May 22, 1956 O. P. WELSH 2,746,364

ENVELOPE MAKING MACHINE

Filed Dec. 28, 1950 4 Sheets-Sheet 1

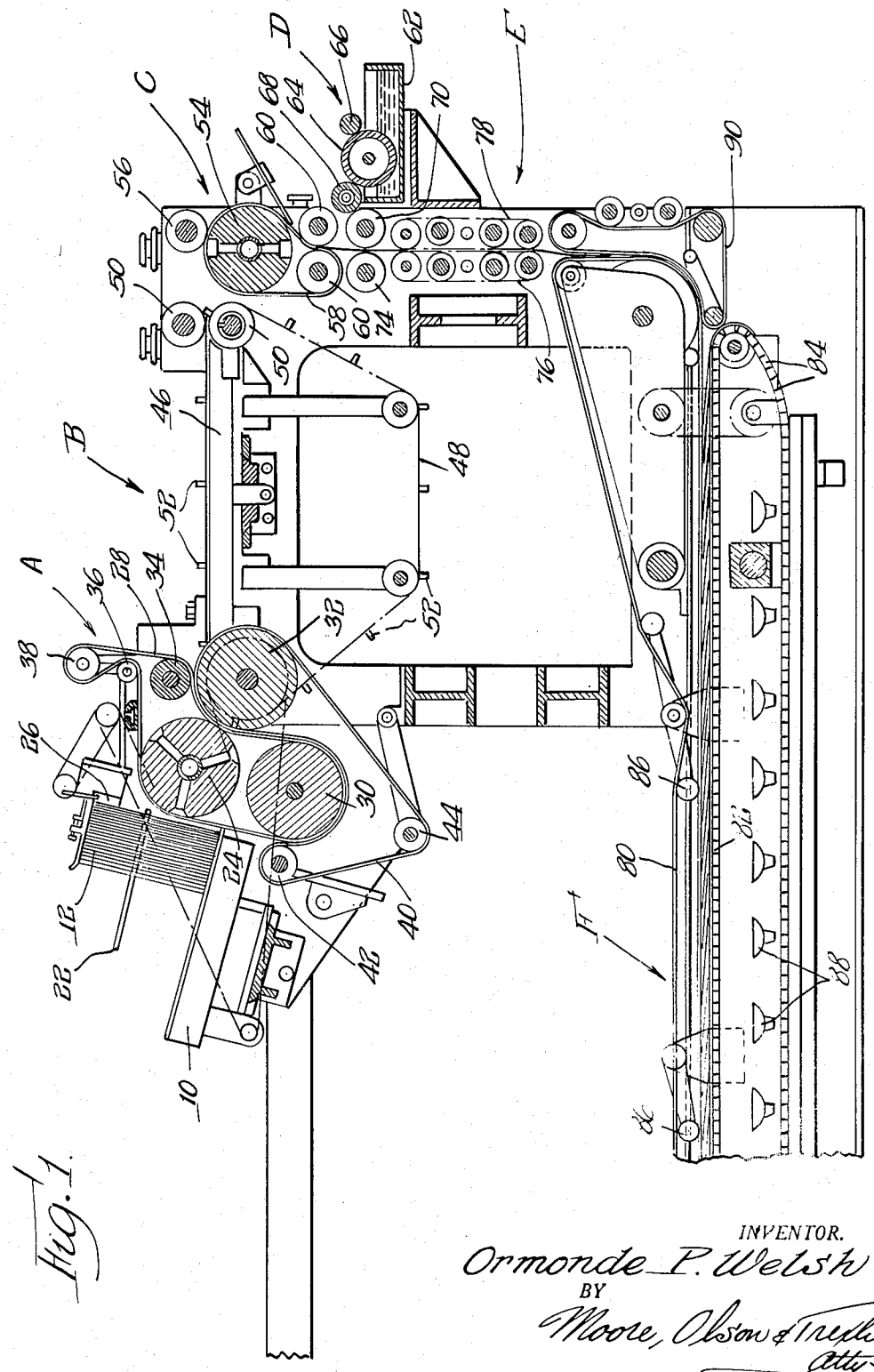


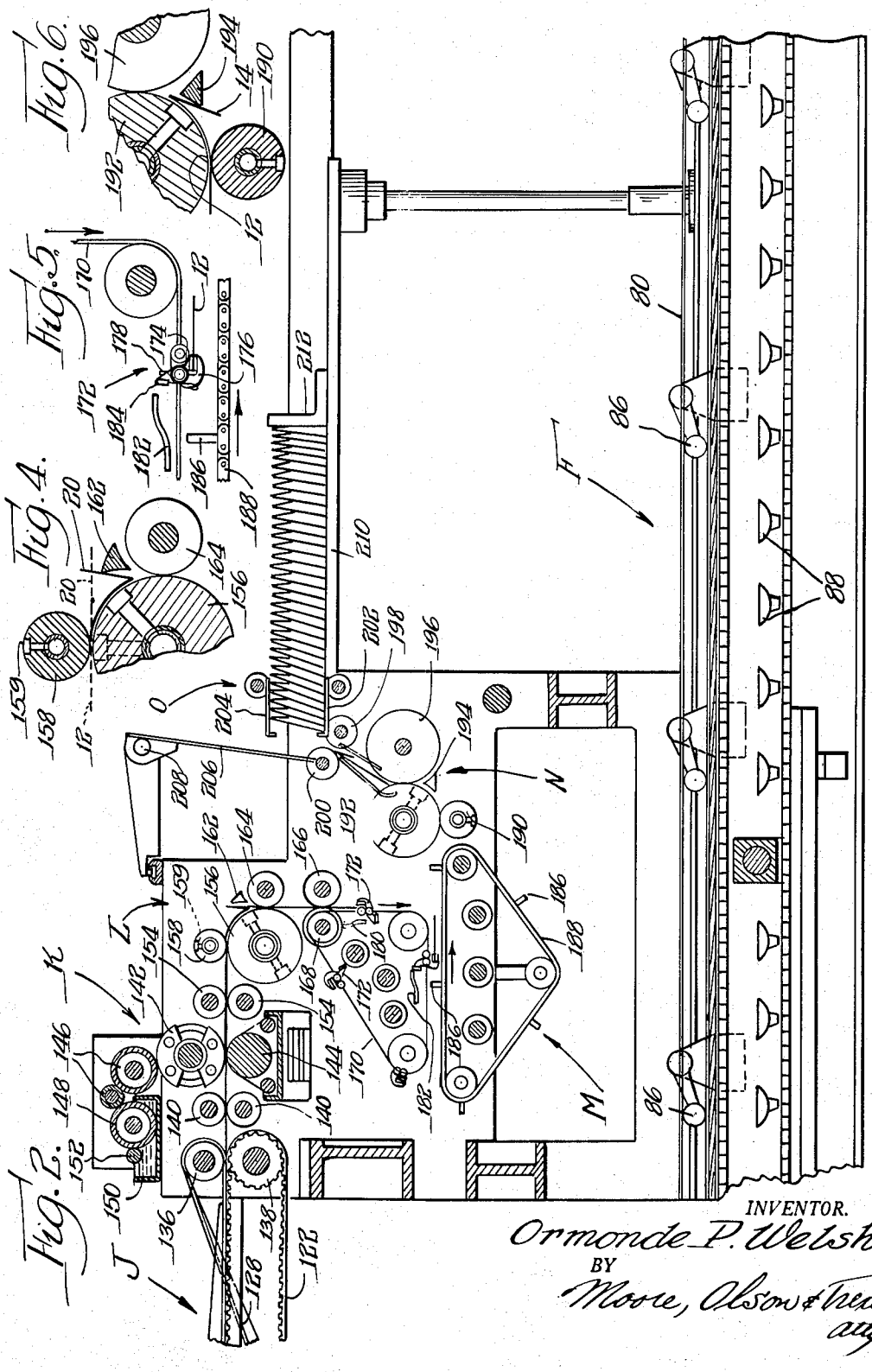
Fig. 1.

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ENVELOPE MAKING MACHINE

Filed Dec. 28, 1950 4 Sheets-Sheet 2



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ENVELOPE MAKING MACHINE

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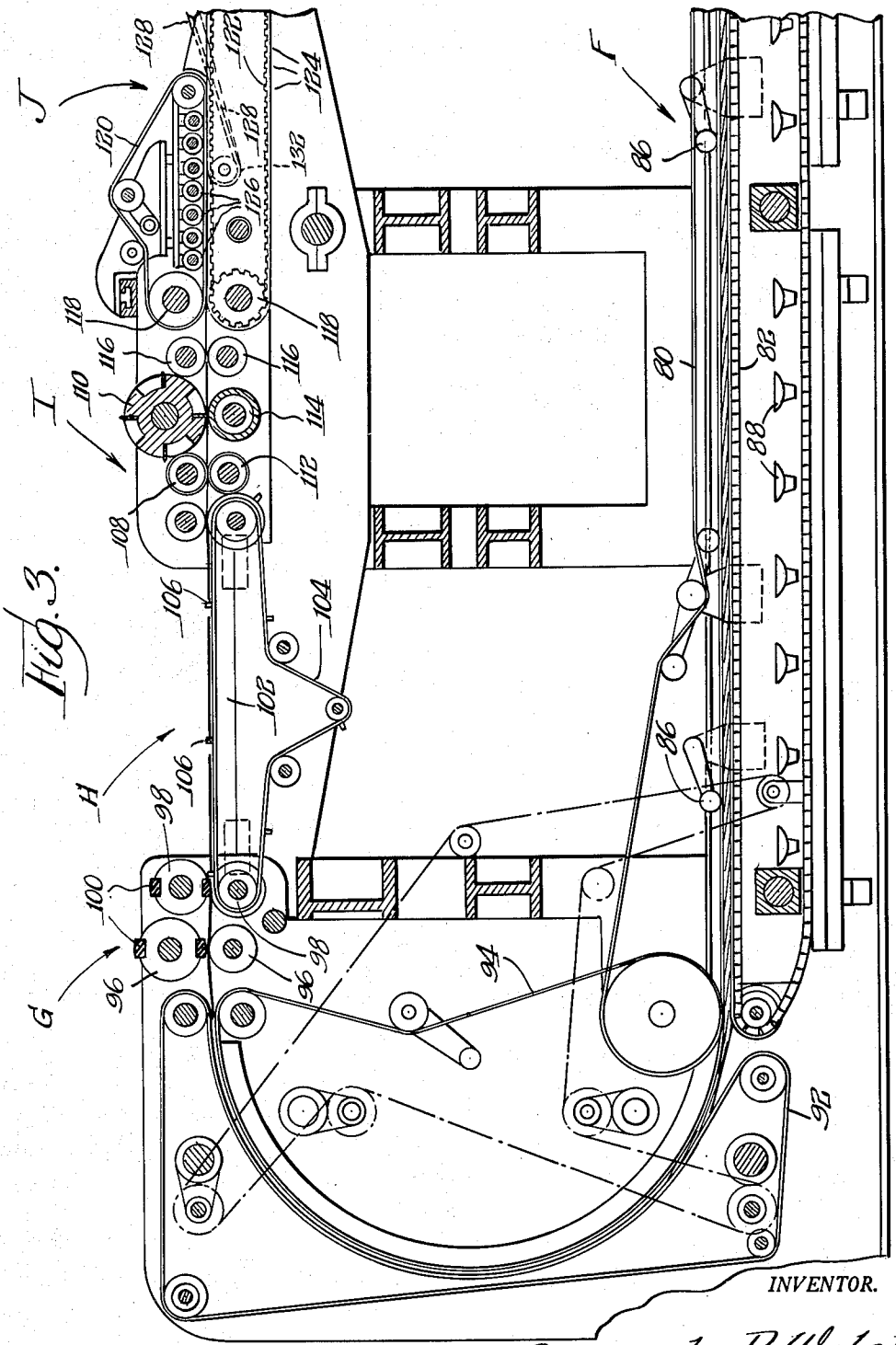


Fig. 3.

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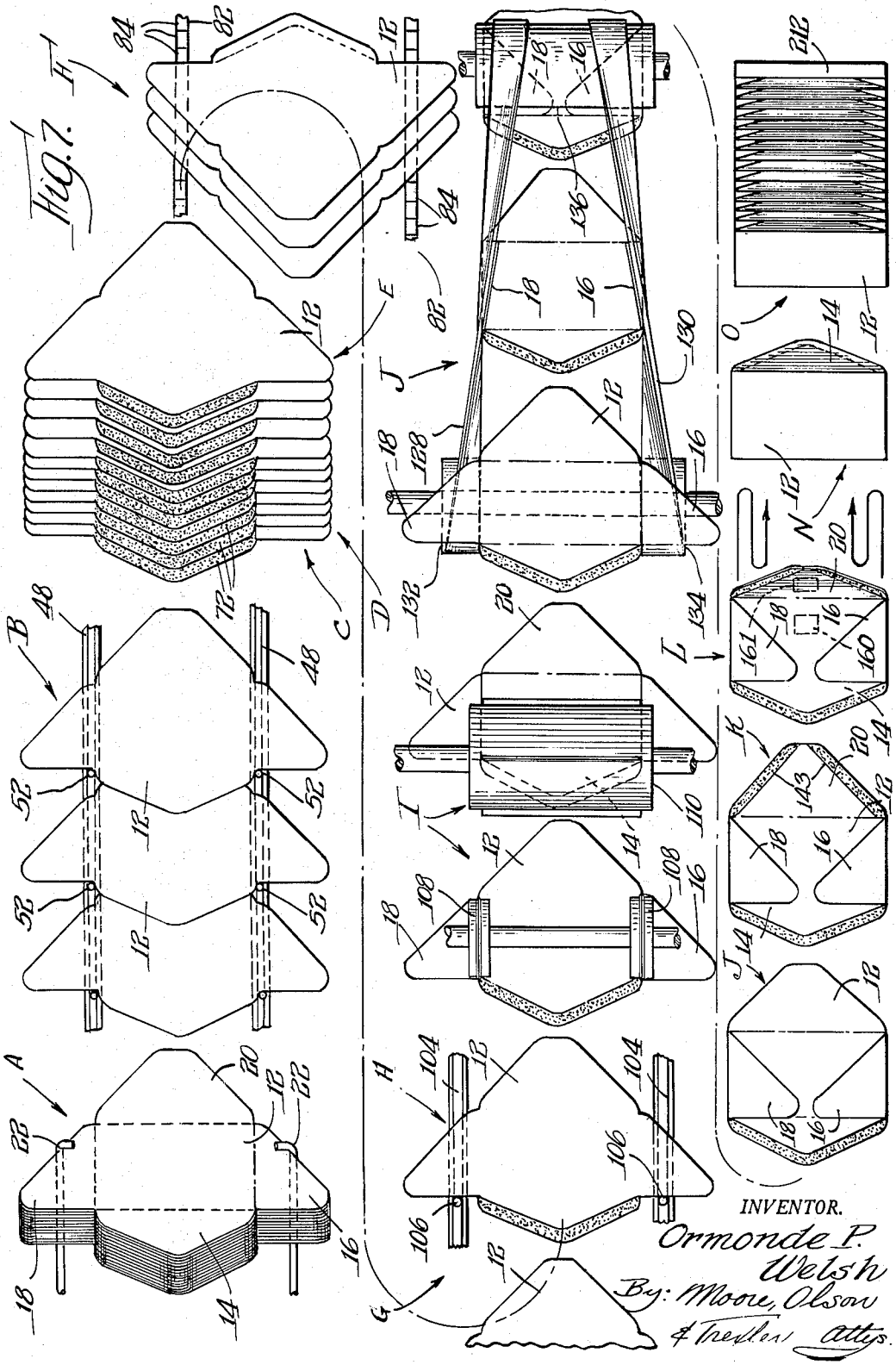
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ENVELOPE MAKING MACHINE

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Fig. 7.



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ENVELOPE MAKING MACHINE

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Application December 28, 1950, Serial No. 203,101

14 Claims. (Cl. 93—62)

This invention relates to envelope making machines, and concerns particularly such machines of the high speed automatic type.

In the manufacture of envelopes, cost considerations make high speed operation desirable; and such high speed operation, in general, presents problems in the handling of the envelope blanks. Difficulties are presented in effecting the accurate feeding of the blanks into and through the machine, and in effecting the various folding and gluing operations thereon with unvarying accuracy.

It is an object of the present invention to provide an improved envelope making machine; and more specifically stated, to provide an improved envelope making machine of the high speed automatic type.

A further object of the invention is to provide an improved envelope making machine, of the foregoing type, wherein the blanks are fed through the machine more positively, and wherein the various operations performed thereon are more positively controlled.

A still further object of the invention is to provide a high speed automatic envelope making machine wherein the envelope blanks are at all times positively controlled to preclude misalignment or hiatus in the feed; wherein they move in a continuous unimpeded flow through the machine; and wherein the various folding mechanisms are more high speed in character and incorporate a minimum of reciprocating machinery and like inertia parts.

Various other objects of the invention, and the advantages and features of the machine will be apparent from the following specification, when taken in connection with the accompanying drawings, wherein a preferred embodiment of the invention is set forth for purposes of illustration.

In the drawings, wherein like reference numerals refer to like parts throughout:

Fig. 1 is a general assembly view, in side elevation and section, and somewhat diagrammatic in form, of the right end section or portion of an envelope machine constructed in accordance with and embodying the principles of the present invention;

Fig. 2 is a view, similar to Fig. 1, illustrating the central section of the machine;

Fig. 3 is a similar view showing the left end of the machine, Figs. 1, 2 and 3 collectively illustrating the complete machine;

Fig. 4 is an enlarged detail view of the mechanism for folding the bottom of the blank;

Fig. 5 is an enlarged detail view of one of the holder clips forming a part of the feeding and reversing section of the machine;

Fig. 6 is an enlarged detail view of the mechanism for folding the seal flap; and

Fig. 7 is a schematic view, showing the envelope blanks in their various stages of movement through the machine.

Referring more specifically to the drawings, and first to the mechanisms illustrated in Figs. 1, 2 and 3, it will be

seen that the structure comprises, in general, the following machine sections:

Envelope blank feeding mechanism illustrated at A;
A blank timing section illustrated at B;
A blank gathering section C;
A seal flap gluing section D;
A separating section E;
A drying section F;
A separating section G;
A retiming section H;
A blank scoring section I;
A blank side folding section J;
A side or bottom gluing section K;
A bottom flap folding section L;
A reversing feed section M;
A seal flap folding section N, and
A stacking section O for the completed envelopes.

Section A

The envelope blank feeding mechanism or section A of the machine is more specifically set forth and described in my copending application entitled "Envelope Blank Feeding Mechanism," Serial No. 203,266, filed December 29, 1950, now U. S. Patent No. 2,709,081. It comprises a table **10** upon which a stack of envelope blanks **12** is arranged, as shown in Fig. 1, the table having a forward sloping inclination of approximately 10–15°, and the blanks being gravity urged by the inclination of the table forwardly or to the right as seen in Fig. 1. The leftward or rearward position of the stack is accessible to the operator, at all times, so that additional blanks may be added to the stack, as required. The disposition of the blanks in the position which they assume on the hopper or feeding table **10** is shown at A in Fig. 7, wherein it will be seen that the blanks are in superposed stacked relation with their seal flaps **14** uppermost, their side flaps **16** and **18** extending laterally, and the bottom flaps **20** projected downwardly between the holding and guide bars **22** forming a part of the hopper structure.

As more particularly set forth in said companion application, a rotary suction wheel **24** and a reciprocating suction block **26** are provided in combination, for feeding the blanks, one by one from the forward end of the stack, in a downward direction. More particularly, the suction block **26** moves upwardly with the suction applied thereto, lifting the foremost blank **12** upwardly slightly to release it from the holding fingers **22**, whereupon the suction in block **26** is released and substantially simultaneously the suction is applied to the active port of the suction feed wheel **24**, causing the envelope blank to adhere thereto and be moved in a downward direction. The downward feeding of each blank is started prior to the time that the trailing edge of the preceding blank clears the stack so that the blanks are maintained in overlapped relation as they are fed from the stack and pass through the feed belts presently to be described.

As will be understood, the air suction is applied to the feeding members **24** and **26**, and released therefrom, in proper timed relation, by suitable rotary valves.

As the blank **14** is moved downwardly it becomes engaged between laterally spaced endless belts **28**, disposed laterally on opposite sides of the feed wheel **24**, said belts being operable around feed rolls **30** and **32**, and suitable idler pulleys as indicated at **34**, **36** and **38**. Cooperating with belts **28** there is a pair of belts **40** also operable around the feed rolls **30** and **32**, and guide rolls **42** and **44**, the blanks being clamped between the belts and fed thereby onto the surface of a table structure **46**.

Section B

As best shown in Figs. 1 and 7, the timing section illustrated at B comprises a pair of spaced chains **48** driven

at suitable speed, passing around the feed roll **32** and the lower of a pair of feed rolls **50**. The chains **48** are provided with spaced lugs **52** engageable with the envelope blanks to effect the propulsion thereof.

It will be seen that the timing section effects the spacing of the blanks at accurately predetermined intervals, while maintaining the overlapped relation thereof.

Section C

From the timing section B the blanks pass to the gathering section C which comprises a suction gathering and feed wheel **54** and a cooperating pressure roll **56**. As in the case of the feed wheel **24**, the suction gathering wheel **54** is provided with suction ports operative to grip the blanks and propel them in a manner so that as they leave the gathering section they are disposed in more closely overlapped relation as indicated at C in Fig. 7. A pair of spaced belts **58** is arranged around the feed wheel **54** in a manner so as not to interfere with the functioning of the suction ports thereof, and around one of a pair of cooperative feed rolls **60**, whereby to propel the blanks from the gathering section C to the flap gluing section D of the machine.

Section D

The seal flap gluing mechanism comprises an adhesive or glue reservoir **62** having an adhesive pickup roll **64**, a wiper and distributing roll **66** and a transfer roll **68** associated therewith, operative to transmit a glue film to a glue roll **70**. This roll applies a patch of glue to the upper portion of the seal flaps of the blanks, as indicated in Fig. 7 at **72**, the area of the applied patch being determined by the degree of overlap between the blanks.

A pressure roll **74** cooperates with the glue roll **70** to back up the glue roll and hold the envelope blanks thereagainst.

Section E

From the glue mechanism the blanks are propelled to a feeding and separating section of the machine, wherein the blanks are slightly separated, as shown at E in Fig. 7 to separate the seal flap glue patches, for drying.

This separating section comprises pairs of endless belts **76** and **78** driven at predetermined speed, and passing over idler and drive rolls, as indicated in Fig. 1, these belts being operative to deliver the blanks, slightly separated as above described, to the drying section F of the machine.

Section F

The drying section is elongated and extends along the bottom of the machine substantially throughout the entire length thereof. It comprises a pair of spaced upper feed belts **80**, and a pair of lower feed belts **82**, the latter being provided with rubber blocks as shown at **84** in Figs. 1 and 7 engageable against the undersides of the blanks on the opposite sides of the glued areas.

A series of weighted rollers **86**, Figs. 1–3, engages the upper belts **80** at spaced intervals so as to hold the belts firmly in engagement with the upper faces of the blanks, whereby the blanks are positively gripped between the belts **80** and the upper blocks **84** of the belts **82** to effect the positive and accurate feeding thereof.

The drying section is provided with a series of heating devices **88** such, for example, as infra-red lamps or the like, the rays of the heating elements being projected upwardly against the downwardly facing glued surfaces of the blanks to effect the drying thereof as the blanks are propelled through the drying section of the machine.

A pair of feed belts **90**, Fig. 1, cooperate with the in-feed portions of the belts **80** to deliver the blanks to the drying section, and pairs of cooperative feed belts **92** and **94**, Fig. 3, are operative to propel the blanks from the drying section to the separating section G, now to be described. It will be understood, as the blanks are delivered from the drying section the applied adhesive to form the seal flaps has been dried by the progressive action of the drying section heating elements. Due to the close overlap of the blanks within the drying section, the blanks move therethrough relatively slowly.

Section G

The separating section G comprises two pairs of cooperative feed rolls **96** and **98**, the upper roll of each pair being provided with rubber blocks as indicated at **100** operable to grip and propel the blanks. The driven speed of these rolls is such that the blanks are completely separated, for the first time in the machine, as they leave these rolls and are propelled into the retiming section H.

Section H

The retiming section H is generally similar to the timing section B previously described and comprises a table **102** having a pair of spaced driving chains **104**, Figs. 3 and 7, operable therealong, the chains being provided with drive pins **106** at predetermined intervals as in the instance of the timing chains previously described. In the case of the retiming section H, the drive pins are sufficiently spaced so that the blanks are delivered from the retiming section in completely separated relation, for actuation by the subsequent operating mechanisms of the machine.

Section I

The scoring section comprises a pair of scoring rolls **108**, Figs. 3 and 7, for applying the longitudinal score lines for the side flaps **16** and **18**, and a score roll **110** for applying the transverse score lines for the seal flap **14** and the bottom flap **20**. The score rolls are backed by cooperating backup or pressure rolls **112** and **114**. A pair of feed rolls **116** cooperates with the scoring rolls to impart a positive feeding movement to the blanks as they are propelled through the scoring section of the machine.

Section J

From the scoring section the blanks are transmitted to the side folding section J at which the side flaps of the blanks are folded over onto the blank bodies, as shown in Figs. 3, 2 and 7.

More particularly, the blanks are first transmitted between a pair of feed rolls **118** having respectively associated therewith feed belts **120** and **122**, the latter preferably being of the chain type as indicated at **124** whereby their speed of operation is accurately correlated with that of the feed rolls **118**. A series of pressure rolls as indicated at **126** engages against the inner face of the belt **120**, so as to urge the envelope blanks firmly into engagement with the surfaces of belts **122**.

The folding of the side flaps is effected by a pair of twisted side belts **128** and **130**, these belts being engageable under the side flaps as shown in Fig. 7, and the twisted reaches thereof being operable to turn the side flaps upwardly and over onto the blank bodies. The belts are journalled at their receiving ends upon a pair of rolls **132** and **134**, respectively, and at their delivery ends upon a roll **136** which also acts in cooperation with the roll **138**, Fig. 2, as a pressure creasing roll for creasing and pressing the side flaps permanently into position.

Section K

From the side folding section of the machine the envelope blanks are delivered by a pair of feed rolls **140** to the glue applying section K, at which a segmental glue applying roll **142** in conjunction with a pressure roll **144** operates to apply patches of glue **143** on the side edges of the bottom flap **20**, as shown in Fig. 7.

The glue is delivered to the glue roll through the action of transfer rolls **146** which receive the glue or other

adhesive from a supply roll **148** operable within the glue reservoir **150**. A wiper roll **152** operates to properly distribute the glue on the supply roll, as will be understood.

Obviously the glue may be applied either to the bottom flap **20**, or to the side flaps **16** and **18**, or to both, as may be desired.

Section L

From the glue section the blanks are transmitted to mechanism designated at L, wherein the bottom flap **20** is folded over onto the side flaps.

The blanks are transmitted from the glue roll by a pair of feed rolls **154** to a suction wheel **156** and cooperative pressure roller **158**, also having a suction port as indicated at **159**. The suction port of roll **156** engages the blank body, substantially at the point indicated at **160**, Fig. 7, and port **159** of roll **158** engages the bottom flap momentarily at the point **161**, whereby the forwardly projecting bottom flap is projected over an abutment **162**, as shown in dotted lines in Fig. 4, and is thereafter drawn downwardly between said abutment and the surface of the suction wheel, as shown in full lines in Fig. 4, so as to be drawn between the suction wheel and a cooperative pressure roll **164**, which creases and presses the bottom flap firmly into position.

It will be noted that this operation occurs without disturbing or varying the continuous progress of the blanks.

Section M

From the bottom flap folding mechanism the blanks are delivered to a reversing feed section of the machine, as designated at M, wherein the travel of the blanks is reversed so that the heretofore trailing seal flap is caused to assume the leading position of the blank.

More particularly, the blanks are delivered to a pair of feed rolls **166** and **168**, the latter of which has connected therewith an endless belt or chain **170** carrying a series of spring pressed holding clips **172**, the details of which are shown in Fig. 5.

Each holding clip is provided with a fixed clamping jaw **174** and a cooperative pivoted clamping jaw **176**, the latter being normally spring urged by a spring **178** into engagement with the fixed jaw whereby to clampingly grip the envelope blank.

Fixed cams **180** and **182** are arranged to engage an abutment **184** formed on each pivoted jaw **176**, whereby the jaws are momentarily opened as the cams are engaged. Cam **180** opens the jaws as the blanks are projected therebetween from the feed rolls **166—168**, after which the blank is gripped and carried by the clip until cam **182** is engaged whereupon the clip jaws are again momentarily opened to release the blank.

At the instant that the blank is released it is engaged by a pair of upstanding pins **186** carried by chains **188**, Figs. 2 and 5, traveling in the opposite direction in respect to the direction of movement of belt **170** and disposed laterally on either side thereof, whereby the direction of travel of the blanks is reversed, the blanks being caused to move to the right as seen in Figs. 2 and 5, with the seal flap portions thereof in the forward or leading position.

Section N

From the reversing feed section the blanks are transmitted to a pair of feed rolls **190** and **192**, Figs. 2 and 6, formed as a pair of suction rolls, and operable respectively to grip the seal flap and the blank body, there being associated therewith a folding abutment member **194** which functions to fold and crease the seal flap **14** (the adhesive of which is dry) into position in the same manner as heretofore described in reference to the bottom flap **20**. The folding and creasing of the seal flap is completed by the action of a presser roll **196** substantially similar to the presser roll **164** in the instance of the bottom flap, as previously set forth.

Section O

The stacking mechanism for completed envelopes, as indicated at O, is of the type more particularly described in my companion application, "Envelope Stacking Mechanism," Serial No. 203,267, filed December 29, 1950, now U. S. Patent No. 2,702,190.

This stacking mechanism comprises a pair of feed rolls **198** and **200** operable to receive the blanks from the rolls **192**, **196**, rolls **198—200** operating to project the envelopes between a pair of receiving plates as indicated at **202** and **204**.

As more particularly pointed out in said companion application, these receiving plates are moved toward and away from each other, in timed relation, as each envelope is received; and a swinging tucking arm **206** pivoted at **208** is provided for positioning each envelope as it is received between the plates.

A table **210** is associated with the lower plate **202**, as an extension thereof, the envelopes thus being projected along the sliding table against an abutment block **212**, from which table the completed envelopes may be removed, in groups, by the operator.

It will be noted that the delivery table **210** is closely adjacent the infeed hopper **10**, of the machine, so that one operator may readily supply the blanks to the supply hopper and also remove the completed envelopes from the delivery table.

It will be seen that the machine provides a high speed automatic mechanism wherein the blanks are continuously transmitted, while being positively controlled. The suction control devices provide for the accurate feeding and movement of the blanks, in cooperation with the timing sections, which insure the proper operation of the gluing and folding mechanisms. The side and bottom flap folding is effected while the blanks are moving forwardly in continuous progression, and after reversing, the seal flap is folded in a similar manner.

It is obvious that various changes may be made in the specific embodiment set forth without departing from the spirit of the invention. The invention is accordingly not to be limited to the particular structures shown and described, but only as indicated in the following claims.

The invention is hereby claimed as follows:

1. An envelope making machine comprising a supply hopper for envelope blanks, means for feeding the blanks from the hopper in predetermined overlapped relation, seal flap gluing means, and transfer means for transferring the blanks from the feeding means to the gluing means, said transfer means including means for maintaining the blanks in said predetermined overlapped relation, and means in advance of said seal flap gluing means for gathering the blanks toward each other to reduce the spacing thereof.

2. An envelope making machine comprising a supply hopper for envelope blanks, means for feeding the blanks from the hopper, seal flap gluing means, transfer means for transferring the blanks from the feeding means to the gluing means, said transfer means comprising an endless band feeding member and feeding lugs on said endless band in predetermined spaced relation for adjusting the blanks in predetermined overlapped relation.

3. An envelope making machine comprising a supply hopper for envelope blanks, means for feeding the blanks from the hopper, seal flap gluing means, and transfer means for transferring the blanks from the feeding means to the gluing means and for maintaining said blanks in predetermined overlapped relation, said transfer means comprising a vacuum gathering wheel for reducing the spacing of the blanks at a predetermined point in their path of travel.

4. An envelope making machine comprising a supply hopper for envelope blanks, means for feeding the blanks from the hopper, said means comprising a vacuum feeding wheel for feeding the blanks from the hopper in predetermined timed and overlapped relation, seal flap glu-

ing means, and transfer means for transferring the blanks from the feeding means to the gluing means and for maintaining said blanks in said pretermined overlapped relation, said transfer means including a vacuum gathering wheel for reducing the spacing of the blanks.

5. In an envelope making machine having a supply hopper for blanks, seal flap gluing means to which the blanks are transmitted from the hopper, drying means to which the blanks are transmitted from the gluing means, and blank folding means, the combination of transfer means for transferring the blanks from the drying means to the folding means, said transfer means comprising first and second pairs of feed rolls with at least one of said rolls having a radially projecting friction block intermittently cooperable with another roll for feeding and separating the blanks, and an endless conveyor operatable around sprocket means axially aligned with one roll of said second pair having spaced feeding lugs for transmitting the blanks to the folding means in predetermined spaced relation.

6. In an envelope making machine having a supply hopper for envelope blanks, and side flap folding means to which the blanks are fed from the supply hopper, a suction wheel having a suction port engageable with the body of the blanks with a flap extending forwardly therefrom, means disposed adjacent to but spaced from the periphery of said suction wheel for engaging and partially folding said last named flap as a blank is carried around the suction wheel, and a presser wheel cooperable with said suction wheel and engageable with the flap for completely folding it onto the blank body.

7. An envelope making machine comprising a supply hopper for envelope blanks, side flap folding means, bottom flap folding means, means for transmitting the envelope blanks to the side flap folding means and the bottom flap folding means from the supply hopper with the bottom flap forming the leading edge, coacting blank feeding means relatively arranged to reverse the position of the leading and trailing edges of the blanks to arrange the seal flap as the leading edge prior to folding the seal flap, and seal flap folding means for receiving the blanks from said reversing means.

8. An envelope making machine as defined in claim 7, wherein said reversing means comprises a pair of endless conveyors operable in opposite directions.

9. An envelope making machine as defined in claim 7, wherein said reversing means comprises a pair of endless conveyors operable in opposite directions, one of said conveyors being provided with spaced blank grippers thereon.

10. An envelope making machine as defined in claim 7, wherein said reversing means comprises a pair of endless conveyors operable in opposite directions, one of said conveyors being provided with spaced blank grippers thereon, and the other of said conveyors being provided with spaced abutments thereon for receiving the blanks from the grippers.

11. In an envelope making machine as defined in claim 7, wherein said side flap folding means includes a pair of endless bands having twisted reaches engageable with the side flaps of the blanks, and said bottom flaps and seal flap folding means each includes a suction wheel for gripping the blank bodies with the bottom or seal flap freely extending forwardly and a presser wheel cooperable with said suction wheel for folding said bottom and seal flaps onto the blank bodies.

12. In an envelope making machine having a supply hopper for envelope blanks, side flap folding means, bottom flap folding means, and means for transmitting the blanks successively from a supply hopper to each of said folding means, the combination comprising a vacuum suction wheel operable to grip the blanks bodies with the seal flaps freely extending forwardly, and a pressure wheel cooperable with said suction wheel for folding seal flaps of the blanks onto the blank bodies.

13. In an envelope making machine having a supply hopper for envelope blanks, side flap folding means, and means for transmitting the blanks successively from the supply hopper to said side flap folding means and along a predetermined path of travel, the combination comprising a pair of spaced suction wheels operable to grip the blanks bodies with either the bottom flap or the seal flap freely extending forwardly, a presser wheel cooperable with one of said suction wheels for folding bottom flaps of the blanks, a second presser wheel cooperable with the other suction wheel for folding seal flaps of the blanks, and means for conveying the blanks from one suction wheel to the other and for reversing the positions of the leading and trailing edges of the blanks.

14. An envelope making machine comprising a supply hopper for envelope blanks, bottom flap folding means, means for transmitting the envelope blanks from the supply hopper to the bottom flap folding means with the bottom flap forming the leading edge, endless motion means for reversing the position of the leading and trailing edges of the blanks to arrange the seal flap in the leading position, and seal flap folding means for receiving the blanks from said reversing means.

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