

June 24, 1958

F. E. BOUGHTON

2,839,880

ENVELOPE INSERTING MACHINE

Filed Oct. 11, 1954

6 Sheets-Sheet 1

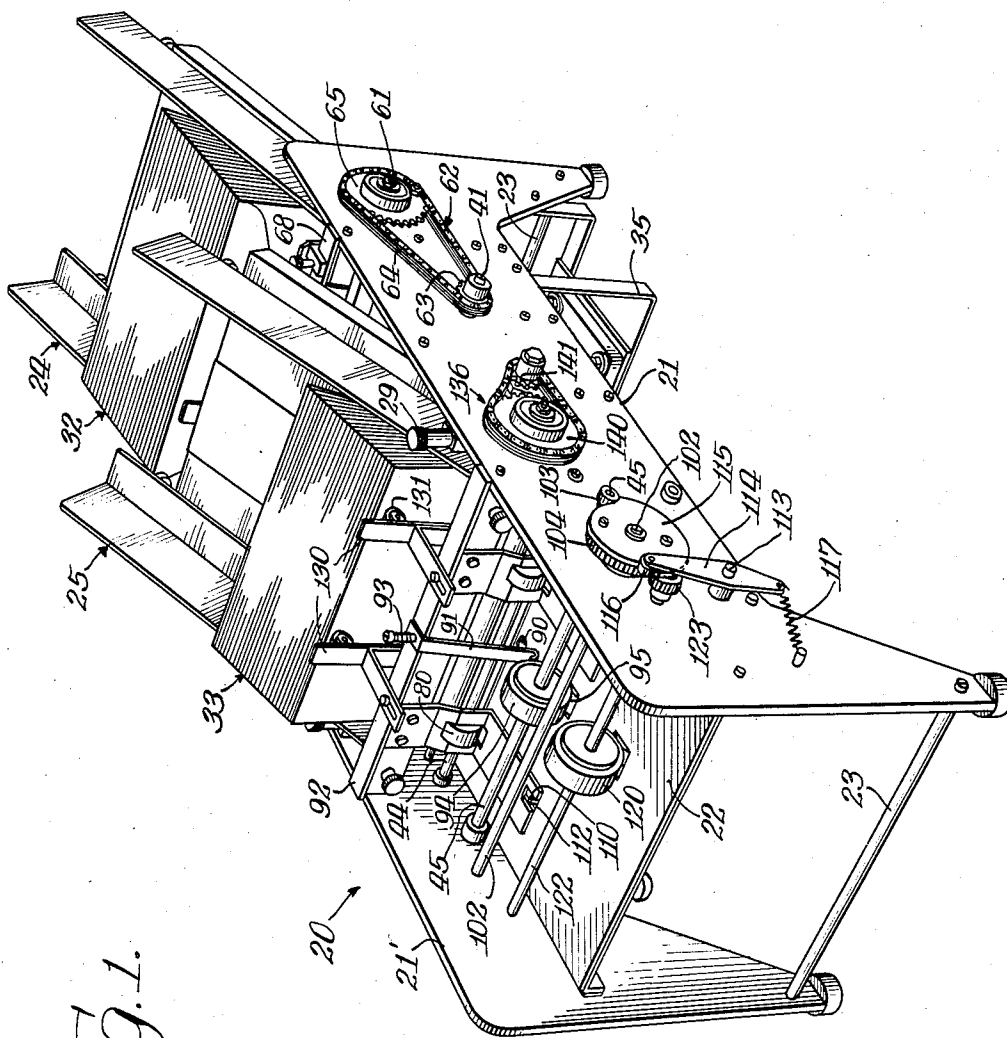


Fig. 1.

INVENTOR.
Frank E. Boughton,
BY *Morgan, Jackson*
Smith & Quinn
Attys.

June 24, 1958

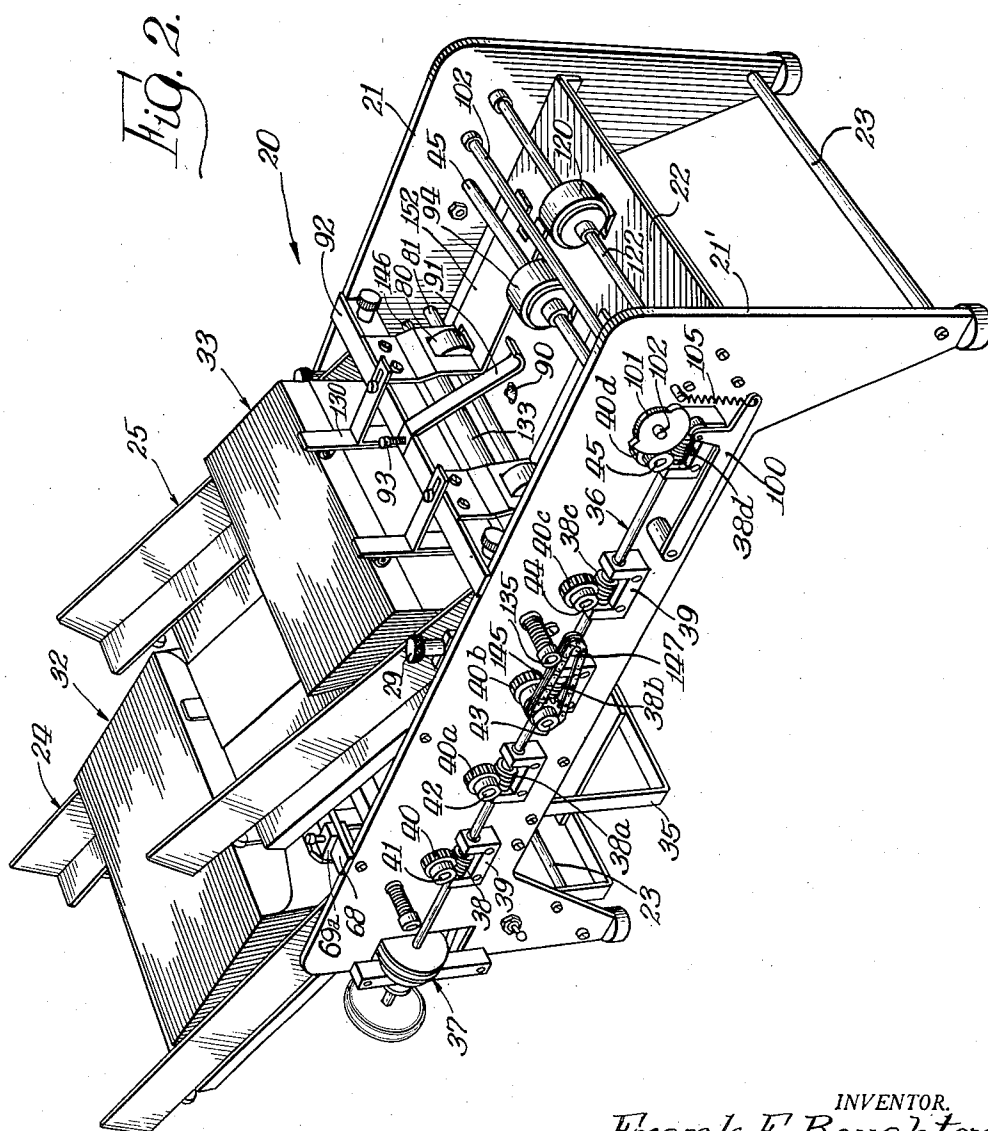
F. E. BOUGHTON

2,839,880

ENVELOPE INSERTING MACHINE

Filed Oct. 11, 1954

6 Sheets-Sheet 2



INVENTOR.
Frank E. Boughton,
BY *Braum, Jackson,*
Notcher & Quinn Attys.

June 24, 1958

F. E. BOUGHTON

2,839,880

ENVELOPE INSERTING MACHINE

Filed Oct. 11, 1954

6 Sheets-Sheet 4

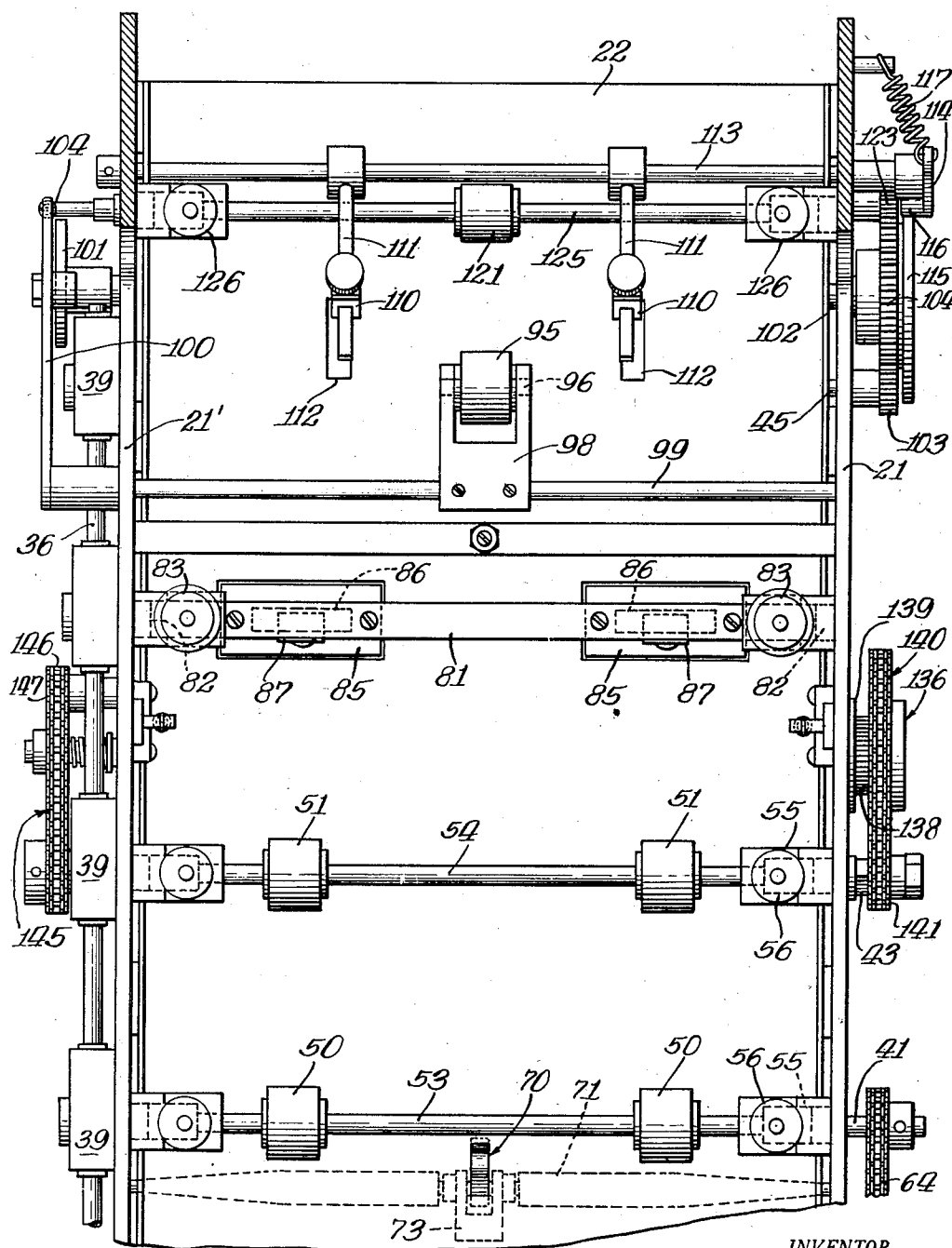


Fig. 4.

INVENTOR.
 Frank E. Boughton,
 BY *Max. Jackson*
Boettcher & Dunn Attys.

June 24, 1958

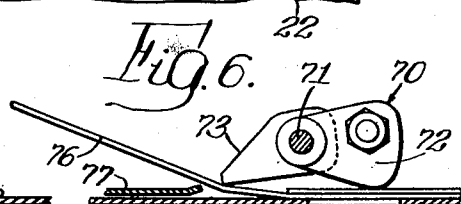
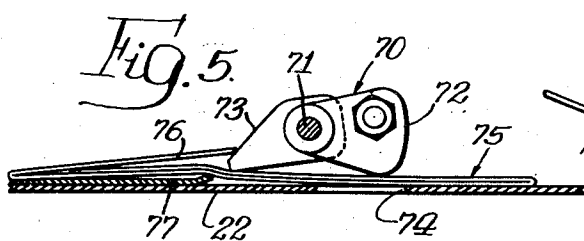
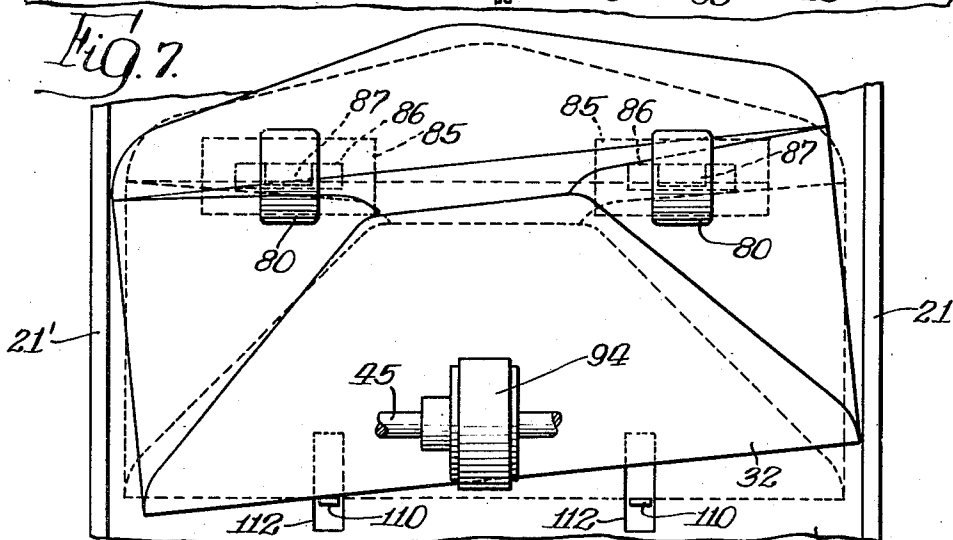
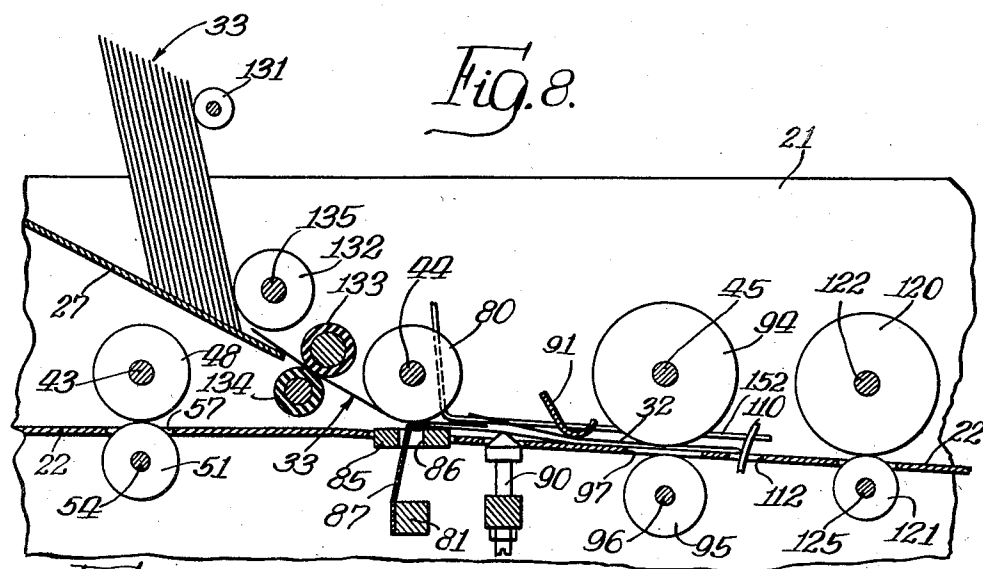
F. E. BOUGHTON

2,839,880

ENVELOPE INSERTING MACHINE

Filed Oct. 11, 1954

6 Sheets-Sheet 5



INVENTOR. 22
Frank E. Boughton,
BY *Max J. Fisher*
Paul H. Fisher & Son Attys.

June 24, 1958

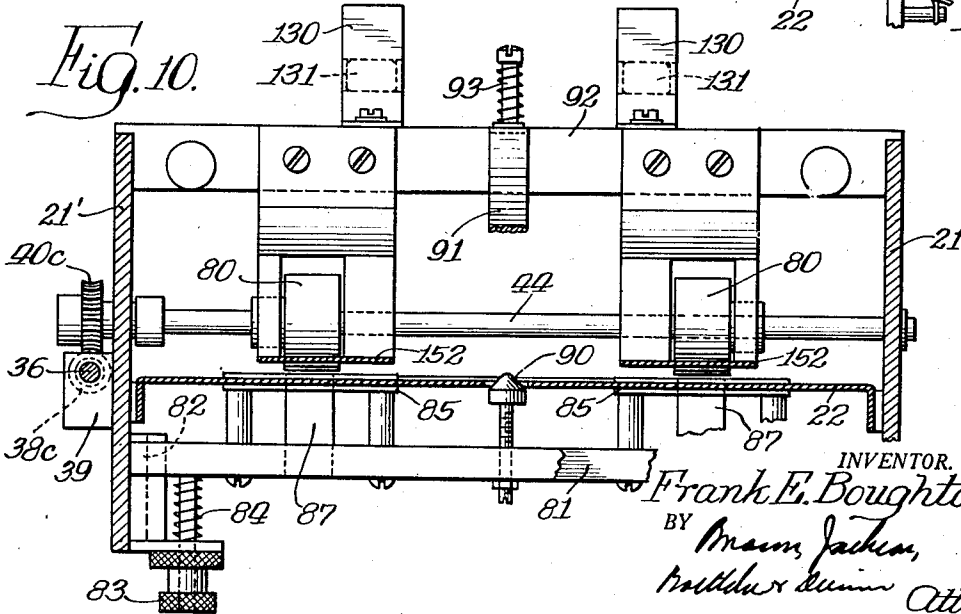
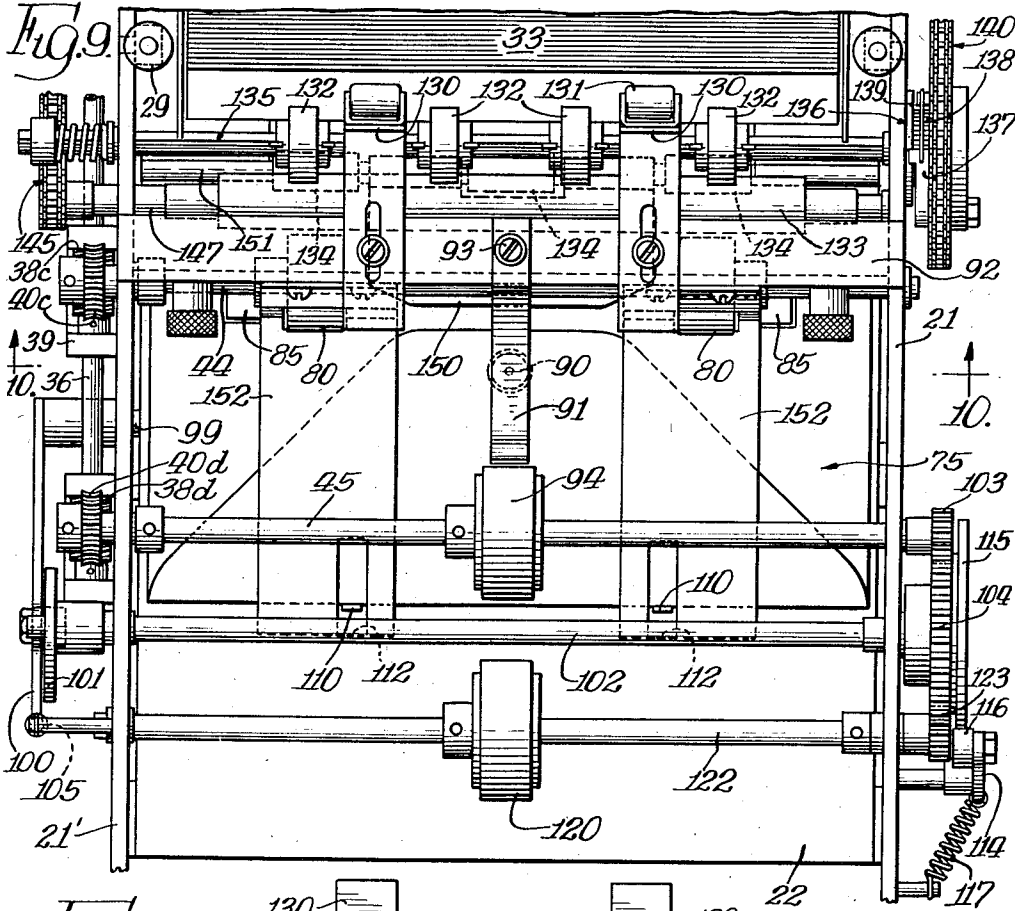
F. E. BOUGHTON

2,839,880

ENVELOPE INSERTING MACHINE

Filed Oct. 11, 1954

6 Sheets-Sheet 6



INVENTOR.
 Frank E. Boughton,
 BY *Max Jacobson*
Attorney

1

2,839,880

ENVELOPE INSERTING MACHINE

Frank E. Boughton, Chicago, Ill.

Application October 11, 1954, Serial No. 461,460

5 Claims. (Cl. 53—188)

This invention relates to a mechanized device for automatically inserting materials into envelopes.

The provision of so-called envelope inserter machines is not new. However, the provision of a successful and low cost mechanism for performing this function has been constantly sought for some time. To my knowledge this want has heretofore remained unfulfilled. While I do not present my invention as constituting the sole solution to the many problems attending the provision of such a device, it is nevertheless believed that the improvements and novel modifications embodied in the device hereinafter to be described, mark the same as a progressive advancement in this art.

One of the chief difficulties encountered by previous inventors in this field has been the provision of an effective and successful means for feeding or advancing envelopes to a stop position and holding such envelopes in arrested condition while the inserting operation is performed without undue buckling either the insert materials or the envelopes.

One of the more common expedients resorted to for advancing or feeding envelopes in this art has been the employment of sets of mechanized feed rollers. Normally such feed rollers engage a surface on which the paper is conveyed and supported and against which the friction feed rollers work in frictionally advancing the paper. Such a construction requires a system of a fixed feed table or surface and cooperating rollers having rotational axes fixed with respect to the table. Alternatively sets of rollers may be used to cooperate with one another to feed paper therebetween. In either case, it is obvious that if the spacing or gap for the rollers is set to accommodate the thickness of one sheet of paper, then a variation in that gap is required to accommodate more than one or varying thickness of paper. Such gap variation is usually brought about through either the compressibility of the rollers themselves or the mounting of such on axes which are appropriately adjustable to accommodate variations in paper thickness. Little or no difficulty is encountered in accommodating variations in paper thickness or the presence of multiple thicknesses of paper so long as devices of one character or the other are combined with the rollers to permit gap variation.

However, when a friction feed roller system is employed to advance a sheet of paper against a stop, some means must be provided automatically to disengage or relieve the frictional engagement of the feed rollers with the paper in order to avoid undue buckling and tearing of the sheet. Previous patentees in this field have assumed that the best solution lay in lifting the roller from the feed table or separating a pair of feed rollers between which the sheet is advanced to take the feed roller out of contact with the paper. The period of arresting an envelope in an inserting device of the class of my invention must be maintained until the insert materials have been fed or inserted into the envelope. Thereafter a positive feed should take place to eject the envelope with added insert as a unit. The problem of maintaining a

2

proper timing cycle for this process becomes increasingly compounded and complex in accordance to the elaborateness of the means used for relieving the frictional engagement of the roller with the envelope at its arrested stage.

Generally speaking prior devices in this field have employed complex feed roller and lifting or separating systems which have unduly complicated the mechanized insertion procedure and led to the commercial failure of this class of machine.

By way of contrast, I have devised a new means for using a fixed feed table and roller system which provides an automatic variation in feeding gap and automatically relieves frictional engagement of the rollers. Advantage and simplicity of function and construction is especially found in my improved automatic gap relieving mechanism and friction relieving means in that the feed rollers employed are generally rotated on fixed axes free of any elaborate mechanism for moving such axes either by way of adjustment or automatically for lifting the feed roller. Additionally, the device is of such a character that accommodation of a range of paper thicknesses is available without readjustment of the feed roll gap or relieving means while buckling and tearing of the envelopes and inserts at their stop position is successfully maintained at a workable degree. The exact features of such improvements which mark my invention as an advancement over prior devices of this character will be set forth in greater detail hereinafter in relation to the following description of a preferred form of inserting machine.

The main object of this invention is to provide a new and improved envelope inserting machine.

Another object of this invention is to provide a new and improved automatic variable gap mechanism for use in envelope inserting machines.

A further object of this invention is to provide a new and improved means for automatically relieving frictional engagement between a feed roller and a sheet of paper being conveyed in an envelope inserting machine.

Still another object of this invention is to provide a new and improved envelope inserting machine which is efficient, accurate and simplified in construction and operation.

The above and further objects, features and advantages of my invention will be recognized by those familiar with the art from the following detailed description and specifications regarding a preferred embodiment of my invention illustrated in the accompanying drawings.

In the drawings:

Figure 1 is a perspective view of the new and improved inserting device of this invention taken from a vantage point above and to the right of the discharge end of the machine;

Figure 2 is a another perspective view, similar to Figure 1, looking at the improved envelope inserting machine of this invention from a vantage point taken above and to the left of its discharge end;

Figure 3 is a view in full longitudinal cross section of the machine illustrated in Figures 1 and 2;

Figure 4 is a partial bottom plan view of my improved machine shown at a scale enlarged over that used in Figures 1, 2 and 3;

Figure 5 is a schematic showing in side elevation of a flap lifter used for opening the envelopes in the device of Figures 1 and 2; the same being shown in its position of initial engagement with an envelope flap;

Figure 6 is a schematic showing, similar to Figure 5, illustrating the flap opening operation of the flap lifter seen in Figure 5;

Figure 7 is a partial enlarged top plan view schematically demonstrating the activity of the envelope feeding system as the envelope reaches the stop or arresting mech-

anism and the functioning of the envelope feeding system to straighten the envelope and register the same against the stop mechanism;

Figure 8 is a partial longitudinal cross sectional view showing a portion of the device as illustrated in Figure 3, but at an enlarged scale thereover, to demonstrate the operation of the insert feeding mechanism;

Figure 9 is a partial top plan view of substantially the portion of the machine illustrated in Figure 8; and

Figure 10 is a cross sectional view taken substantially at line 10—10 of Figure 9 and looking in the direction of the arrows.

Turning now to the illustrated embodiment found in the drawings, it will be seen from Figures 1 and 2 that the inserting machine 20 shown comprises a pair of side frame members 21—21' which are separated in spaced parallelism by a substantially mid positioned horizontally disposed conveyor table 22 and several spacer rods 23. An envelope stacking means 24 is disposed in tandem behind a similar insert stacking means 25; such stacking means comprising individual inclined feed trays, such as the feeding tray 26 for the envelope stacking means and tray 27 for the insert stacking means. Adjustment means 28 and 29 are associated with the stacking means 24 and 25 respectively, for regulating the incline of the related tray members according to recognized practice. Weighted back plate members 30, 30 are provided for loading envelopes 32 and insert members 33 which are supported on the tray elements 26 and 27. An electric drive motor 34, carried by a suitable framing system 35 is located beneath the conveyor table 22 for rotatably driving a transfer shaft means 36 by means of suitable belt and pulley wheel system 37. Drive shaft means 36 carries five worm members 38, 38a, 38b, 38c and 38d which are located at suitable intervals along the shaft 36 by spaced bearing block members 39 attached to frame plate 21'. Each of the worm members 38, 38a, etc. serves to drive a related worm wheel 40, 40a, 40b, 40c and 40d each associated with one of several horizontally disposed shafts 41, 42, 43, 44 and 45 which are carried in bearings located in the opposed side frame members 21, 21'.

Pairs of friction faced feed rollers 46, 47 and 48 (see Figure 3) are mounted on their respective shafts 41, 42 and 43. Such rollers 46, 47 and 48 cooperate with registering aligned sets of rollers 49, 50 and 51 located beneath the conveyor table 22 and carried on shaft means 52, 53 and 54 respectively. The roller members 49, 50 and 51 are not positively driven, but constitute idlers with their respectively associated shaft members 52, 53 and 54 being carried in sliding block means 55 mounted adjacent the two side frame members 21 and 21' and adjusted vertically by spring loaded adjustment screws 56, 56. Suitable openings 57 are formed through the table 22 for permitting the idler rollers 49, 50 and 51 to engage their associated overlying rollers 46, 47 and 48; the adjustment of the spring and screw means 56 serving to regulate the contacting pressure between such pairs of feed rollers according to known practice.

The cooperation of the rotatably driven rollers 46, 47 and 48 with the idler rollers 49, 50 and 51 serves to form a conventional friction feed roller system for conveying paper, specifically the envelopes 32, along the conveyor bed 22 from envelope stacking means 24 to substantially the point where the insert members 33 are introduced to the conveyor table. In addition to adjusting the contact pressure between the pairs of feed rolls, the spring loaded screw means 56 and blocks 55 permit vertical relative movement between the rotatably driven shafts 41, 42 and 43 and the idler shafts 52, 53 and 54 to accommodate variations in paper thickness etc., passing between the related pairs, of feed rollers.

With particular reference to Figures 1, 3 and 4 of the drawings, it will be seen that at a point just slightly above and behind rollers 46, a pair of feed rolls 60 are

carried on a shaft means 61. Shaft means 61 is disposed in spaced parallelism to the shaft means 41 and is rotatably driven therefrom by means of a sprocket and chain drive means indicated generally at 62 (see Figure 1). In greater particular, shaft 41 supports a drive sprocket 63 at its outer end adjacent the side frame member 21. A chain means 64 leads from such drive sprocket 63 around a larger sprocket 65 mounted on shaft 61. Sprocket 65 is rotatably mounted on shaft 61 and cooperates in conjunction with a conventional ratchet pawl and gear mechanism (not shown) for intermittently rotating shaft 61 and the roller means 60 disposed thereon.

It will be appreciated that the intermittent driving of the roller 60 serves to periodically pull an envelope 32 from the stack position on the top of the tray member 26. In order to maintain the stacked condition of the envelopes 32, a pair of stacking fingers 66—66, each having a roller member 67 adjacent its upper end, are carried on a bar 68 adjacent the forward end of the tray element 26 and at a slightly inclined position to assist the weighted back plate means in the downward feeding of the envelopes according to recognized principles. A thumb screw 69 and clamp means 69a serve to hold the fingers 66 on bar 68. Each time the rollers 60 are driven, a single envelope is pulled from the stack on the tray member 26 and disposed with its leading edge in the bite of the rollers 46 and 49. Thereafter the envelopes are advanced one by one along the table 22 and driven over a flap opener means 70 illustrated best in Figures 3, 4, 5 and 6. It will, of course, be appreciated that while the envelope feeder just described is a friction feed roll type, other styles or types readily known in the art, such as a suction system or "pusher" type may be substituted for this purpose without violating the spirit of my invention.

The flap opener 70 is mounted for rotation with a shaft means 71 mounted adjacent and just slightly above and parallel to the conveyor table 22 intermediate the roller members 46 and 47. The flap opener means 70 comprises a counter-weight portion 72 and a flap engaging finger portion 73 which are suitably related to form a bell crank which rocks with the shaft member 71 and is self activated by engagement with an envelope (see Figures 5 and 6). In its non-operating position, the flap opener 70 assumes a condition, as illustrated best in Figure 3, with the weight portion 72 thereof extending through an opening 74 formed in the conveyor table 22. As an envelope, for example envelope 75 shown in Figures 5 and 6, is advanced by rollers 46 and 49, the leading edge thereof first engages the weight portion 72 and rocks the flap opener with shaft 71 in a counter-clockwise direction so that the flap engaging finger portion 72 is conditioned to engage the leading edge of the envelope's flap portion 76. By the time that the leading edge of the envelope has passed beneath the weight portion 72 the same is engaged by the set of feed rollers 47 and 50 and pulled beneath and across the flap opening finger portion 73 which effectively opens the flap of the envelope in the manner illustrated in Figure 6 of the drawings. To assist in the opening operation of the envelope and the engagement of the finger portion 73 with the flap portion 76 of the envelope, a guide plate 77 is provided on top of the feed table 22 immediately before the flap opener assembly 70.

As the envelope leaves the feed rolls 47 and 50, it is engaged by the next pair of feed rolls 48 and 51 and guided beneath an elongated guide spring 78 which is carried at its upper end by the U-clamp 69a. This spring serves to hold the envelopes securely, but lightly against the upper surface of the table 22.

As an envelope leaves the sets of feed rolls 48 and 51, it passes beneath a pair of overlying feed rolls 80 mounted on shaft 44. Since shaft 44 is constantly driven, the feed rollers 80 are likewise constantly driven. With regard to the feed roll 80, particular attention is drawn to Figures 4, 7 and 8 wherein the features of my new

automatic variable gapping system or means employed with feed rolls 80 is illustrated. Specifically, it will be seen that located beneath the feed table 22 and extending transversely thereof in registry with the axle or shaft 44, is a bar member 81 which is carried in spring loaded block elements 82 at its opposite ends so that the same constitutes a resilient system. More particularly, note that the block elements 82 are related or associated with adjustment screw means 83 each carrying a compression coil spring 84 in a manner similar to the adjustment means 56 heretofore described. The bar member 81 carries additionally a pair of spaced block members 85, each of which is provided with an elongated rectangular opening 86. Block members 85 are located one beneath each of the roller wheels 80 with the rectangular opening 86 therein, providing a relief gap at the approximate point of tangential engagement of the rollers 80 with the plane of the feeding table 22. Extending upwardly between the bar member 81 and the block members 85 and entering each opening 86 in the latter members, is a spring means 87 supported on bar 81 (see Figure 8). Spring means 87 may comprise a cantilever spring type as shown, a compression type with an engagement nose, a resiliently biased pivot or fulcrum lever or other suitable resilient means of an equivalent nature. Particularly, it will be recognized, that the friction feed wheels 80 are distinguished in their functioning of feeding the paper from the sets of feed rolls 48 and 51, in that instead of cooperating with a secondary friction wheel such as the wheels 49, 50 and 51, the feed rollers 80 cooperate with the opening 86 formed in the block members 85. Note too that the spacing between the periphery of wheels 80 and the block member 85 is sufficient to establish a gap capable of accommodating multiple thicknesses of paper.

With the provision of the opening 86 beneath the point of tangential contact of rollers 80 with the paper being fed therebeneath, I have discovered that sufficient frictional contact is established to effectively advance the paper while the presence of the gap 86 provides adequate relief to avoid undue buckling of the paper, when the envelopes are registered against stop means as will be described presently hereinafter.

An added feature in the cooperation of the feed rolls 80 and the openings or gaps 86 is the provision of the spring means 87 which acts as a gap modulator thereby presenting a variable gap thickness for the introduction of a range of paper or envelope thicknesses as well as the thickness of the combined envelopes and inserts. In regard to spring means 87, it should be pointed out that the same is designed to have a flexible resistance sufficient only to insure the required frictional engagement between the paper fed thereover and the friction engaging surface of the overlying rollers 80. However, this function of the spring means 87 which assists in bringing the paper and rollers 80 into contact is overcome when the paper is advanced to the stops so that the openings 86 immediately come into play to provide the necessary relief to avoid jamming or crumpling the envelopes. This feature is thought to be a marked departure from previous devices in this class and is therefore considered to be one of the more outstanding points of novelty in this invention.

As an envelope passes through the bite of the feed rollers 80, it passes first over an adjustable plunger or button 90 extending upwardly through the feed table 22 and is held therebeyond in engagement with the upper surface of the feed table by the action of an elongated leaf spring 91 adjustably connected to a cross frame member 92 extending between side plates 21 and 21'. For purposes of adjusting the tension of the spring 91, an adjustment screw means 93 is provided. The button 90 serves to hump the envelope slightly upward while spring 91 holds it down. The combined cooperation of these

two members effectively opens the envelope pocket for receiving the insert as required.

Before the flap of the opened envelope leaves the rollers 80, the bottom or leading edge of the envelope passes beneath and is engaged by a single roller 94 mounted on shaft 45. A cooperating underlying roller 95 is mounted on an axle 96 beneath table 22. It will be noted especially that an opening 97 is formed in the conveyor table 22 between the rollers 94 and 95. The normal operation of this feed roll system is such that roller 95 is lowered, as in Figure 3, so as to be out of contact or engagement with roller 94 when an envelope is being fed by roller 94.

Shaft 45, as noted hereinbefore, is driven by the worm 15 and worm wheel arrangement comprising worm 38d and worm wheel 40d and thus roller 94 continuously rotates. Shaft 96 comprises a stub shaft carried in a yoke member 98 as best shown in Figure 4 of the drawings. As a result, the roller 95 is not power driven. The yoke member 98 is carried on a bar shaft 99 which extends between the side frame members 21, 21' immediately below the feeding table 22 and is arranged to be actuated with a rocking motion by virtue of a lever arm 100 and a cam means 101 mounted on shaft means 102. It will be noted from Figure 2 in particular that the lever arm 100 and cam member 101 are mounted adjacent the worm and worm wheel means 38d and 40d. Shaft 102 is rotatably driven off of shaft 45 by means of a pair of meshing gears 103 and 104 mounted outwardly of side plate member 21 or that is on the opposite ends of shafts 45 and 102 from the worm wheel 40d and the cam means 101. By this arrangement rotation of shaft 45 serves to rotatably drive shaft 102 to actuate cam means 101 for periodically lowering the lever arm 100 against the tension of a spring means 105. The downward motion of the arm 100 in turn rocks the shaft means 99 to lower the roller 95. From a further inspection of Figure 2 of the drawings, it will be appreciated that cam 101 is designed to maintain the roller 95 in a lowered position for a greater time interval that it permits the raising of the same. Therefore, under normal feeding activity of an envelope beneath roller 94, the roller member 95 will be lowered and will remain in such position until the envelope with its added insert is ready for discharge from the machine as will be explained hereinafter.

As an envelope advances beneath the roller 94, it is eventually thrust against a pair of stop fingers 110 which are adjustably carried on actuating arms 111 (see Figure 4). The stop fingers are arranged to move upwardly through the conveyor table 22 by means of apertures 112 formed therein immediately in front of the feed roll 94 and to the sides thereof. The stop carrying arm members 111 are fixed to a shaft means 113 which is located beneath the conveyor table 22 and carried in end bearing means located in the side frame members 21, 21'. Shaft 113 is arranged to be partially rotated periodically by means of a lever arm 114 driven off of a cam member 115 mounted on shaft 102 outwardly of side frame member 21 (see Figures 1 and 4). The lever arm 114 carries a cam following roller 116 which is biased into normal engagement with the cam 115 by means of a tension spring member 117. As a result of this arrangement, it will be recognized that the stop fingers 110 are periodically raised to engage the leading edge of the envelope and thus arrest its advancement across the feeding table 22. The arrangement of the rollers 80 and 94 should be considered at this junction as set forth in Figure 7. It will be understood that when stop fingers 110 are raised the main body of the envelope is frictionally fed by roller 94 but that the flap portion thereof remains in frictional contact with the rollers 80. As a result, if for any reason the envelope becomes cocked in its position as illustrated in Figure 7, the continued action of rollers 80 will serve to right the envelope and drive its leading

edge into the two stop fingers 110 as diagrammed by the dotted lines showing in that figure.

When the stop fingers 110 are lowered in response to appropriate activity of the cam actuated arm 114, the underlying secondary roller 95 which cooperates with roller 94 is engaged to press the envelope has had an insert added thereto tightly against the friction surface of the roller 94. This function assures positive and quick movement of the envelope across the stop fingers and into engagement with the bite of a final set of discharge roller means 120 and an underlying roller 121. Roller 120 is mounted on a shaft 122 which extends between frame plates 21, 21' and is driven off of gear 104 by means of a gear 123 while roller 121 idles with its shaft 124 and is driven off of roller 120.

From the above description it will be appreciated that envelopes stacked on tray 26 are fed one by one by the periodic actuation of roller 60 and through the bite of successive sets of feed rolls 46—49, 47—50 and 48—51 for engagement by rollers 80 associated with the relief gap system 86 and modulating gap spring means 87. As the envelopes are thereafter advanced by rolls 80 to the roller 94, the stop members 110 are raised to their position illustrated in Figure 8 of the drawings. Thus the fingers arrest the forward progress of the envelope. In this condition the envelope flap portion, such as portion 76 of the envelope 74 illustrated in Figures 5 and 6, remains beneath roller 80 while the main body portion of the envelope is beneath roller 94. Due to the fact that the rollers 80 and 94 cooperate with underlying openings formed in the conveyor bed or table sufficient relief from frictional contact with such rollers is afforded to prevent buckling of the envelope to permit the arrestation of the forward progress of the envelope even though the feed rollers 80 and 94 continue to rotate. It should be noted that whereas the spring means 87 serves to modulate the gap between the roller 80 and the conveyor table 22, the strength of such spring is insufficient to prevent opening 86 from relieving the feeding action of rollers 80 when the stop members are in their raised condition. In point of fact, the springs 87 serve merely to raise the envelope into light engagement with the rollers 80 and to yieldingly accommodate various envelope and insert thicknesses beneath the rollers 80. The provision of relief openings 86 beneath the rollers 80 on the other hand affords the requisite relief of frictional engagement to permit the stopping of the forward progress of the envelopes while the feed rolls 80 continue to rotate in frictional contact therewith.

In conjunction with the envelope feed means and the advancement of the envelopes along the conveyor table 22, the features of the insert system will now be considered. As described heretofore, a stack of inserts 33 are positioned on top of the inclined feeding tray 27 and held in a desired angular relationship between the back plate means 30 and a set of finger members 130, 130 provided with rollers 131, similar to the construction of the means 66 heretofore described. The positioning of the insert feeding system is such that the delivery of the insert members is in a downward angular line of travel substantially directly from the leading edge of tray 27 to the feed rolls 80.

Specifically, a pair of rollers 132, 132 are provided adjacent the forward end of the tray member 27 to frictionally engage the insert members and feed them one by one downwardly across the leading edge of the tray 27 to additional, constantly driven intermediate sets of feed rolls 133 and 134 similar to the friction roller feed system used with the envelopes. Again replacement of this friction type insert feeder by a suction or pusher type is contemplated according to known practice in the art.

Feed rolls 132 are mounted on a shaft 135 arranged for periodic rotation through the activity of a ratchet pawl and gear system 136 in which the ratchet pawl 137 is

periodically engaged with a gear 138 by the presence of a cam 139; this system being identical to the means employed for periodically actuating the envelope feeding rollers 60 (see Figure 9). The ratchet means 136 is driven off of shaft 43 by means of a chain drive and sprocket means 140 located adjacent the side frame member 21; such chain cooperating with a small sprocket wheel 141 on shaft 43 (see Figure 1). Because of the design of the cam member 139 the pawl mechanism 137 periodically engages the teeth of the gear means 138 on shaft 135 and periodically rotates the set of feed rolls 132, 132.

Actuation of the intermediate feed roll 133 is carried out by chain drive means 145 extending between the shaft 43 and a sprocket 146 mounted on shaft 147 which carries the roller 133 (see Figure 2). Since rollers 134 engage roller 133, rotational driving of the former is responsive to driving of roller 133. Sets of leaf spring guide members 150 are provided on shaft 151 which rotatably carries rollers 134. The guide springs 150 serves to guide the inserts beneath the feed rolls 80 and to maintain an envelope therebeneath against the upper face of the conveyor table 22. Additional guide means 152 comprising two elongated arms having a substantially right angular bend therein, are provided on opposite sides of the single leaf spring 91, the same being connected at their upper ends to the cross frame member 92. The guide fingers 152 are primarily provided for guiding the envelopes and insert materials and for holding the same in a substantially horizontal condition on top of table 22 against a slight buckling pressure set up by frictional action of rollers 80 and the springs 87.

From the above description of the several elements and their combination in the machine illustrated, it will be appreciated that the several feeding systems involved and the mode of driving the various feed rollers are substantially conventional with the exception of the organization and operation of feed rolls 80 and 94. These two rollers and their association with the gap means provided in the underlying conveyor table 22 comprise the heart of my present contribution to the art in that they embody the novel concept of cooperating with an underlying opening in the conveyor or feed table 22 which serves as an automatic relief means to prevent buckling of the paper fed by such rolls when the paper is arrested by the stop finger system described. It will be appreciated also that the presence of the spring means 87 in the relief openings 86 beneath rollers 80 acts as an automatic gap modulator to accommodate a range of envelope and insert thicknesses without the requirement for readjusting the gap between rollers 80 and table 22.

While in the normal order of events paper envelopes, and inserts passing beneath rollers 80 and 94 will remain in a planar or substantially planar condition, upon operation of the stop means 110 to arrest the flow of the paper, the normal tendency toward buckling experienced in previous devices of this class is prevented by the provision of the relief openings beneath such rollers. Thus even though the rollers 80 and 94 remain in frictional engagement with the paper therebeneath, the presence of the relief gaps serves to permit a slight bowing of the paper downwardly to substantially lessen the frictional action of the rollers 80 and 94 thereby to avoid buckling. By this arrangement, I am able to constantly drive rollers 80 and 94 thereby eliminating an elaborate timing mechanism for either lifting or interrupting the rotation of these rollers during the state when the insert is being applied to the envelope and the envelope is arrested on the feed table by the presence of the stop fingers 110. This system is entirely successful and has proven remarkable in its operation, giving the present device gratifying commercial success and acceptance.

While I have herein shown and described the novel concepts and features of my invention in conjunction with a preferred form of device, it is nevertheless to be recognized that numerous changes, modifications and sub-

stitutions of equivalents can be made in the illustrated embodiment without necessarily departing from the spirit and the scope of the inventive features involved. As a result, it is not my intention that I be limited to the particular form of device herein illustrated and described except as may appear in the following appended claims.

I claim:

1. In an envelope inserting device of the class described the combination comprising a substantially planar conveyor table means for supporting paper envelopes and inserts to be combined by the device, a constantly driven rotating feed roller means positioned above said table means for frictionally engaging and moving said envelopes and inserts along said table means, and a relief opening means formed through said table means directly beneath said roller means for automatically relieving the driving engagement of said roller means with said envelopes and inserts when the latter are arrested in their travel along said table means.

2. In an envelope inserting device of the class described the combination comprising, a conveyor table means for supporting paper envelopes and inserts to be processed by the device, constantly driven rotatable feed roller means disposed above said table means and in spaced relation with the upper face thereof, said roller means frictionally engaging said envelopes and inserts therebeneath for advancing the same along the said table means, relief opening means extending through said table means and formed directly beneath said roller means for automatically relieving driving engagement of said roller means with said envelopes and inserts when such are arrested in their advancement along said table means, and resilient means extending through said relief opening means and terminated above said upper face of said table, said resilient means serving to automatically modulate the gap spacing between said table and roller means to accommodate variations in insert and envelope thickness.

3. In an envelope inserting device of the class described, the combination comprising, a conveyor table means for supporting paper envelopes and inserts, constantly driven, rotatable feed roller means positioned above said table means for frictionally engaging and driving such envelopes and inserts along said table means, stop means periodically operable to arrest the movement of said envelopes and inserts along said table means, and a relief opening extending through said table means directly beneath said roller means for automatically relieving the latter's driving engagement with said envelopes and inserts when such are arrested by said stop means.

4. In an envelope inserting device of the class described, the combination comprising, a substantially horizontal conveyor table means, constantly driven rotatable

feed roller means disposed on an axis over said table means and aligned transversely to the line of movement of said envelope and insert members along said table means, the periphery of said roller means being spaced from the plane of said table means and arranged to frictionally engage and move envelopes and inserts, stop means periodically operable to arrest the movement of said envelopes and inserts along said table means, relief opening means extending through said table means directly beneath said roller means for automatically relieving driving engagement of said roller means with said envelopes and inserts when the latter are engaged by said stop means, and a flexible spring means extending upwardly through said opening means for automatically modulating the gap spacing between said roller means and table means thereby to accommodate a range of envelope and insert thicknesses.

5. In an envelope inserting device of the class described, the combination comprising, a substantially horizontal conveyor table means, first friction feed roller means disposed above said table and arranged to rotate on an axis disposed transversely to the line of advancement for envelope and insert materials along said table means, second friction roller means disposed in spaced parallelism to said first friction roller means for frictionally engaging and advancing said envelope and insert materials, periodically operable stop means arranged to extend through the plane of the table means and arrest advancement of said envelopes and inserts, the arrangement and spacing of said roller means and stop means being such that an envelope engaged by said stop means resides with its main body portion beneath said second roller means and its flap portion beneath said first roller means, first relief opening means formed through said table means beneath said first roller means, second relief opening means formed through said table means beneath said second roller means, and spring means extending through said first relief opening means and terminating above the plane of said table means, said spring means serving as a resilient gap modulator for automatically accommodating the variations in envelope and insert thicknesses, said two named relief opening means serving automatically to relieve driving engagement between said two named roller means and said envelopes and inserts to substantially prevent undue buckling of the latter when the same are arrested by operation of said stop means.

References Cited in the file of this patent

UNITED STATES PATENTS

998,663	Wood	July 25, 1911
2,643,119	Morrison	June 23, 1953