rails each include a plurality of laterally spaced apart rail members 19 for the upper set and 20 for the lower set, a sufficient number of rails 19 being provided

to resist sagging or bulging of the blanks therebetween in the transverse direction thereof.

As above stated, the invention contemplates temporarily stiffening the blanks in approximately the direction of travel between the sets of guides while the blanks are firmly retained in guided contact with the lower set of rails responsive to centrifugal force. The sets **16** and **17** of guide rails are, therefore, of arcuate form in their lengthwise direction, in that they curve about an axis of rotation of a driving means **21** by which the envelopes are mechanically aligned and advanced through the pass **18** between the sets of guide rails, after which they are regripped by a subsequent conveying and advancing means, later to be described.

The driving means **21** comprises laterally spaced apart rotary members **22** and **23** adjustably fixed to a rotating shaft **24** that is driven in timed relation with the subsequent operating mechanisms of the envelope making machine (not shown). Each member **22** and **23** includes a hub portion **25** that is positioned on the shaft **24** by means of a key **26**. Extending radially from the hubs are arms **27** with the outer terminal of each arm carrying a pin or finger **28**. The arms **27** of each member **22** and **23** are of a length so that when the members **22** and **23** are rotated in the direction of the arrow, Fig. 1, the pins **28** move radially through the pass **18** between the upper and lower sets of guide rails **16** and **17** to engage and register the blanks **4** and to advance the blanks in curved condition through the pass in bearing contact with the inner edges of the lower guide rails, responsive to centrifugal action produced in the blanks by reason of their high speed curvilinear travel as the pins push the blanks to the gripping mechanism which holds the blanks in their registered condition as they are moved out of the pass and advanced to subsequent processing mechanisms, for example, printing and/or gumming, folding and scoring mechanisms of a modern rotary envelope making machine, of which only one mechanism is represented in the drawing and that being one pair of scoring rolls **29** and **30**, shown in Fig. 1.

The gripping means which holds the blanks in registered time relation as they move from the pass **18** comprises a suction roll **31** that rotates at the ends of the lower or outer set of guide rails **17** and positioned coaxially of reversely curved terminals **32** of the upper or inner set of rails **16** which act to impart a reverse curve in each blank and to guide the forward edge thereof into contact with the periphery of the suction roll **31** to be gripped thereagainst responsive to suction. The suction is drawn through orifices **33** that are suitably located in the periphery of the suction roll. The suction is made effective in properly timed relation with the foremost portions of the blanks to be gripped and fed between the face of the suction roll and pressure wheels **34**. The peripheral speed of the suction roll and pressure wheels corresponds with the peripheral speed of the pins **28** as they advance through the pass when pushing the blank therethrough. The blanks are thus gripped and advanced at the same speed that the rear portions of the blanks are being pushed by the pins **18**.

The blanks **4** are registered by contact of the pins with the rear edges of the blanks after the blanks have entered the foremost portion of the pass **18** and continue their advance at the same linear speed when the propelling force is taken off by the suction roll. Therefore, there are no strains tending to deform or tear the blanks.

The driving members are spaced apart so that the pins **28** engage in the notches **35** and **36**. The notches define points of fold of the flaps of the envelopes and also assist in registry of the blanks when the pins **28** engage therein.

It will be noted that the shape of the pass **18** between the guide rails constitutes an important function of applying resistance to forward movement of the blanks by the driving members, so that the friction which the envelopes encounter as they are held against the outer guide rails by centrifugal force, tends to retard forward advance of the blanks and retains the notch portions **35** and **36** thereof in contact with the pins **28**, thereby assuring positive registry, since, as above stated, the driving members are operated in timed relation with the mechanisms which perform subsequent operations on the envelopes, such as the scoring rolls **29** and **30**.

In the modified form of invention shown in Figs. 3 and 4, the envelope blanks are advanced in the same manner as in the first described form, and the same description and numerals of reference are applied to the like parts, however, the driving means for pushing and registring the blanks in the pass **18** is equipped with means for positively drawing the blanks into the entrance to the pass **18** and to hold onto the blanks until they have been completely drawn into the pass when they are freed to float in the pass until advanced by the pins **28**, as now to be described.

Located on the shaft intermediate the rotary members **22** and **23** is a suction wheel **37** having diametrical bores **38** terminating in suction orifices **39** at the circumference of the wheel. The inner ends of the bores **38** connect with channels **40** in the shaft **24**, which in turn connect with a vacuum control valve **41** to time the intervals during which suction is effected through the orifices **39**. The suction orifices **39** are located in the periphery of the wheel in intermediate spaced relation with the pins **28** of the rotary members **22** and **23** to effect the positive feed of the blanks from the wheels **14** and **15** into the curved pass **18**. In this way, the forward portions of the blanks **4** are individually attached by the suction as the orifices pass the path of the blanks, at which point the vacuum is made effective in those orifices to seize and lead the blanks into the curved pass. As soon as the blanks have safely entered the pass, the suction is suspended to allow positioning and aligning of the blanks in the pass when the set of pins **28** engage the rear edge of the blank.

The modified form shown in Figs. 5 and 6 of the drawings is adapted for registering blanks that are previously carried singly in spaced apart relation between a plurality of guide rollers and pressure wheels **42** and **43** into position to be engaged between curved forward ends of the lowermost sets of rails **44**, whereon each blank is temporarily stiffened by centrifugal force exerted in the blanks when they are gripped by suction wheel **45** at the time the suction is effective in drawing the blanks into the curved pass **46** for registry thereof by means of the pins **47** on the periphery of the disks **48**, corresponding to the members **22** and **23** previously described. Rollers **49** and **50** are provided at the discharge end **51** of the curved pass, but rotate at a reduced rate of speed to collect and overlap the blanks when they are transported between the runs **52** and **53** of the conveyer belts **54** and **55** for further processing where it is desirable to overlap the blanks, for example, to apply sealing gum to sealing flap portions of the blanks in the forepart of an envelope making machine.

The operation of the different forms of the invention have been substantially described in connection with the description of the apparatus.

In Fig. 1 the envelopes are conveyed between the runs **7** and **8** of the belts **5** and **6** to the point where they run out from under the belt **6** and under the pressure wheels **10** to cooperate with the runs **7** of the belts **5** in successively presenting the foremost ends of the blanks into contact with the separating roller **12** and the pressure wheels **13**. The roller **12** being operating at a higher speed than the speed of the conveyer belts **5** and **6**, withdraws the blanks one at a time for separate advancement between the pairs of wheels **14** and **15** into the entrance of the pass **18**. The speed of the separating roller **12** is such that the blanks are spaced apart, that is, the rear edge of a foremost blank has entered the pass **18** by the

time the foremost edge of a following blank is engaged between the separating roller **12** and pressure wheels **13**, as shown in Fig. 1, so that the pins **28** on one of the arms **27** of the rotors **22** and **23** pass therebetween to engage within the notches **35** and **36** of the blank that has then entered the pass. As soon as the rear edge of the blank has cleared the last of the pairs of feed wheels **14** and **15**, there may be a momentary lag of the blank, due to the curving contact thereof with the upper edges of the rails **20**, to permit the pins **28** to catch up therewith and continue movement of the blank through the pass in registering and timed relation with the processing mechanisms of the envelope making machine, such as the scoring means **29** and **30**.

The blanks are stiffened incidental to their curvature and the frictional contact with the inner edge of the lower or outermost set of guide rails by reason of the centrifugal force imparted therein as the blanks are moved through the pass by the driving means **21**. Since the blanks are stiffened, it is obvious that substantially thin, light weight materials may be used in the formation of the envelopes, with the result that the envelope making machine may be operated at a higher speed than with present methods of registry which have been previously described.

When a blank reaches the end of the pass, the curved ends **32** of the sets of guide rails **16** guide the blank into position to be sucked into contact with the periphery of the suction roll **31** as the port **33** moves thereunder and the suction is made effective to bring the forward edge of the blank under the pressure wheels **34** to continue feed to subsequent processing mechanisms of the envelope making machine, as represented by the scoring rollers.

The form of the invention shown in Figs. 3 and 4 operates in the same manner as the form illustrated in Figs. 1 and 2, with the exception that when the envelope blanks pass the last of the feed rollers **14** and **15**, the blanks are engaged by suction which is effected through the orifices **39** as they move into position, shown in Fig. 3. At this time, the control valve **41** establishes a suction through those orifices that are then in contact with the blank. By the time the blank has been pulled into the pass, the control valve has shut off the vacuum to release the blank in the pass. The pins **28** engage the notches in the rear edges of the blank to continue movement of the blank through the pass as previously described in connection with the first described form of the invention.

In the form of the invention shown in Fig. 5, the blanks **4** are delivered separately and spaced apart to the timing mechanism by means of the wheels or rolls **42** and **43**. In this instance, the ends of the guides are curved to facilitate directing the blank into the pass, so that it may be engaged by the suction orifices, substantially as described in connection with the form of the invention shown in Fig. 3, until the rear edge of the blank has been engaged by the pins **47**, whereupon the movement of the blank is continued. In this instance, the blanks are moved at the slower speed of the rollers **49** and **50** into the conveyer belts **54** and **55**, so that the blanks overlap and are carried in overlapped formation between the runs **52** and **53** of the belts **54** and **55**.

From the foregoing, it is obvious that we have provided a timing and registering mechanism which will operate successfully on blanks formed of thin, light weight materials, and which may be actuated at high speed without causing the blanks to be torn or otherwise deformed by the registering mechanism.

What we claim and desire to secure by Letters Patent is:

1. An apparatus for positioning blanks to be processed, including means for conveying the blanks in overlapped relation, upper and lower curved guides providing a curved pass in receiving relation with the conveying means, means for separating the foremost blank, suction means for engaging and carrying the separated blank into the curved pass to impart a curvature in each blank for temporarily stiffening the blank, a rotor having radially projecting pins, means supporting the rotor in coaxial relation with the curvature of said pass for carrying the pins through said pass in engagement with rear edges of the blank to advance the blank through said pass in said curved condition, and means for removing the blank from said pass, said lower guides providing frictional contact with the blank to hold the blank in contact with said pins.

2. An apparatus for timing and registering blanks during movement to a processing stage, including means for conveying the blanks in overlapped relation, upper and lower curved guides providing a curved pass in receiving relation with the conveying means, means for separating the foremost blank and carrying the separated blank into the curved pass to impart a curvature in said blank, a rotor having radially projecting pins, means supporting the rotor in coaxial relation with the curvature of said pass for movement of the pins through said pass for engaging rear edges of the blank and moving the blank through said pass, and means on said supporting means and movable with the rotor to cooperate with said separating means in carrying the blank into said pass.

3. An apparatus for timing and registering blanks during movement to a processing stage, including means for conveying the blanks, upper and lower curved guides providing a curved pass in receiving relation with the conveying means, means for separating the foremost blank and carrying the separated balnk into the curved pass to impart a curvature in each blank, a rotor having radially projecting pins, means supporting the rotor in coaxial relation with the curvature of said pass for movement of the pins through said pass for engaging rear edges of the blank and moving the blank through said pass, a suction member on said supporting means and having suction orifices for engaging the blank and cooperating with said separating means in carrying the blank into said pass, means for controlling suction through said orifices for releasing the blank when the blank is contained in said pass and in position to be engaged by said pins, and means for removing the blank from said pass.

4. An apparatus for timing and registering envelope blanks having notches in edges thereof for defining points of fold, including means for conveying the blanks with edge portions having at least two of the notches in trailing relation on said conveying means, a pair of laterally spaced rotary members having notch engaging means adapted to engage in said notches, inner and outer curved guides having substantially concentric support coaxially with the rotary members and providing a pass having an inlet end and a discharge end, means for withdrawing the blanks successively from said conveying means and carrying the blanks one at a time into said pass for curving the blanks and positioning the blanks for engagement by said pins in the notches to continue movement of the curved blank through said pass, and means at discharge end of the pass for gripping and withdrawing blanks from said pass.

5. An apparatus for timing and registering blanks having notches for defining points of fold, including means for conveying the blanks in lapped relation with edge portions having at least two of the notches in trailing relation on said conveying means, a pair of laterally spaced rotary members having pins adapted to engage in said notches, means for withdrawing the blanks successively from said conveying means, upper and lower spaced guides having support coaxially with the rotary members and spaced apart to provide a pass having an inlet end in receiving relation with said withdrawing means, means rotatable with the rotary members for engaging a forward end of each blank from the withdrawing means to carry the blank into said pass for curving the blank

and to position the blank for engagement by said pins in the notches to continue movement of the curved blank through said pass, and means at opposite ends of the guides for gripping and withdrawing the blank from said pass.

6. An apparatus for positioning and timing sequence of envelope blanks to a processing stage, including substantially concentrically arranged upper and lower curved guides, means for supporting said guides in spaced apart stationary position to provide a curved pass therebetween, means for feeding the blanks individually into the curved pass, a rotor having portions spaced uniformly about the periphery thereof, and means for rotatably carrying said rotor with the spaced portions thereon projecting into and movable through the pass in the direction of curvature for engaging rear edges of the blanks to propel the blanks in substantially free flight through the pass in spaced apart relation and to cooperate with the curvature of the lower guides to maintain engagement of the rear edges of the blanks with said projecting portions of the rotor for bringing the blanks into uniform position and timing while in flight through said pass.

7. An apparatus for positioning and timing sequence of envelope blanks to a processing stage, including substantially concentrically arranged upper and lower curved guides, means for supporting said guides in spaced apart stationary position to provide a curved pass therebetween, suction means for feeding the blanks individually into the curved pass, a rotor having portions spaced uniformly about the periphery thereof, and means for rotatably carrying said rotor with the spaced portions thereon projecting into and movable through the pass in the direction of curvature for engaging rear edges of the blanks to propel the blanks in substantially free flight through the pass in spaced apart relation and to cooperate with the curvature of the lower guides to maintain engagement of the rear edges of the blanks with said projecting portions of the rotor for bringing the blanks into uniform position and timing while in flight through said pass.

8. An apparatus for positioning and timing sequence of envelope blanks to a processing stage, including substantially concentrically arranged upper and lower curved guides, means for supporting said guides in spaced apart stationary position to provide a curved pass therebetween, means for feeding the blanks individually into the curved pass, a rotor having portions spaced uniformly about the periphery thereof, means for rotatably carrying said rotor with the spaced portions thereon projecting into and movable through the pass in the direction of curvature for engaging rear edges of the blanks to propel the blanks in substantially free flight through the pass in spaced apart relation and to cooperate with the curvature of the lower guides to maintain engagement of the rear edges of the blanks with said projecting portions of the rotor for bringing the blanks into uniform position and timing while in flight through said pass, and suction means carried by the rotor and cooperating with said feeding means to completely draw the blanks into the pass prior to engagement of the projecting portions of the rotor with the blanks.

9. The method of timing sequence of envelope blanks while the blanks are moving in a continuous flight, including loosely guiding the blanks in a curvilinear stationary path, delivering the blanks individually into said path, applying a propelling force to each blank after entering said path, maintaining the propelling forces in timed sequence for advancing the blanks in corresponding timed sequence, and applying a retarding force on each blank responsive to curving of the blanks by the centrifugal force produced in each blank to keep each blank in contact with its propelling force.

10. The method of timing sequence of envelope blanks while the blanks are moving in a continuous flight, including loosely guiding the blanks in a curvilinear stationary path, delivering the blanks individually into said path, applying a propelling force to each blank after entering said path, maintaining the propelling forces in timed sequence for advancing the blanks in corresponding timed sequence, applying a retarding force on each blank responsive to curving of the blanks by the centrifugal force produced in each blank to keep each blank in contact with its propelling force, and applying a gripping force to each blank for maintaining said timed sequence during continued advance of the blank to a processing stage.

11. The method of timing sequence of envelope blanks while the blanks are moving in a continuous flight, including loosely guiding the blanks in a stationary curvilinear path, delivering the blanks individually into said path, applying a corresponding curvilinear propelling force only at the rear edge of each blank after the blank has fully entered said path, maintaining the propelling forces in timed sequence for pushing the blanks through the curvilinear path in corresponding timed sequence, and applying a retarding force on each blank responsive to curving of the blanks against said path by the centrifugal force produced in each blank to keep each blank in contact with its propelling force.

12. The method of timing sequence of envelope blanks while the blanks are moving in a continuous flight, including loosely guiding the blanks in a stationary curvilinear path, delivering the blanks individually into said path, gripping a foremost marginal portion of the individual blank to draw the blank completely into said curvilinear path, releasing the grip on each blank for allowing the blank to float in said path, applying a propelling force in a corresponding curvilinear direction to only the rear edge of each blank after the blank has been fully drawn into said path and the grip has been released, maintaining the propelling forces in timed sequence for advancing the blanks in corresponding timed sequence, applying a retarding force on each blank to keep each blank in contact with its propelling force, and applying a gripping force to each blank as the blank emerges from said curvilinear path for maintaining said timed sequence during continued advance of the blanks to a processing stage.

13. The method of timing sequence of envelope blanks while the blanks are moving in a continuous flight, including loosely guiding the blanks in a stationary curvilinear path, delivering the blanks individually into said path, gripping a foremost marginal portion of the individual blank to draw the blank completely into said curvilinear path, releasing the grip on each blank for allowing the blank to float in said path, applying a propelling force in a corresponding curvilinear direction to only the rear edge of each blank after the blank has been fully drawn into said path and the grip has been released, maintaining the propelling forces in timed sequence for advancing the blanks in corresponding timed sequence, applying a retarding force on each blank responsive to curving of the blanks in said path by the centrifugal force produced in each blank to keep each blank in contact with its propelling force, and applying a gripping force to each blank as the blank emerges from said curvilinear path for maintaining said timed sequence during continued advance of the blank to a processing stage.

14. An apparatus as described in claim 6 for positioning and timing sequence of envelope blanks to a processing stage, including means at the end of the pass for partially lapping the blanks for delivery in lapped relation to the processing stage.

15. The method of timing sequence of envelope blanks while the blanks are moving in continuous flight as described in claim 9, and including the additional step of finally lapping the blanks partially one upon another.

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