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[21] Appl. No. **37,203**
[22] Filed **May 14, 1970**
[45] Patented **Dec. 28, 1971**

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[54] **APPARATUS FOR REGULATING THE SEAL GUM WIDTH ON ENVELOPE AND BAG MACHINERY**
8 Claims, 2 Drawing Figs.

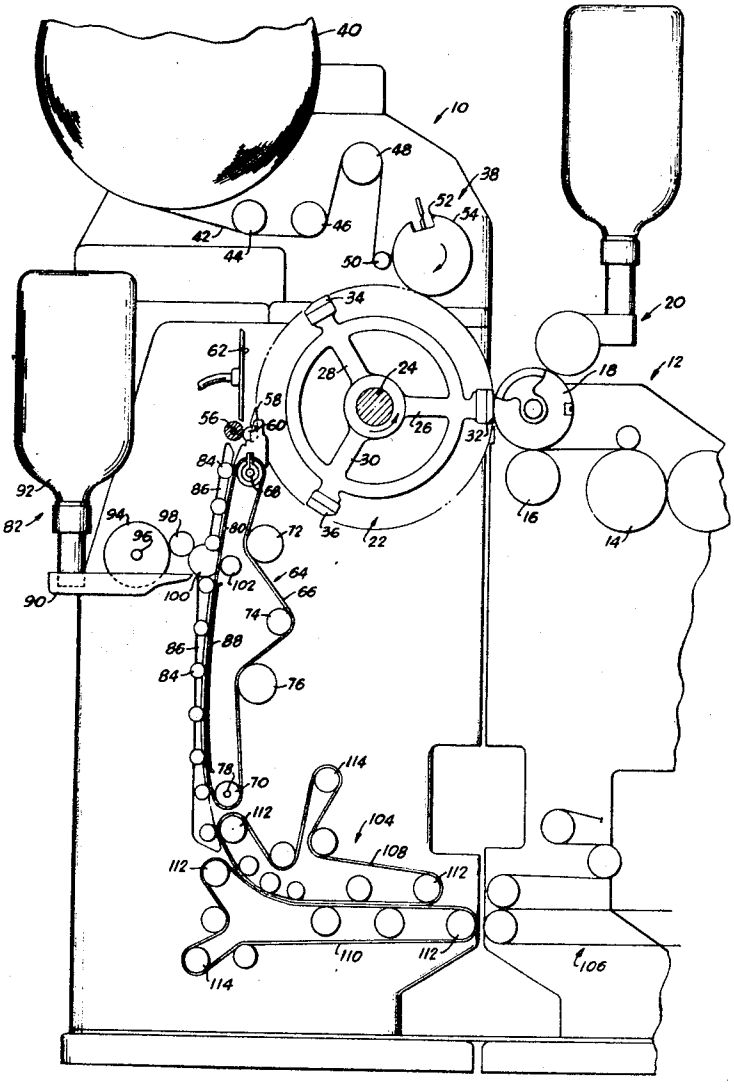
[52] **U.S. Cl.** ..... **93/62,** 93/36 MM, 93/61 A, 93/93 HT
[51] **Int. Cl.** **B31b 21/74,** B31b 1/62, B31b 1/96
[50] **Field of Search** ..... 93/36 MM, 61 A, 61 AC, 62, 93 HT

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Primary Examiner—Wayne A. Morse, Jr.
Attorney—Stanley J. Price, Jr.

ABSTRACT: Apparatus for applying gum or adhesive to the seal flap of an envelope includes a collator vacuum cylinder that feeds the envelope blanks at a predetermined speed relative to the drive shaft of the envelope machine to a collator roll. The collator roll is driven at a speed arranged to move the envelope blanks into overlapped relation as a band onto a gumming belt conveyor. The gumming belt conveyor and the gumming roll drive mechanism are driven at a speed to maintain the envelope blanks in the band in preselected overlapped relation while adhesive is applied to the exposed flap portion of the envelope blanks by the gumming apparatus. The collator roll, gumming belt conveyor and the gumming roll drive mechanisms are driven in timed relation to each other and are drivingly connected to each other. The collator vacuum cylinder is driven at a fixed ratio relative to the main drive shaft. The input shaft of a variable speed drive mechanism is drivingly connected to the collator vacuum cylinder and the variable speed drive mechanism output shaft is drivingly connected to the apparatus for driving the collator rolls, gumming belt conveyor and the gumming roll drive mechanism. With this arrangement the speed of the collator roll, gumming belt and gumming roll drive mechanism may be changed relative to the speed of the collator vacuum cylinder and thus vary the overlapped relationship of the envelope blanks and the width of the strip of seal gum applied to the seal flap portion of the envelope blank.



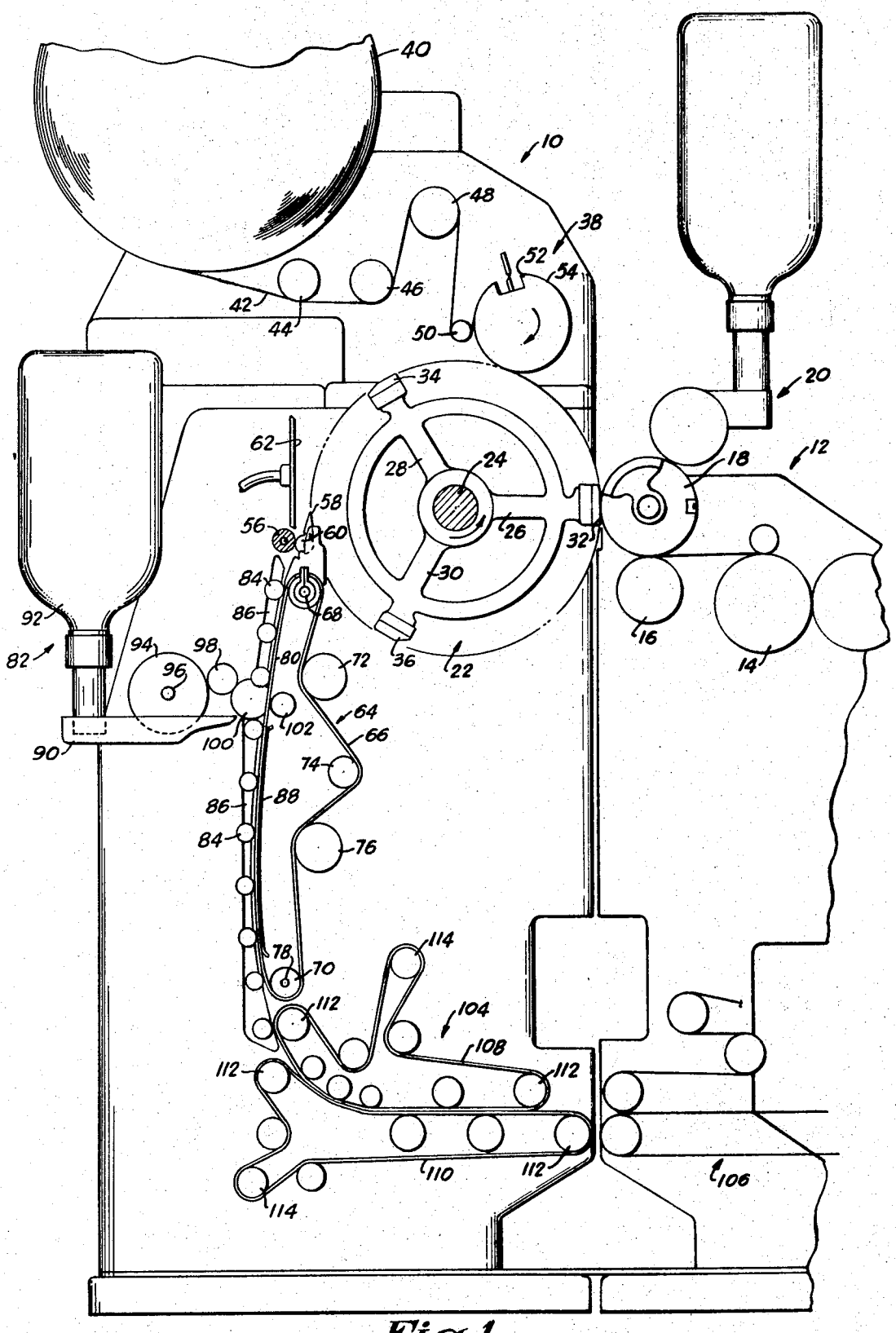

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Fig. 1.

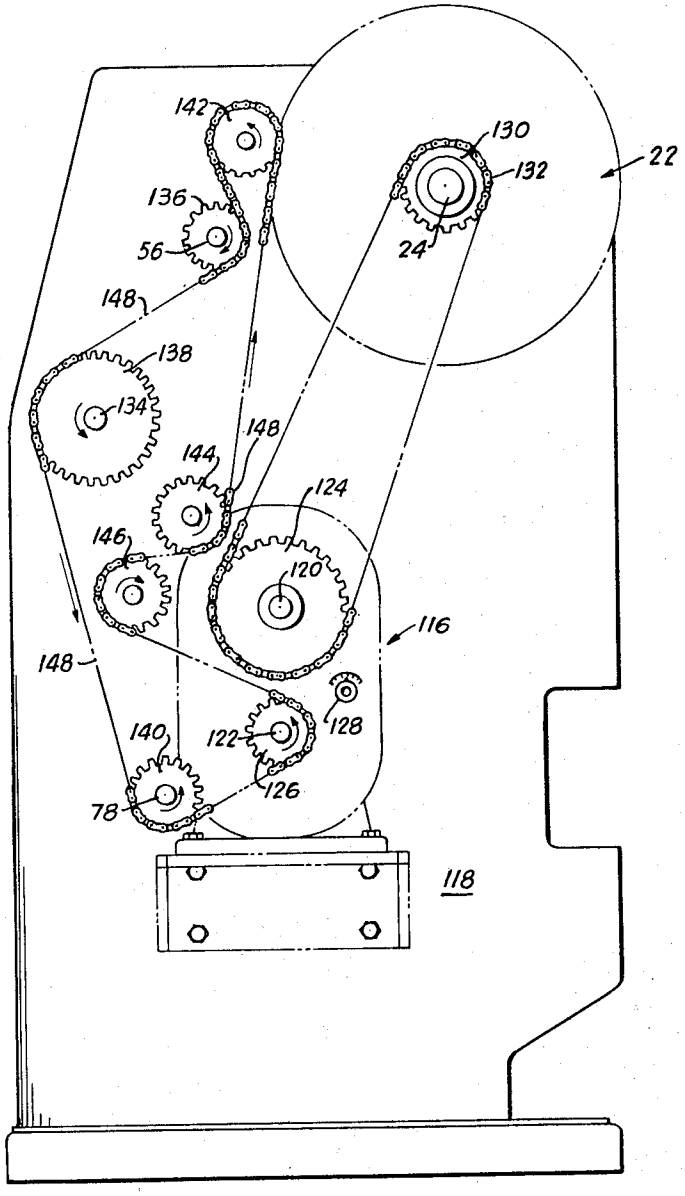

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Fig. 2.

APPARATUS FOR REGULATING THE SEAL GUM WIDTH ON ENVELOPE AND BAG MACHINERY

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates generally to apparatus employed for making envelopes and bags and more particularly to apparatus for regulating the seal gum width for an envelope or a bag.

2. Description of the Prior Art

The width of the strip of seal gum on an envelope seal flap is determined by the overlap spacing of the envelopes while the seal gum is being applied. The portion of the seal flap exposed when the blanks are in overlapped relation is the portion that is coated with the seal gum. When the overlapped spacing is increased, the width of the strip of seal gum on the seal flap is increased. Similarly, when the overlapped spacing is decreased, the width of the strip of the seal gum applied to the seal flap is decreased.

The overlap spacing of the envelope blanks as the seal gum is applied thereto is dependent on the speed of the collating apparatus that receives the blanks from the vacuum patch cylinder. The collating apparatus retards the speed of the blanks and positions the blanks in overlapped relation to form a band of overlapped envelope blanks. The speed of the collating apparatus relative to the remainder of the envelope machine determines the degree of overlap of the blanks and the width of the seal flap exposed for coating with the adhesive.

The known methods of changing the width of the strip of gum on the seal flap includes changing either gears or sprockets on the collator apparatus to thus change the speed ratio between the collator section and the remaining portions of the envelope machine. The time required to change the speed of the collator section is substantial since it requires the removal and replacement of several machine components. The ratio of the components replaced is also critical in that the replaced components determine the new width of the strip of seal gum. The ratio of substituted components must be calculated for each seal width desired and a substantial number of components must be maintained in inventory. With the present apparatus and known methods, it is not possible to make adjustments in the seal gum width while the envelope machine is running and envelope blanks are being conveyed therethrough. There is a need, therefore, for apparatus to quickly and effectively change the overlapped relation of the envelope blanks in the endless band of envelopes to thereby change the width of the strip of seal gum applied to the seal flap portion of the envelope blank.

SUMMARY OF THE INVENTION

The hereinafter described invention relates to apparatus for collating envelope blanks and changing the overlapped relation of the collated envelope blanks while the envelope machine is running. The apparatus includes feeding apparatus for supplying the envelope blanks in spaced tandem relation to collator apparatus at a fixed predetermined speed relative to the speed of the envelope machine drive shaft. The collating apparatus includes means to position the envelope blanks in overlapped relation to form a band of overlapped envelopes and to convey the band of envelope blanks. Gumming apparatus is provided for continuously applying adhesive to the exposed seal flap portions of the overlapped envelope blanks as the blanks are conveyed by the collating apparatus. A variable speed drive mechanism with an input shaft and an output shaft is arranged with the input shaft drivingly connected to the envelope machine drive shaft so that the input shaft is driven at a fixed ratio relative to the feeding apparatus. The variable speed drive mechanism output shaft is drivingly connected to the collating apparatus so that the collating apparatus is driven at a fixed ratio to the speed of the output shaft. The variable speed drive mechanism is operable to change the speed of the output shaft while the input shaft speed remains substantially constant to thereby change the

overlapped relation of the envelope blanks being conveyed by the collating apparatus and the width of the exposed portions of the overlapped blanks and the width of the strip of adhesive applied to each envelope blank.

With the above arrangement, the speed of rotation of the variable speed output shaft is controlled to thereby control the speed of the collator apparatus which, in turn, controls the width of the exposed portion of the envelope blank seal flap in the band of envelope blanks. The speed of the collator apparatus can be changed relative to the speed of the feed mechanism while the envelope machine is running and the feed apparatus is supplying envelopes to the collating apparatus. An increase in speed of the collating apparatus increases the width of the exposed portion of the seal flap and, conversely, reducing the speed of the collating apparatus relative to the feed apparatus, reduces the width of the exposed seal flap portion. With this arrangement the speed of the collating apparatus can be quickly and accurately adjusted while the envelope machine is running by adjusting the variable speed drive mechanism to either increase or decrease the speed of the variable speed mechanism output shaft.

Accordingly, the principal object of this invention is to provide collating apparatus in which the overlapped relation of the envelope blanks can be adjusted without the replacement of gears, sprockets and the like.

Another object of this invention is to provide apparatus for changing the overlapped relation of the envelope blanks in the collating apparatus while the collating apparatus is conveying a band of envelopes therethrough.

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

FIG. 1 is a schematic view in elevation of the collator section of an envelope making machine.

FIG. 2 is a schematic view in side elevation illustrating schematically the drive mechanism for the collating section of the envelope machine illustrated in FIG. 1.

DESCRIPTION OF THE PREFERRED EMBODIMENT

This invention may be employed with collating apparatus similar to that illustrated in U.S. Pat. Nos. 3,141,667; 3,153,533 and 3,160,081. Detailed description of the patching collator vacuum cylinder, the patch severing apparatus, the patch applying apparatus, the collator roll, the seal gum box and gumming rolls, the collator belt conveyor and the other conveyor devices and the manner in which the above enumerated devices are mounted in the frame of an envelope machine is shown and described in the prior art, including the above patents and will not be described in detail. The above enumerated patents are incorporated by reference herein.

Referring to FIG. 1, there is schematically illustrated a collating section **10** of an envelope machine positioned adjacent to a panel cutter section **12**. The envelope blanks are fed from a rotary feeder through a printing press to the panel cutter section **12** of the envelope machine. The envelope blanks are fed in spaced tandem relation through the panel cutter section **12** where panels or windows are cut in the face of the blank. The envelope blanks with the panels cut therein are conveyed by suitable conveying rolls **14** and **16** to a vacuum roll **18** where patch gum is applied to the envelope blank by the patch gummer generally designated by the numeral **20**. The envelope blanks are thereafter transferred to a patching collator vacuum cylinder generally designated by the numeral **22**.

The vacuum cylinder **22** is mounted on a shaft **24** and has three radially extending spokes **26, 28** and **30** which terminate in vacuum devices **32, 34** and **36**. The vacuum devices **32, 34** and **36** are arranged to engage the envelope blanks by suction while on the vacuum roll **18** and to transfer the envelope blanks therefrom. Positioned above the vacuum cylinder **22** is

a patch cutting device generally designated by the numeral 38 that includes a roll of glassine 40 with the web 42 reeved about rolls 44, 46, 48 and 50. Patch severing apparatus 52 cuts lengths of patch material from the web 42 and by rotation of the cylinder 54 positions the patch over the cutout window portion of the blank while the blank is secured to the vacuum cylinder 22.

The suction on the vacuum devices 32, 34 and 36 is turned off adjacent to a collator roll 56 and the blanks are stripped from the vacuum cylinder by the element 58. The collator roll 56 has a backup roll 60 positioned in peripheral abutting relation therewith. As later described, the backup roll 56 is driven at a preselected speed relative to the vacuum cylinder 22 is arranged to position the envelope blanks in overlapped relation to form a continuous band of overlapped envelope blanks. A backup plate 62 is positioned above the collator roll 56.

A collator conveyor generally designated by the numeral 64 includes a pair of endless tapes 66, one of which is shown in FIG. 1. The endless tapes 66 are reeved about end pulleys 68 and 70 and have takeup pulleys 72, 74 and 76. The lower end pulley 70 has a shaft 78 which is driven, as will be later explained. The endless tapes 66 have a conveying reach 80 arranged to frictionally engage the band of envelope blanks and convey the band into position to receive gum or adhesive from the seal gummer generally designated by the numeral 82. A plurality of pressure rolls 84 are suitably mounted on frames 86 and are arranged to maintain the band of envelope blanks in frictional engagement with the conveying reach 80 of the endless tapes 66. A backing plate 88 is positioned on the underside of the conveying reach 80 below the seal gum apparatus 82 to provide further support for the band of envelopes.

The seal gummer 82 includes a reservoir or tray 90 with an inverted supply bottle 92 positioned therein. A gummer roll 94 has a shaft 96 and is partially immersed in the adhesive within the tray 90. A transfer roll 98 is positioned in abutting relation with the periphery of the gummer roll 94 and is arranged to transfer a preselected amount of adhesive to an applicator roll 100 positioned in abutting relation therewith. The applicator roll 100 is in overlying relation with the band of overlapped envelope blanks being conveyed by the collator conveyor 64. A counterroller 102 is positioned on the opposite side of the conveying reach 80 and supports and band of envelope blanks as the applicator roll 100 applies adhesive to the exposed portions of the seal flaps in the band of overlapped envelope blanks.

A transfer conveyor generally designated by the numeral 104 transfers the band of envelope blanks from the collator conveyor 64 to another conveyor 106 in the panel cutter section 12 of the envelope machine. The envelope blanks are thereafter transferred from the panel cutter section 12 to a drier where the seal gum applied thereto is dried prior to the folding of the envelope blanks into envelopes. The transfer conveyors 104 and 106 may be formed from endless tapes 108 and 110 that are reeved around suitable end pulleys 112 and have takeup devices 114. The transfer conveyors 104 are preferably driven at a slightly higher speed than the collator conveyor 64 to increase the space between the same edges of adjacent envelope blanks and thus separate the gummed portions of adjacent envelope blanks to prevent the blanks from adhering to each other after drying.

FIG. 2, is a schematic illustration of the drive mechanism for the collator roll 56, the collator conveyor 64 and the seal gummer 82. The vacuum cylinder 22 is illustrated schematically mounted on the shaft 24. Shaft 78 of the collator conveyor drive pulley 70 is also illustrated.

The vacuum cylinder 22 is driven by suitable gearing connected to the envelope machine main drive shaft so that the vacuum cylinder 22 rotates at a fixed ratio with the main drive shaft of the envelope machine. A variable speed drive mechanism generally designated by the numeral 116 is suitably supported on the frame 118 of the collator section 10. The variable speed drive mechanism 116 is preferably a P.I.V. gear type variable speed drive manufactured by the Link Belt Company. A suitable P.I.V. variable speed drive is described in Kent's Mechanical Engineering Handbook, 11th Edition, Section 24, beginning on page 72. Briefly, a suitable P.I.V. variable speed gear drive includes pairs of conical discs mounted on shafts that serve as input and output shafts. The conical discs have radial teeth formed in their conical faces and the conical discs are arranged to move axially toward and away from each other on their respective shafts. An endless chain is reeved between the conical discs and has portions engaging the radial slots thereon. Movement of the pairs of discs toward and away from each other changes the speed ratio between the input and output shafts. Thus, for example, movement of the discs on the input shaft in one direction and corresponding movement of the discs on the output shaft in the opposite direction, will provide a change in the speed ratio of the input and output shafts. It should be understood that, although the P.I.V. gear variable speed drive is preferred, other types of variable speed drives, as for example the Reeves Variable Speed Transmission or the Graham Variable Speed Transmission could also be used. It is preferred, however, that the input and output shafts of the variable speed drive be mechanically connected to each other to eliminate undesired speed variations therebetween.

Again referring to FIG. 2, the variable speed drive 116 has an input shaft 120 and an output shaft 122. A sprocket 124 is mounted on the input shaft 120 and a sprocket 126 is mounted on the output shaft 122. An adjusting knob 128 is arranged upon rotation in the direction indicated by the arrows to increase or decrease the speed ratio between the input shaft 120 and output shaft 122. The vacuum cylinder 22 has a sprocket 130 mounted on shaft 24 for rotation therewith. An endless chain 132 is reeved about the sprocket 130 on vacuum cylinder 22 and about the sprocket 124 connected to the input shaft 120. With this arrangement rotation of the vacuum cylinder, 22, which is driven at a fixed ratio with the main drive shaft, drives the input shaft 120 of the variable speed drive 116 by means of the sprockets 124 and 130 and the endless chain 132.

The collator roll 56 has a sprocket 136 mounted thereon. The seal gummer 82 is driven by a sprocket 138 mounted on a stub shaft 134. Suitable gearing drivingly connects stub shaft 134 to shaft 96 of gummer roll 94 illustrated in FIG. 1 so that rotation of sprocket 136 is transmitted to shaft 96 through stub shaft 134 and gearing on shafts 134 and 96. With this arrangement, gummer roll 94 rotates in a direction opposite to sprocket 134. Similarly, the drive roll 70 of the collator conveyor 64 has a sprocket 140 mounted on its shaft 78. Suitable idler sprockets 142 and 144 are provided with a takeup sprocket 146. An endless chain 148 is reeved about the sprocket 126 on the output shaft 122 of the variable speed drive 116 and also about the sprocket 136 associated with the collator roll 56, the sprocket 138 associated with the seal gummer shaft 134 and the sprocket 140 associated with the drive roll 70 for the collator conveyor 64. With this arrangement, the collator roll 56, the gum box drive means controlled by the gummer roll 94 on shaft 96 and the collator conveyor 64 are all driven in a fixed ratio relative to one another through the common drive chain 148. All of the above elements are driven through the drive chain 148 by the output shaft 122 of the variable speed drive mechanism 116.

OPERATION

The collating apparatus previously described operates in the following manner. The vacuum cylinder 22 is driven in a fixed ratio with the main drive shaft of the envelope machine. The vacuum cylinder, in turn, drives the input shaft 120 of a variable speed drive mechanism 116. The output shaft 122 of the variable speed drive mechanism, in turn, drives the collator roll 56, the drive for the seal gummer 82 and the drive pulley 70 of the collator conveyor 64. The speed of the above enumerated elements can be changed relative to the speed of the

vacuum cylinder **22** by rotating the knob **128** of the variable speed drive mechanism **116**. Thus, the speed at which the envelope blanks are formed into an endless band and the amount of overlap between adjacent envelope blanks is controlled by the speed of the variable speed drive mechanism output shaft **122**. Simultaneously, the drive of the seal gummer **82** is also regulated with the drives for the collating apparatus so that the applicator roll has the same peripheral velocity as the endless band conveyed by the collator conveyor **64**. To increase the width of the seal flap to which seal gum is applied, the speed of the output shaft **122** is increased to thus increase the take-away speed of the blanks by the collator roll and the conveying of the envelope blanks by the collator conveyor **64**. To reduce the width of the seal flap to which adhesive is applied, the speed of the output shaft **122** is reduced to thus reduce the speed at which the envelope blanks are taken away by the collator roll **56** and conveyed by the collator conveyor **64**.

It is now possible with the previously described apparatus to either increase or decrease the width of the exposed portion of the seal flap in the band of overlapped envelopes while the envelope machine is running and the vacuum cylinder **22** is supplying envelope blanks to the collator roll **56**. The adjusting knob **128** of the variable speed drive mechanism may be adjusted while the machine is running to thus make fine adjustments to the width of the seal gum applied to the envelope blank seal flap.

According to the provisions of the patent statutes, the principle, preferred construction, and mode of operation of the invention have been explained, and what is considered to represent its best embodiments have been illustrated and described. However, it should be understood that, within the scope of the appended claims, the invention may be practiced otherwise than as specifically illustrated and described.

I claim:

1. Apparatus in for envelope machine for collating envelope blanks and changing the overlapped relation of the collated envelope blanks while the envelope machine is running comprising,

feeding apparatus for supplying envelope blanks in spaced tandem relation to collator apparatus at a fixed predetermined speed relative to the speed of the envelope machine drive shaft,

said collating apparatus including means to position said envelope blanks in overlapped relation and form a band of overlapped envelopes and to convey said band of envelope blanks,

gumming apparatus for continuously applying adhesive to the exposed seal flap portions of said overlapped envelope blanks in said band as said blanks are conveyed by said collating apparatus,

a variable speed drive mechanism having an input shaft and an output shaft,

said input shaft drivingly connected to said envelope machine drive shaft so that said input shaft is driven at a fixed ratio relative to said feeding apparatus,

said output shaft drivingly connected to said collating apparatus so that said collating apparatus is driven at a fixed ratio to the speed of said output shaft, and

said variable speed drive mechanism operable to change the speed of said output shaft while said input shaft speed remains substantially constant to thereby change the overlapped relation of said envelope blanks being conveyed by said collating apparatus and the width of the exposed portion of said seal flap and the width of the strip of adhesive applied to each envelope blank seal flap.

2. Apparatus in an envelope machine for collating envelope blanks as set forth in claim **1** which includes,

drive means for at least one roller of said gumming apparatus, and

driving connections between said variable speed drive mechanism output shaft and said gumming apparatus drive means so that said gumming apparatus is driven at a fixed ratio to the speed of said output shaft.

3. Apparatus in an envelope machine for collating envelope blanks as set forth in claim **1** in which said feeding apparatus includes,

a delivery cylinder having a plurality of longitudinally spaced vacuum ports along the periphery thereof, said delivery cylinder arranged to secure blanks by vacuum on the periphery thereof and transfer said blanks to said collating apparatus.

4. Apparatus in an envelope machine for collating envelope blanks as set forth in claim **3** in which

said collating apparatus includes a collating cylinder positioned adjacent to said delivery cylinder and a counter-roller positioned in abutting relation to said collating cylinder,

said collating cylinder arranged to receive said envelope blanks from said delivery cylinder and position said envelope blanks in overlapped relation.

5. Apparatus in an envelope machine for collating envelope blanks as set forth in claim **1** in which,

said collating apparatus includes endless belt conveyors for conveying said band of overlapped envelope blanks into abutting relation with said gumming apparatus, and

idler rollers positioned in overlying relation with said endless belts to maintain said band of overlapped envelope blanks in frictional engagement with said endless belt conveyors.

6. Apparatus in an envelope machine for collating envelope blanks as set forth in claim **1** in which said gumming apparatus includes,

a receiver for a liquid adhesive,

a gumming roll partially immersed in said adhesive,

a transfer roll in abutting relation with the periphery of said gumming roll,

an applicator roll in overlaying relation with a conveyor device of said collating apparatus, said applicator roll positioned in abutting relation with the periphery of said transfer roll, and

a backup roll in abutting relation with the periphery of said applicator roll on the opposite side of said conveyor device.

7. Apparatus in an envelope machine for collating envelope blanks as set forth in claim **1** in which,

said collating apparatus includes first sprocket means connected to said means to convey said band of envelope blanks,

said gumming apparatus includes second sprocket means connected to a gumming roll,

said variable speed drive mechanism having third sprocket means connected to said output shaft, and

an endless chain reeved about said first, said second, and said third sprocket means so that said variable speed drive mechanism output shaft drives said collating apparatus and said gumming apparatus in timed relation thereto.

8. Apparatus in an envelope machine for collating envelope blanks as set forth in claim **7** in which,

said feeding apparatus includes a cylinder with a fourth sprocket means connected thereto,

said variable speed drive mechanism having a fifth sprocket means connected to said input shaft, and

a second endless chain reeved about said fourth and fifth sprocket means so that said input shaft of said variable speed drive mechanism is driven by said cylinder of said feeding apparatus.

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