United States Patent

Helm

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[54] APPARATUS FOR FEEDING A BAND OF OVERLAPPED BLANKS TO A SEPARATOR

[72] Inventor: **Herbert W. Helm,** Hollidaysburg, Pa.

[73] Assignee: **F. L. Smithe Machine Company, Inc.,** Duncansville, Pa.

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[52] **U.S. Cl.**.....**271/76,** 93/62, 198/139

[51] **Int. Cl.**.....**B65h 29/12**

[58] **Field of Search**.....271/2, 37, 38, 76, 77; 93/61, 93/62; 198/139

[56] **References Cited**

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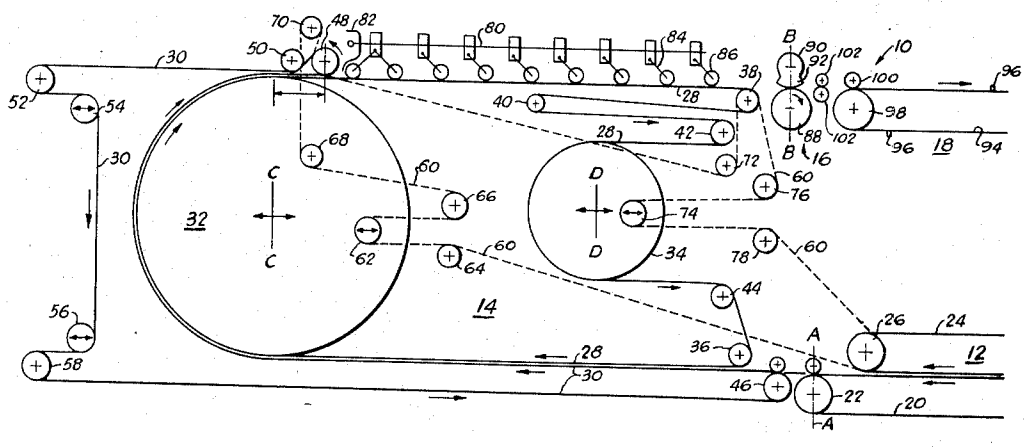
3,122,233	2/1964	Novick	93/62 X
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Primary Examiner—Joseph Wegbreit
Assistant Examiner—Bruce H. Stoner, Jr.
Attorney—Stanley J. Price, Jr.

[57] **ABSTRACT**

In an envelope making machine a band of overlapped blanks is conveyed from an adhesive drier to a blank separator by a refeeder. The refeeder has pairs of inner and outer endless belts that are driven at the same speed with the outer belts overlying portions of the inner belts. The belts engage the band of overlapped blanks therebetween and convey the band from the drier to the separator. is positioned beneath an idler roll carriage that has an end release roll adjacent the separator. The separator includes pull-out rollers with a radially extending pull-out segment on one roller that engages the front or leading edge of the blank and accelerates the front blank to separate it from the band of overlapped blanks and feed it in timed relation to the subsequent elements of the envelope forming apparatus. When the length of the blank changes or when the dimension of the conveyors in the drier and refeeder increase with increased operating temperatures of the machine, an adjustment is required in the phasing or timing of the blanks delivered to the separator so that the pull-out segment continues to engage the front leading edge of the blank. The disclosed refeeder adjusts the timing of the blanks by changing the effective length of the refeeder conveyor and thus the distance that the band of overlapped blanks travels from the drier to the separator. The length of the refeeder conveyor is changed by moving two reference frames or drums relative to each other. Movement of one reference drum changes the effective length of the path followed by the blanks and movement of the other reference drum changes the effective length of the inner belts. The outer belts have spring loaded take-up idlers that proportionately adjust the effective length of the outer belts to conform to that of the inner belts. An endless chain drive mechanism for the inner and outer belts is connected to the pair of reference drums so that the effective length of the chain is adjusted with the reference drums. The pitch diameter of the belt drive pulleys and belt drive sprockets is substantially the same so that the chain velocity remains constant and the phase relation of the chain drive changes with the endless belts.

8 Claims, 2 Drawing Figures



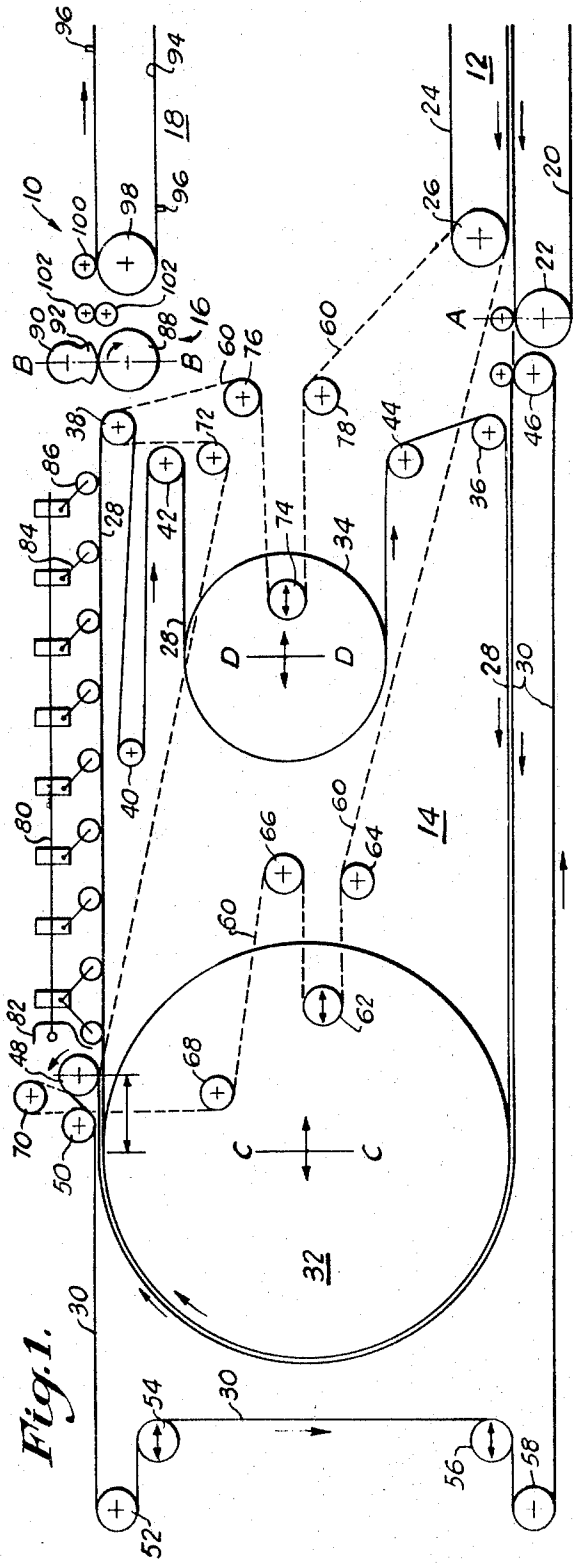


Fig. 1.

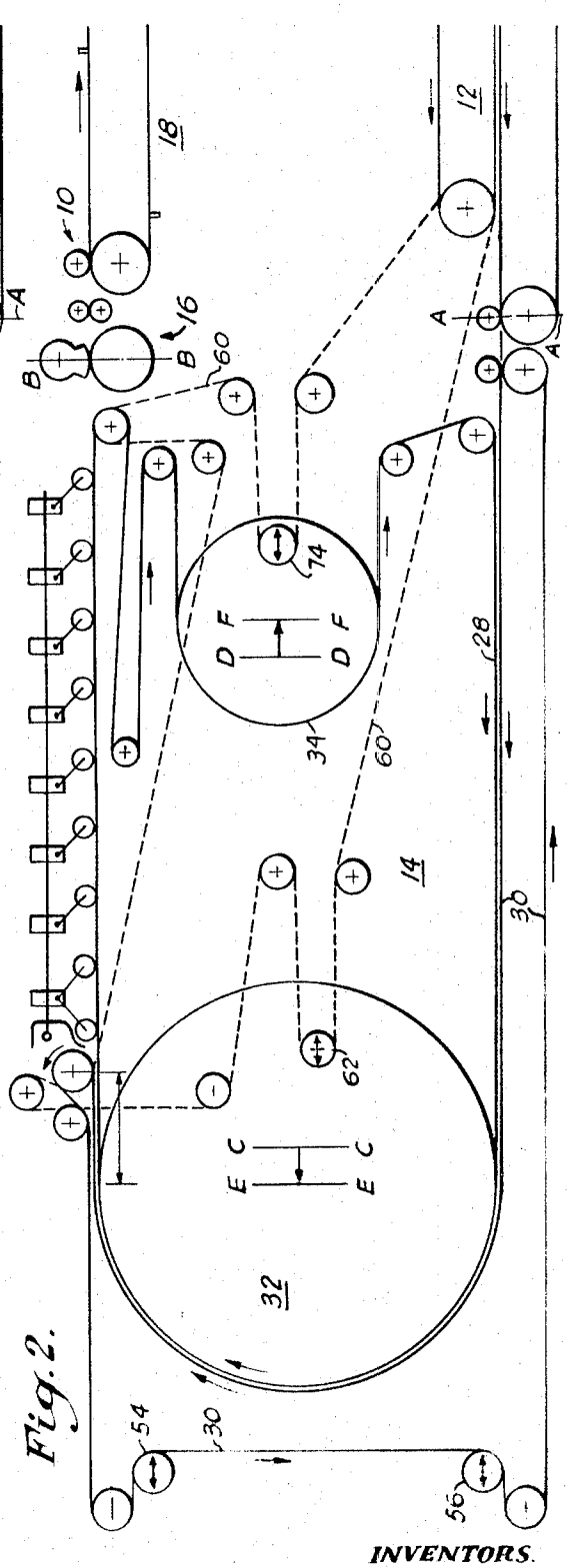


Fig. 2.

INVENTORS.
Herbert W. Helm

BY Stanley J. Hunt
their ATTORNEY

APPARATUS FOR FEEDING A BAND OF OVERLAPPED BLANKS TO A SEPARATOR

BACKGROUND OF THE INVENTION

1. Field of The Invention

This invention relates to envelope or bag making machines and more particularly to a refeeder device for conveying a band of overlapped blanks to a separator.

2. Description of the Prior Art

In an envelope or bag making machine the sealing flaps of the blanks are gummed with adhesive while the blanks are conveyed as a band in a close overlapped relation with the seal flap portion of each blank exposed. The blanks are dried while being conveyed through a drier and then conveyed to a separator by a refeeder type conveyor. At the separator the blanks are separated and accelerated by a rotating pullout segment that is arranged to engage the front edge of the blank in timed relation with the subsequent aligning, scoring and folding devices. The blanks must, therefore, be delivered to the separator in timed relation with the pullout segment and the other following envelope forming devices. Several methods of adjusting the timing of the blanks have been disclosed in the prior art.

Since the separator is drivingly connected to the other subsequent envelope forming devices, the pullout segment and all of the following devices can be advanced or retarded when timing adjustments are required for different sized blanks. This requires stopping the machine, disengaging the clutch elements between the devices, changing the timing and engaging the clutches. This procedure is time consuming and relatively complex. Further, problems are encountered where the phasing or timing changes occur during operation due to temperature changes in the machine. Another method of advancing or retarding the separator and the subsequent envelope forming devices is to include a differential drive for the envelope forming devices that would permit adjustment when the machine is running. Again, this type of mechanism is relatively complex and expensive.

U.S. Pat. No. 3,122,233 discloses apparatus for pivoting the refeeder section about a pivot point adjacent to the lower paper line. With this arrangement the release rolls adjacent the pullout segment must be adjusted with each adjustment of the refeeder section and it is difficult to both sense and correct the phasing of the blanks with an automatic control similar to that disclosed in U.S. Pat. No. 3,379,103.

SUMMARY OF THE INVENTION

The present invention relates to an envelope or bag making machine that has a pair of spaced blank treating stations. A conveyor is positioned between the stations and is arranged to convey a band of overlapped blanks from the first station to the second station and deliver the blanks to the second station in timed relation with the actuation of a blank engaging device in the second station. The conveyor has an effective conveying portion that engages and conveys the band of overlapped blanks. A conveyor drive is provided that moves the conveyor and band of overlapped blanks at a fixed preselected speed. The blank engaging device upon actuation engages, separates and accelerates the leading blank from the moving band of overlapped blanks and feeds the separated blank to another blank treating station. The blank engaging device is arranged to engage the front end of a blank periodically with fixed periods of time therebetween. The conveyor includes means to either increase or decrease the length of the effective conveying portion to thereby vary the distance traveled by the blanks in the band of overlapped blanks from the first station to the second station.

With this arrangement it is now possible to adjust the phase and timing of the blanks delivered to the separator while the machine is either running or not running. Further, small incremental adjustments may be made in the timing while the machine is running to compensate for dimension changes caused by increased temperatures during operation.

Accordingly, the principal object of this invention is to provide apparatus for adjusting the timing and phase delivery of a bond of blanks to a separator device.

Another object of this invention is to provide a phase adjusting device that may be easily motorized and automated for minor corrective adjustments during operation of the machine.

These and other objects and advantages of this invention will be more completely disclosed and described in the following specification, the accompanying drawings and the appended claims.

BRIEF DESCRIPTION OF THE DRAWINGS

FIGS. 1 and 2 are similar schematic views in elevation of an envelope machine refeeder section illustrating diagrammatically the endless conveyor belts, drive chains, blank separator and blank aligner.

FIG. 1 is positioned above FIG. 2 and clearly illustrates the manner in which the drum members and idler sprockets mounted on movable centers are moved relative to each other to increase and decrease the path followed by the band of overlapped blanks.

DESCRIPTION OF THE PREFERRED EMBODIMENT

U.S. Pat. Nos. 3,122,233 and 3,379,103 disclose envelope making machines with the various elements for forming the envelopes and the disclosures in these patents are incorporated by reference herein.

As discussed in the above patents, envelope machines include a feeder mechanism that discharges a continuous stream of blanks in an overlapped relation with the seal flap portion exposed to an endless conveyor. The overlapped blanks are conveyed on the conveyor past a seal flap gummer mechanism and adhesive is applied to the exposed flap portions of the continuous band of overlapped blanks. The band of blanks is next fed to a drier where the adhesive on the seal flaps is dried. The overlapped blanks are usually slightly separated prior to entering the drier portion of the machine to prevent the blanks from adhering to each other.

The overlapped band of blanks is transferred from the conveyor extending through the drier to a refeeder mechanism that feeds the overlapped blanks in timed relation to a separator or an individualizing mechanism where the blanks are separated and fed as individual blanks to envelope forming elements and the individual blanks are scored, the side flaps folded over the blank body portion, adhesive applied to the bottom flap, and the bottom flap folded over and adhesively secured to the side flaps to form a folded envelope. The folded envelope is then fed to a transfer device and stacked on a receiver.

The elements of the envelope forming apparatus are interconnected and operate in timed relation for continuous operation of the envelope machine. It is essential that the individual blanks be separated from the band of overlapped blanks and fed into the envelope forming apparatus at a definite stage in the envelope forming apparatus operational cycle. An operational cycle can be conveniently defined as one revolution of the envelope forming elements.

A suitable feeder mechanism is disclosed in U.S. Pat. No. 2,799,497 and suitable belt type conveyor mechanisms are disclosed in U.S. Pat. No. 3,122,233. Both the individualizer or separator and aligning devices may be similar to that disclosed in U.S. Pat. No. 1,896,867. A suitable scorer is disclosed in U.S. Pat. No. 2,101,268 and a suitable side flap folder is disclosed in U.S. Pat. No. 1,839,492.

The separator or individualizer mechanism is connected to the subsequent envelope forming devices and is arranged to engage each blank and accelerate it to separate it from the band of overlapped blanks. The separator, upon accelerating the blank, feeds the individual blanks to the aligning mechanism. As disclosed in U.S. Pat. No. 2,101,268 the separator includes a pair of pullout rollers rotating in timed

relation to the subsequent elements of the envelope forming apparatus. One of the pullout rollers has a blank engaging pullout segment that engages the front edge of the leading blank and exerts a pulling force on the blank and accelerates the blank to separate it from the bond of overlapped blanks.

The refeeder that conveys the band of overlapped blanks from the drier to the separator includes pairs of endless tapes and an idler roll carriage adjacent the pullout segment. The end idler roll next to the pullout rollers is a release roll and is spaced from the pullout roller a distance substantially equal to the distance from the leading edge of the seal flap to the trailing edge of the side flaps so that the trailing edges of the side flaps are released by the release roll an instant after the seal flap front edge of the same blank is engaged by the pullout segment of the pullout rollers. Where changes are made in the length of the blanks or where the path of the blanks is increased due to increased temperatures during operation of the envelope machine, it is necessary to adjust the timing of the blanks as they are fed to the pullout segment.

Referring to the drawings, there is schematically illustrated a portion of an envelope machine generally designated by the numeral **10** that has a drier section **12**, a refeeder section **14**, a separator section **16** and an aligner section **18**. The drier section **12** includes a drying chamber with a lower endless conveyor chain **20** extending around an end idler sprocket **22**. An upper endless drier chain **24** extends around an end drive sprocket **26** and cooperates with the lower conveyor chain **20** to convey the band of overlapped envelope blanks therebetween through the drier section **12**.

Adjacent to the drier section **12** is the refeeder section **14** that conveys the band of overlapped envelope blanks from the drier section **12** to the separator section **16**. The refeeder section **14** includes a pair of inner belts **28** and a pair of outer belts **30** that are supported on a plurality of fixed idler rolls and also about an adjustable enlarged drum **32**. It should be understood that a plurality of idler rolls mounted on a frame and forming an arcuate section could be substituted for the drum **32** similar to the group of idler rolls illustrated in U.S. Pat. No. 3,160,081.

The drum **32** is adjustably arranged to move horizontally a preselected distance as indicated by the arrows in FIG. **1**. The pair of inner belts **28** also extend around a second adjustable drum **34** that is movable horizontally in a manner similar to drum **32**. Again, a series of rolls mounted on a movable frame could be used in lieu of the illustrated drum **34**. The principal requirement of this arrangement is that the drums or frame members **32** and **34** may be moved toward and away from each other. For clarity, the idler rollers that are mounted on fixed centers and are thus fixed on the machine frame are indicated with a + and the rollers that are adjustable and are mounted on movable centers are indicated by the horizontal line with the double arrow.

Referring to the path followed by the endless inner belts **28**, the belts extend around an idler pulley **36** adjacent the drier section **12**, then upwardly around the periphery of the large drum **32** and toward the separator section **16** where it extends around the inner belt drive pulley **38** and around other fixed idler pulleys **40** ad **42**. The inner belts **28** then extend around the movable and adjustable drum **34**, fixed center idler pulley **44** and back to idler pulley **36**.

Similarly, the outer belts **30** extend around a fixed idler pulley **46** adjacent the drier section **12** and then extend upwardly around the adjustably large drum **32** to an outer belt drive pulley **48**. The outer belts **30** are held against the drive pulley **48** by means of idler pulley **50** and then extend around a fixed center idler pulley **52**, around a pair of adjustable movable center pulleys **54** and **56**. The movable center pulleys **54** and **56** may be suitably supported by resilient springs or may be suitably connected to each other through a lever spring mechanism to permit the movable center pulleys **54** and **56** to move horizontally and add or remove portions of the outer belts **30** to the effective conveying portion of the belts. The belts **30** extend around a lower fixed idler pulley **58** and then back to the idler **46**.

A drive chain **60** indicated in dotted lines in the figures is connected to the upper drier chain drive sprocket **26** and extends around an adjustable idler sprocket **62** that is also mounted on the frame that supports the large drum **32**. With this arrangement the sprocket **62** moves with and in the same direction as the frame and drum member **32** during adjustment. The chain **60** is maintained in meshing relation with the sprocket **62** by means of a pair of spaced idler sprockets **64** and **66**. The drive chain **60** then extends upwardly around idler sprockets **68** and **70** and then around an outer belt drive sprocket that is mounted on the same shaft and coaxial with the outer belt drive pulley **48** and thus not illustrated. The outer belt drive pulley **48** is driven by the belt drive sprocket and has the same pitch diameter as the belt drive sprocket so that the chain rolls about the sprocket during adjustment of the belts for a timing or phase adjustment of the feeding of the blanks to the separator, as later explained. The drive chain **60** extends downwardly from the outer belt drive sprocket to a fixed idler sprocket **72** and then up and around an inner belt drive sprocket that is coaxial with the inner belt drive pulley **38**. Again, the inner belt drive pulley **38** is driven by the inner belt drive sprocket and the inner belt drive sprocket is of the same pitch diameter as the inner belt drive pulley **38** to permit the drive chain to compensate for the timing adjustments. The drive chain **60** extends downwardly around an adjustable idler sprocket **74** that is mounted on the same frame as the drum **32** and is movable therewith. A pair of idler sprockets **76** and **78** maintain the chain **60** in meshing relation with the movable idler sprocket **74**. The chain **60** then extends downwardly back around the drive pulley **26**.

An idler roll carriage **80** is pivotally secured to a support bracket **82** and has a plurality of depending spring loaded adjustable rolls **84**. The end roll **86** is the adjustable idler release roll that disengages the rear edge of the side flaps as the front edge is engaged by the separator.

The separator section **16** includes a pair of rotatably mounted rolls **88** and **90** that are driven in timed relation with the remaining elements of the envelope machine. The upper pullout roll **90** has a radially extending pullout segment **92** that rotates into abutting relation with the peripheral surface of the lower roll **88**. The pullout segment **92** is arranged to engage the front edge of the seal flap and separate the leading blank from the band of overlapped blanks. The aligner section **18** is positioned adjacent to the separator section **16** and has an endless aligner chain **94** with depending pin members **96** extending around an end sprocket **98**. A coacting idler roller **100** is positioned above the aligner chain **94** and is arranged to feed the accelerated blanks against the pins **96**. A pair of guide rolls **102** are positioned between the separator rollers and the aligner chain.

With this arrangement the band of overlapped blanks are conveyed from the drier section **12** between the upper and lower endless belts **28** and **30** where the band of overlapped blanks is engaged between the endless belts **28** and **30** and conveyed around the drum **32**. The band of overlapped blanks passes out from under the upper belts **30** and is conveyed on the lower belts **28** and maintained thereon by the idler rolls **84** on the idler roll carriage **80**. The band of endless blanks is then conveyed to the separator station **16**.

The length of the envelope blank path between point A, defined by the center line of the lower drier chain sprocket, a point B, defined by the center line of the pullout rolls **88** and **90**, may be varied by the above described adjustment mechanism for both timing and adjustment of the blank fed into the separator section. Vertical center lines CC and DD are illustrated in FIG. **1** for the drums **32** and **34** and the vertical center lines of drums in an adjusted position are illustrated by the letters EE and FF in FIG. **2**. The center lines of drums **32** and **34** of FIG. **1** are projected onto FIG. **2** to illustrate the direction and distance of adjustment for both of the drums **32** and **34**.

Suitable means such as longitudinal pairs of rotating screws may be connected to both of the drums to provide the horizontal adjustment illustrated. The pairs of horizontal

screw shafts may be interconnected transversely across the envelope machine and further connected to a motorized rotating device through suitable shafts and gearing, as is well known in the art. To increase the length of the path followed by the blanks from point A to point B and thus adjust the time at which the leading edge of the leading blank moves under the pullout segment **92**, the drums **32** and **34** are moved away from each other, as is illustrated in FIG. **2** by the drum adjusting means. Rearward movement of the drum **32** increases the length of the paper path between points A and B. The length of the effective conveying portion of the outer belt is increased by the tension exerted on the spring loaded movable idler rolls **54** and **56**. The inner conveyor belts **28** have their effective conveyor length increased by movement of the drum **34** away from the drum **32** to thus feed more belting into the active conveying portion of the upper belts. Although the belt drive pulleys **38** and **48** with their coaxial chain drive sprockets are on fixed centers, the chain idler sprockets **62** and **74** are movably mounted on the frame members so that when the chain sprockets are moved, for example one half inch, the effective length of the chain increases by 1 inch. This compensates for the double length extension of the conveyor belts.

It will be apparent with the above mechanism that it is now possible to rapidly and easily adjust the phase or timing of the band of overlapped blanks as they are fed from the refeeder to the separator mechanism. Small and accurate adjustments can be made while the envelope making machine is running and the adjustment mechanism can be easily motorized with an open loop adjustment control for phasing of the blanks when either a size or fine adjustment is made.

According to the provisions of the patent statues, I have explained the principle, preferred construction and mode of operation of my invention and have illustrated and described what I now consider to represent its best embodiment. However, I desire to have it understood that, within the scope of the appended claims, the invention may be practiced otherwise than as specifically illustrated and described.

We claim:

1. In an envelope or bag making machine the combination comprising,

a first blank treating station and a second blank treating station spaced from said first blank treating station,

conveyor means between said first station and said second station, said conveyor means including endless conveyor belts extending around a plurality of fixed supporting devices and around a plurality of movable supporting devices,

said conveyor means operable to deliver a band of overlapped blanks to said blank treating station in timed relation to the actuation of a blank engaging means in said second blank treating station, said conveyor means having an effective conveyor portion operable to engage and convey said band of overlapped blanks,

drive means for moving said conveyor means and said band of overlapped blanks at a fixed predetermined speed,

said blank engaging means at said second blank treating station operable upon actuation to engage, separate and accelerate the leading blank from the moving band of overlapped blanks and feed said separated blank to a subsequent blank treating station, said blank engaging means arranged to be actuated in a predetermined timed sequence,

a first one of said movable supporting devices supporting a portion of said conveyor belts,

a second one of said movable supporting devices supporting a portion of said conveyor belts, and

said second one of said movable supporting devices operable to move with said first one of said movable supporting devices in a direction opposite thereto to adjust the length of said conveyor belts in the effective conveyor portion of said conveyor means and the distance traveled by said band of envelope blanks.

2. An envelope or bag making machine as set forth in claim **1** in which,

said drive means for said conveyor means includes an endless conveyor chain, and

means at said first blank treating station for driving said endless chain at a fixed predetermined speed.

3. An envelope or bag making machine as set forth in claim **1** in which,

said drive means includes an endless conveyor chain extending around a plurality of fixed supporting devices and a plurality of movable supporting devices

means connecting said endless conveyor chain to said endless conveyor belts for propelling said endless conveyor belts, and

said movable supporting devices being movable with certain of said endless conveyor belt movable supporting devices to maintain a driving relation between said endless conveyor chain and said endless conveyor belts.

4. An envelope or bag making machine as set forth in claim **3** in which,

certain of said fixed supporting devices for said endless conveyor belts include drive pulleys,

certain of said fixed supporting devices for said endless drive chain includes belt drive sprockets, and

said endless chain drive sprockets and said endless belt drive pulleys having substantially the same pitch diameter.

5. An envelope or bag making machine as set forth in claim **4** in which,

said endless conveyor belt drive pulleys are coaxially arranged with endless drive chain belt drive sprockets.

6. An envelope or bag making machine as set forth in claim **1** in which,

said endless conveyor belts include inner endless belts and outer endless belts,

portions of said inner endless belts positioned in overlying relation with portions of said outer endless belts, and

said overlying portions of said inner and outer endless conveyor belts forming said effective conveyor portion of said conveyor means.

7. An envelope or bag making machine as set forth in claim **6** in which,

said first one of said movable supporting devices supports a portion of said overlying inner and outer conveyor belts, and

means to move said first one of said movable supporting devices relative to said fixed supporting devices to thereby change the effective length of said conveying means.

8. An envelope or bag making machine as set forth in claim **3** in which,

said movable supporting devices of said endless chain member are associated with said movable supporting devices of said endless conveyor belts for movement therewith.

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