United States Patent

[11] 3,537,362

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[21] Appl. No. **843,277**
[22] Filed **June 30, 1969**
Continuation of Ser. No. 674,942, Oct. 12, 1967, abandoned.
[45] Patented **Nov. 3, 1970**

[54] **CREASING AND DELIVERY MEANS FOR ENVELOPE FORMING MACHINE**
5 Claims, 6 Drawing Figs.

[52] **U.S. Cl.** **93/62**
[51] **Int. Cl.** **B31b 21/02**
[50] **Field of Search** 93/62, 61A, 61

[56] **References Cited**

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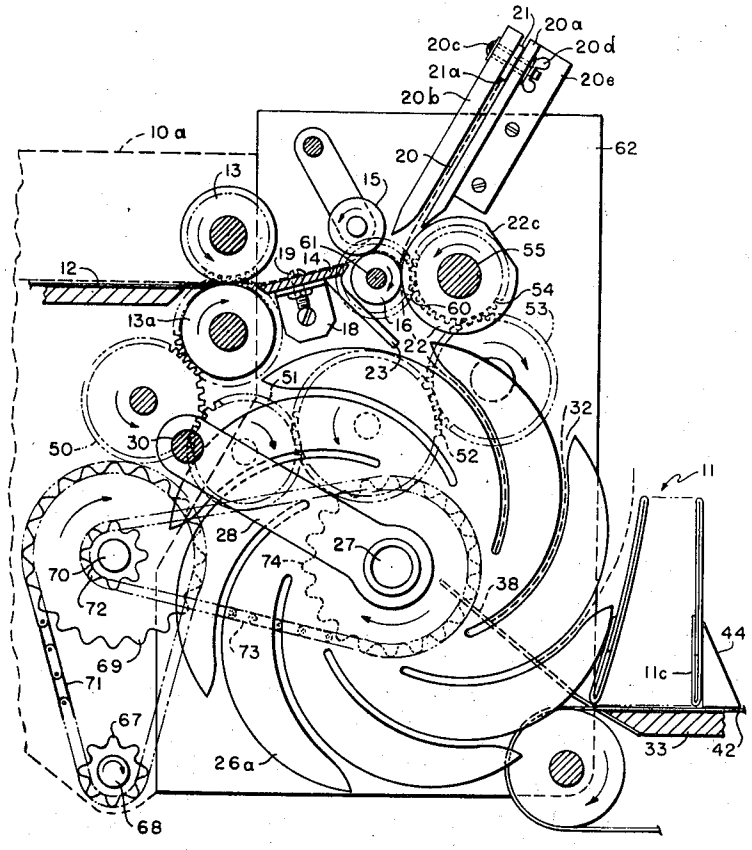
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ABSTRACT: Novel rotary means is provided for rapid creasing and delivery of envelopes in a "wide range" envelope forming machine. The machine may be operated alternatively to deliver finished envelopes with flaps folded or extended.



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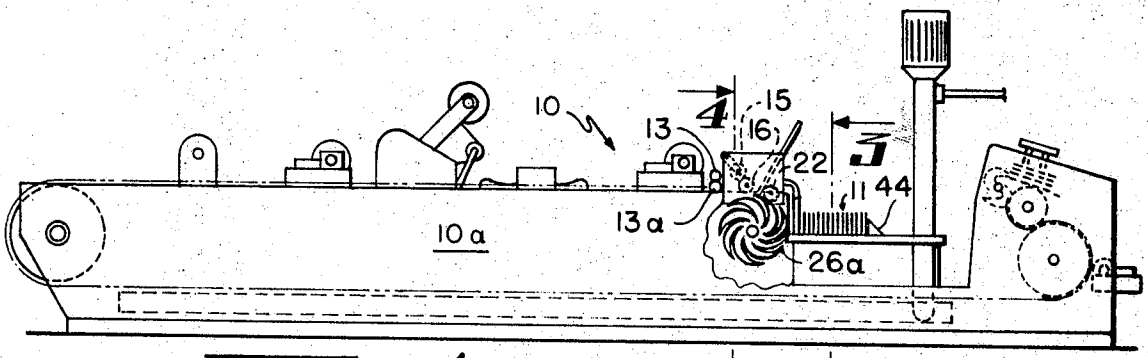


Fig 1

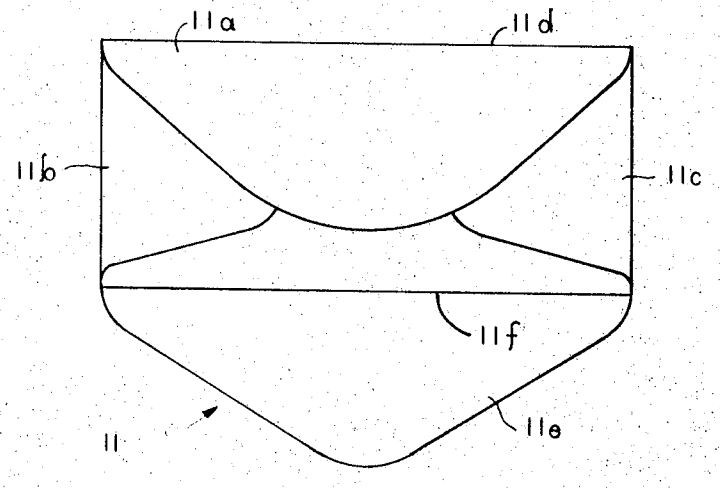


Fig 2

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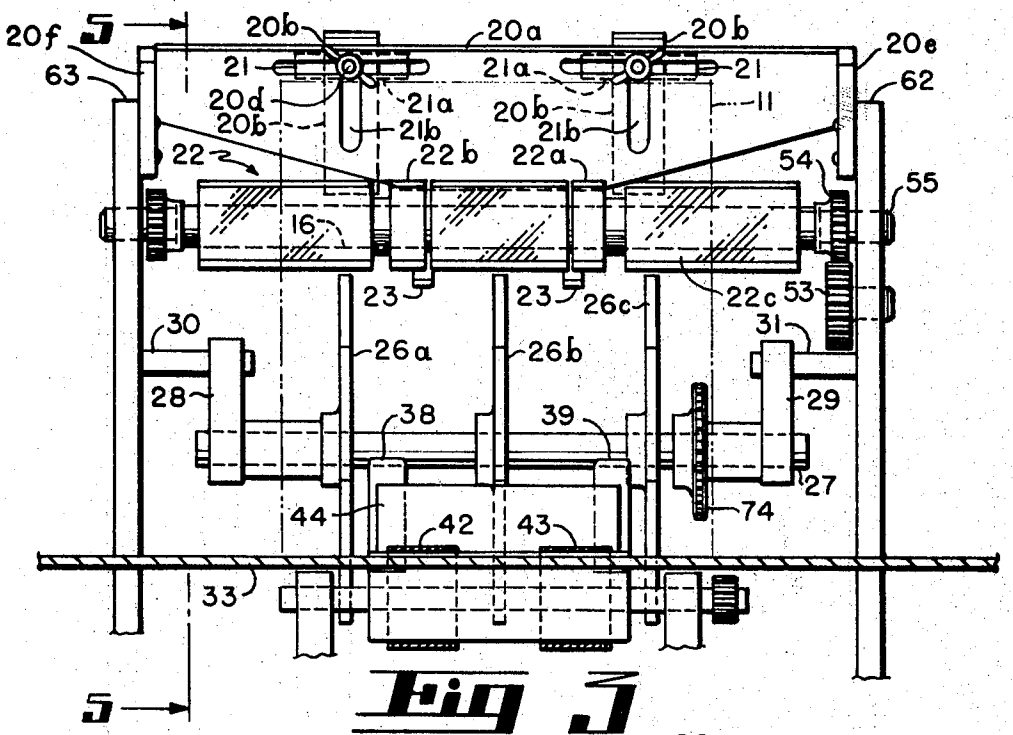


Fig 3

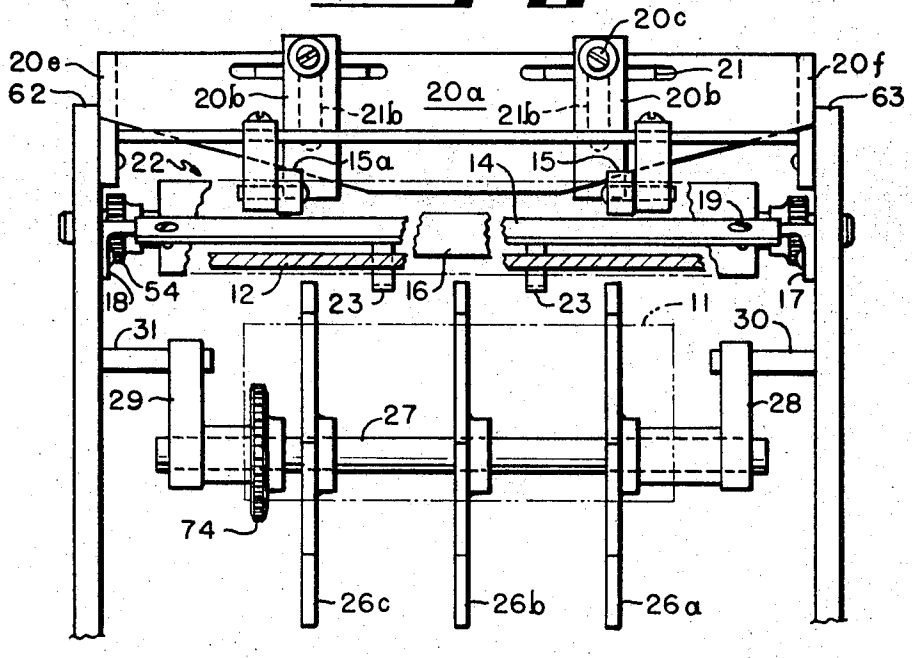


Fig 4

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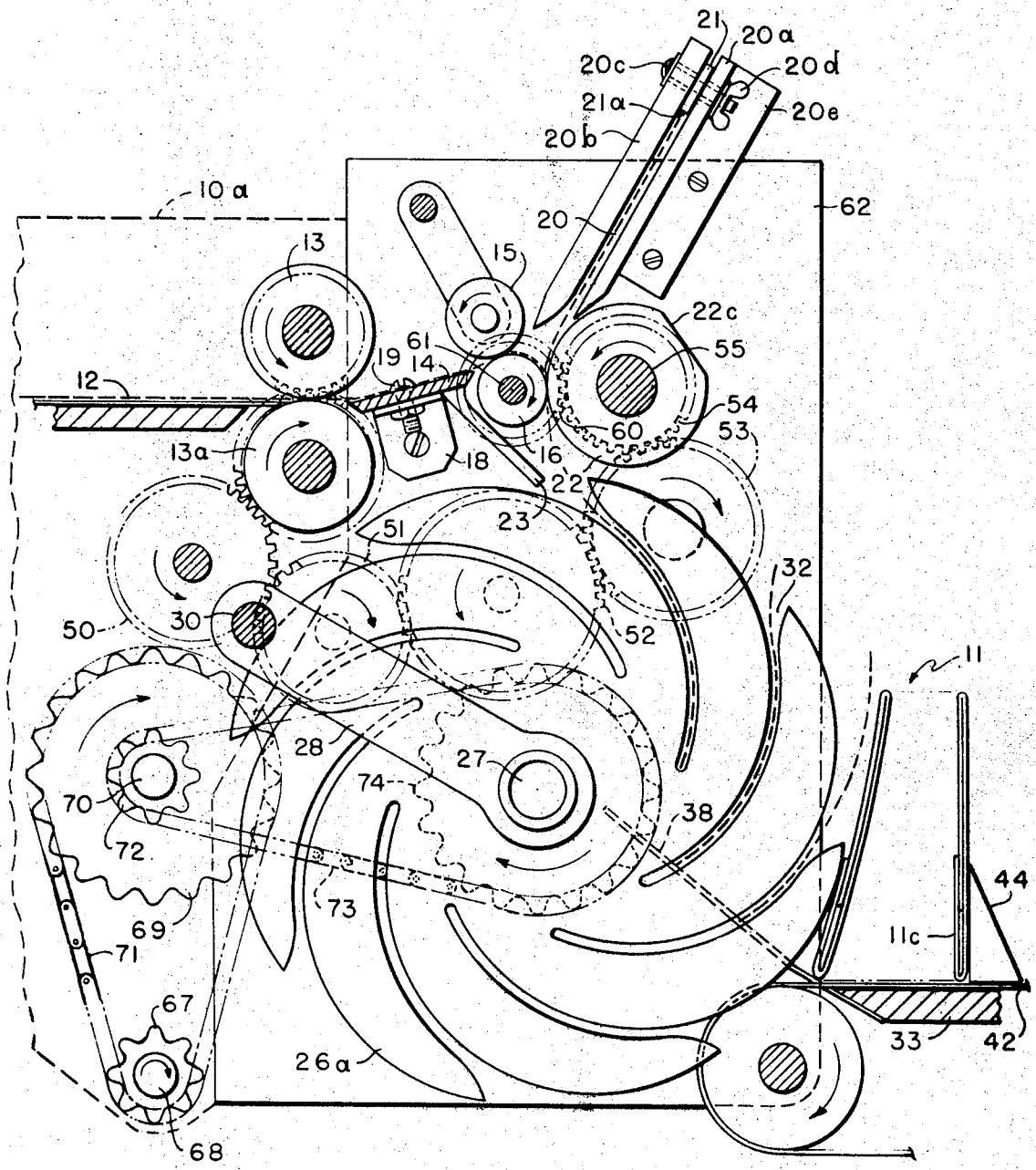


Fig 3

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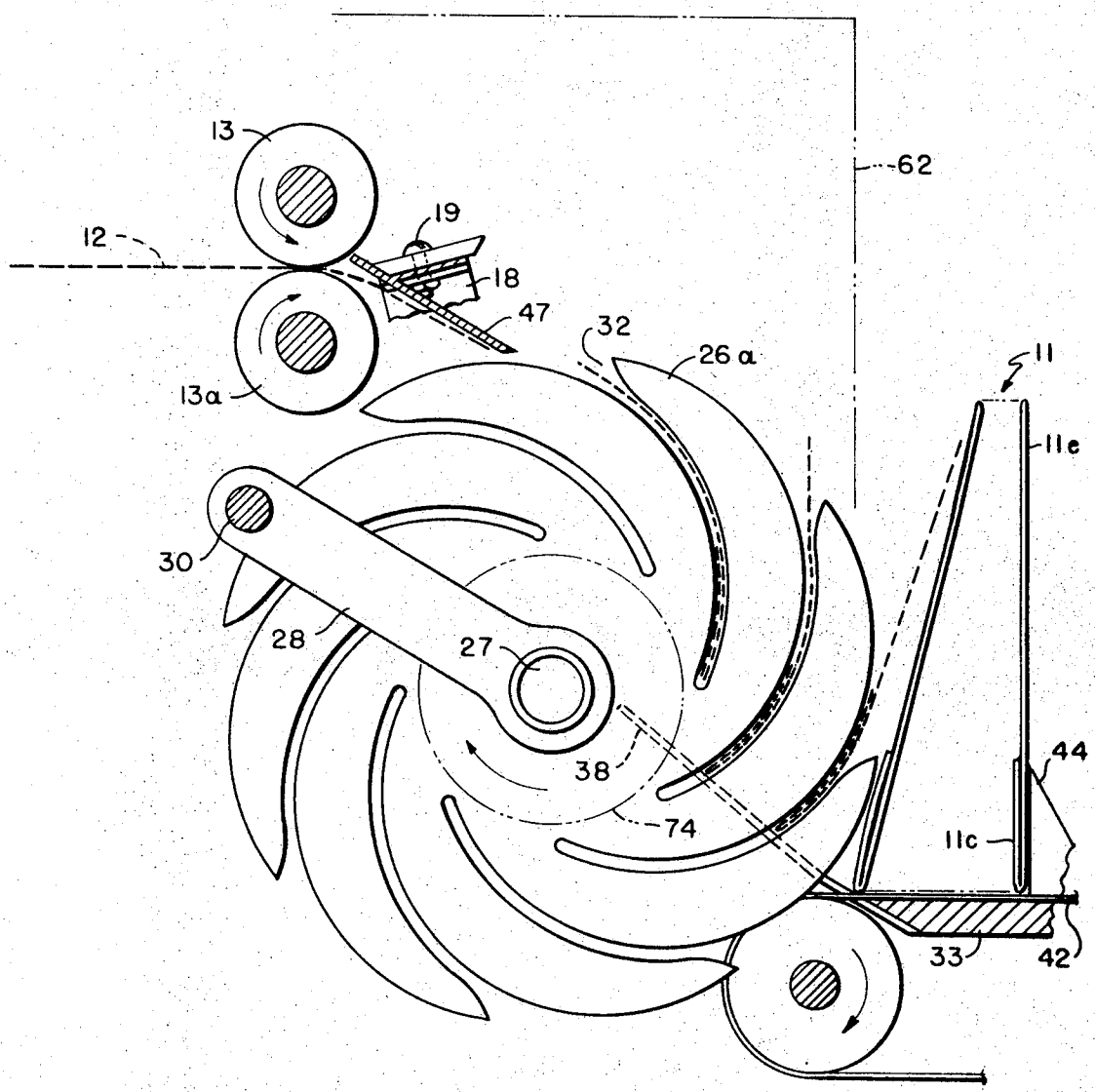


Fig 6

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CREASING AND DELIVERY MEANS FOR ENVELOPE FORMING MACHINE

This is a continuation of my copending U.S. Pat. application Ser. No. 674,942, filed Oct. 12, 1967, now abandoned.

The present invention relates to envelope forming machines, and more particularly, to improvements in those portions of such machines where creasing of the seal flap occurs and delivery of the completed envelope from the machine takes place.

To those engaged in the envelope manufacturing business it is well known that the term "wide range" refers to a particular kind of envelope forming machine. Such machine accepts die-cut blanks which are flat sheets of paper of appropriate configuration, and discharges from the end a completely formed envelope. Involved in such machine in the course of forming the completed envelope are components for feeding the blanks into the machine; applying adhesive; drying the adhesive; scoring; the making of various folds and creases; moving blanks and partially formed envelopes from station to station within the machine; and delivering formed envelopes from the machine. Such machines may or may not include elements to perform a "patching" operation, by which in this trade is meant covering an aperture in the face of the envelope with a transparent piece of material through which an address may be read in the finished envelope.

In such machines the last operation performed to complete the envelope is scoring and folding, or creasing, of the seal flap. After this operation is performed, the completed envelope is delivered from the machine. In the conventional wide range machine, creasing of the seal flap occurs by delivering an otherwise completed envelope to a pair of seal flap pushers, the mode of operation of which is in reciprocating fashion. Such pushers urge the envelope toward a pair of creasing rolls, whereupon the previously scored seal flap is folded against the body of the envelope. Because the creasing rolls in the conventional wide range envelope forming machine tend to force air towards the closed bottom of the envelope, it is necessary that one of the creasing rolls be moved away from the other as each envelope passes therethrough, for otherwise, the envelope being formed might be damaged by compression of the air within the envelope caused by pressure of the creasing rolls in such conventional machines. Following completion of the creasing of the seal flap in the conventional machine, the envelope is picked up first by fabric belts and then by delivery chains which conduct the formed envelopes to the delivery table.

I have found that the reciprocating pushers and the belt and chain delivery means impose limitations upon the speed at which envelopes may be fabricated in the wide range machine, and it is the primary object of this invention to provide a modified structure in the portion of the wide range machine devoted to creasing of seal flaps and delivery of finished envelopes from the machine, whereby the process of envelope formation and delivery from the machine may take place at a much higher rate of speed than has heretofore been possible. In implementing this objective the pushers are altogether eliminated from the machine; a novel structure to accomplish the creasing operation in conjunction with the creasing rolls is provided; and a rotary delivery means is employed in place of the linear fabric belt and chains of the conventional wide range machine. It will be appreciated that it is another object of this invention to make it possible to continue the utilization of the basically sound conventional wide range envelope forming machine, but improving such a machine by increasing its output capability. Envelope manufacturers will therefore enjoy the benefit of being able to continue to use existing equipment rather than being forced to replace such equipment with new machines. A very substantial saving is thus made possible for them. A further object herein is to provide novel means in the conventional wide range envelope forming machine whereby envelopes may be alternatively delivered from the machine with seal flaps unfolded, delivery in this fashion not being possible in such machines as heretofore known.

How these and many other objects are to be implemented will become clear through a consideration of the accompanying drawings wherein:

FIG. 1 shows a schematic side view of a wide range envelope forming machine for purposes of locating the position therein where the improvements of the present invention are located;

FIG. 2 shows a plan view of an envelope;

FIG. 3 is a view of the seal flap creasing elements and finished envelope delivery elements in the wide range machine, the vantage point for such view being indicated by the line 3–3 in FIG. 1;

FIG. 4 is a view of the opposite side of some of the same elements seen in FIG. 3 taken at the line 4–4 in FIG. 1;

FIG. 5 is an enlarged side view of the same elements taken at 5–5 in FIG. 3, showing the creasing and delivery elements for delivery of finished envelopes with seal flaps folded; and

FIG. 6 is a view similar to that of FIG. 5 with drive gears, sprockets, and drive chains omitted for the sake of simplicity, and the structure modified for the delivery of envelopes from the wide range envelope forming machine with seal flaps extended, not folded.

In the ensuing description, the components which act upon the envelopes will be discussed under the heading "Operative Elements," while the drive means therefor will be separately discussed under the heading "Drive".

OPERATIVE ELEMENTS

A wide range envelope forming machine **10** having housing sidewalls **10***a* is generally represented in FIG. 1 for purposes of orientation. The general position of the creasing and delivery means in the wide range machine, which are the subject of the present invention, may be seen in FIG. 1.

Envelopes completely formed in all respects except that seal flap **11***e* is in extended position and not folded, (see FIG. 2 for depiction of single envelope in this condition) are moved by conveyer means **12** to rolls **13** and **13***a*. That is, prior to reaching rolls **13** and **13***a* flat blanks of appropriate configuration have been folded to provide envelopes as seen in FIG. 2 with bottom flap **11***a* and side flaps **11***b* and **11***c* folded over and glued. It will be understood that while the present discussion speaks in terms of, and the illustrations show only a single envelope, in the actual operation of the envelope forming machine a continuous flow of envelopes is maintained throughout the machine and a continuous flow of envelopes is delivered therefrom. Conveyer means **12** and rolls **13** and **13***a* are found in the unmodified machine (see FIG. 5). The components hereafter described, however, are substituted in place of the seal flap creasing and envelope delivery means provided in the original unmodified machine.

Envelope **11** passes between rolls **13** and **13***a* in such position that seal flap **11***e* passes through last. Such envelope then passes over deflector plate **14** which directs the envelope to spaced upper rolls **15** and **15***a*, and lower roll **16** (see FIGS. 4 and 5), the envelope being gripped between such rolls. Rolls **15** and **15***a* are of a resilient material such as rubber, while I prefer to use a knurled steel roll for roll **16**. This combination of resilient rolls **15** and **15***a*, and metal roll **16** provides means for firmly gripping and transmitting envelopes without marking them. Deflector plate **14** is removably held in place upon supports **17** and **18** by means of screws **19**.

After passing between rolls **15**, **15***a* and **16**, the envelope **11** moves bottom edge **11***d* foremost into chute **20**, chute **20** being a channel formed between backplate **20***a* and overlying rigid strips **20***b*, such strips **20***b* being spaced from backplate **20***a* by spacers **21** which provides terminal walls **21***a* in chute **20**. Backplate **20***a*, rigid strips **20***b*, and spacers **21** are all held in assembly by means of bolts **20***c* and nuts **20***d*. Backplate **20***a* is supported upon blocks **20***e* and **20***f* which in turn are secured to supplemental frame members **62** and **63**. The distance from terminal walls **21***a* to roll **16** must be slightly less than the dimension from the bottom **11***d* of envelope **11** to score line **11***f* therein at the base of seal flap **11***e*. Therefore

such distance is adjustable, adjustability being achieved by providing keyways **21***b* within which bolts **20***c* and nuts **20***d*, upon being loosened may be slid up or down, then tightened, spacers **21** moving with such nuts and bolts when they are loosened and moved. Bottom **11***d* of the envelope **11** is fed by spaced rolls **15** and **15***a*, and **16** into chute **20** and ultimately comes into contact with terminal wall **21***a*. When this happens the envelope **11** can not be forced further into the chute **20**. As rolls **15**, **15***a* and **16** then continue to turn, the envelope will bend, and such bending will occur at score line **11***f* in the direction of the point of contact between roll **16** and roll **22**. (See FIG. **5**).

When envelope **11** has deformed far enough, it will be pinched between roll **16** and collars **22***a* and **22***b* on roll **22** at scoreline **11***f* and rotation of rolls **16** and **22** will serve to fold seal flap **11***e* down over the body of the envelope. As rolls **16** and **22** continue to rotate in the direction of the arrows seen in FIG. **5** so that envelope **11** is fed between them, the envelope **11** then will strike deflecting fingers **23** which guide the folded envelope into spiral wheels **26***a*, **26***b* and **26***c*. (See FIGS. **3**—**5**).

Roll **22** is chiefly of aluminum and has a pair of spaced rubber collars **22***a* and **22***b* thereon. During the seal flap creasing operation envelopes are gripped between rolls **16** and **22**, except during the last portion of their passage, at which time such grip is released. Such release occurs because roll **22** has a flat surface **22***c* thereon, collars **22***a* and **22***b* being flat at the appropriate location to conform to flat surface **22***c*. Reference was earlier made to the expedient employed in the conventional wide range envelope forming machine of separating the creasing rolls before each envelope completed its pass between such rolls in order to avoid damage to the envelopes due to compression of entrapped air therein. Flat surface **22***c* also provides such relief against compression of entrapped air in envelopes. When flat surface **22***c* is rotated to position opposite roll **16**, the grip on an envelope between such two envelopes is released, and rotation of rolls is timed so that this occurs before air is compressed within an envelope to an extent that damage to the envelope is threatened.

Spaced spiral wheels **26***a*, **26***b* and **26***c* are mounted for rotation of shaft **27** and (referring to FIG. **5**) rotate in a clockwise direction. Shaft **27** is supported by links **28** and **29** which are secured respectively to rods **30** and **31** bolted to the main frame of the machine. Envelopes are thrust into succeeding arcuate slots **32** in such spiral wheels, there being corresponding slots in all three wheels which are in registry so that an envelope is simultaneously received in slots in all three wheels, and are rotatably conveyed by such spiral wheels towards table **33**.

Extending from table **33** toward the machine, and positioned so that each is disposed between two spiral wheels is a pair of upwardly inclined stationary fingers **38** and **39**. As an envelope is carried downwardly while resting in registered slots **32** of spiral wheels **26***a*, **26***b* and **26***c*, its path of travel will be intersected by said fingers **38** and **39**. Such envelope will be lifted out of the slots **32** and slide down fingers **38** and **39** until they reach belts **42** and **43** which move along the top of table **33** in a direction away from the machine. The envelopes are delivered in a vertical position (see FIG. **5**) and are so maintained by means of support **44** which sits atop and moves with belts **42** and **43**. Accumulated envelopes are removed from the table **33** by an attendant and packed.

It is also possible to operate the modified envelope machine so that envelopes are delivered to the delivery table **33** with seal flaps **11***e* extended. How this is carried out may be seen in FIG. **6**. Elements seen in FIG. **6**, to the extent that they are the same as those seen in FIG. **5** are identified by the same index numbers as those used in FIG. **5**. Apart from the omission of chute **20** and associated creasing elements, the major difference between the apparatus of FIG. **6** and that of FIG. **5** is that deflector plate **14** (FIG. **5**) is replaced by extended flap deflector plate **47** (FIG. **6**) mounted as was deflector plate **14** on supports **17** and **18** by means of bolts **19**.

With extended flap deflector plate **47** in place, envelopes fed by conveyer belt **12** to rolls **13**, **13***a* upon emerging from such rolls pass beneath deflector plate **47** and are deflected downwardly directly to the arcuate slots **32** in spiral wheels **26***a*, **26***b* and **26***c*. The spiral wheels carry envelopes downwardly to table **33**, envelopes being picked out of arcuate slots **32** by fingers **38** and **39**, such envelopes moving then to the top of table **33**, being carried away from the machine along such table top by belts **42** and **43**. It will be understood that while the chute **20** and associated rolls **15**, **16** and **22** are omitted in FIG. **6**, this is for the reason that they do not operate when envelopes are delivered with seal flaps extended, though they may be left in place for convenience when the machine is operated in this mode.

DRIVE

In the ensuing description of elements of the drive train, the elements referred to are shown in FIG. **5**. It will be understood that such elements are omitted in part or entirely from other FIGS. because they are not necessary to understand such other FIGS. and their omission simplifies and clarifies such other FIGS.

The entire wide range envelope forming machine **10** is driven by an electric motor which is not shown. There is a takeoff shaft from the motor and such shaft in turn furnishes the drive for all parts of the machine. As was indicated earlier, rolls **13** and **13***a* shown in FIG. **5** are present in the machine **10** as unmodified. Gear **50** is also present in the original unmodified machine and it is this gear which drives roll **13***a*. Gear **50** also furnishes the drive, through a series of intermediate gears (see FIG. **5**) to rolls **22** and **16**. Thus, because gear **50** meshes with gear **51**, rotation of gear **50** causes gear **51** to rotate. Gear **51** then drives gear **52**, and gear **52** drives gear **53**. Gear **54** is mounted upon the same shaft, shaft **55**, as that upon which roll **22** is mounted. Gear **53** drives gear **54**, and thereby rotation of roll **22** is caused.

Gear **60** is mounted on shaft **61**, the same shaft as that upon which roll **16** is mounted and gear **60** meshes with gear **54**. Rotation of gear **54** then causes rotation of gear **60** to drive roll **16**.

While roll **13***a* and gear **50** are supported by the frame of the original unmodified envelope forming machine, the remaining gears referred to, gears **51**, **52**, **53**, **54** and **60** are supported upon supplemental frame member **62**. Rolls **16** and **22** upon shafts **61** and **55** respectively are supported between such supplemental frame member **62** and a second supplemental frame member **63**, both such supplemental frame members being in turn supported upon the sidewalls **10***a* of the original machine in conventional manner by being bolted thereto. Because mounting of the supplemental frame members to sidewalls **10***a* is conventional and would be obvious to those skilled in the art, it has not been deemed necessary that such mounting be illustrated in the drawings.

A chain drive is employed for shaft **27** upon which spiral wheels **26***a*, **26***b* and **26***c* are mounted for rotation, and the means for motivating such chain drive will now be described. Sprocket wheel **67** on shaft **68** drives a larger sprocket wheel **69** on shaft **70** by means of link chain **71**. A second sprocket wheel **72** is also mounted on shaft **70** for rotation therewith and by means of link chain **73** drives sprocket wheel **74** mounted upon shaft **27** to cause rotation thereof.

Because there is a single motor from which all drives within the envelope forming machine **10** are derived, the relative timing of movement of various components within the machine may be readily determined. For example, each time that an envelope is expelled from between rolls **16** and **22**, an arcuate slot **32** in the spiral wheels **26***a*, **26***b* and **26***c* should be in position to receive it. Coordinating the motion of the spiral wheels and the rate of delivery of envelopes from between rolls **16** and **22** is a matter which may readily be provided by adjusting the various drives so that shaft **27** upon which said spiral wheels are mounted rotates sufficiently to present a succeed-

ing arcuate slot 32 for each full rotation of shaft 68, and also each full rotation of shaft 61 which carries roll 16. Timing and coordination of operative elements are matters which will be apparent to those skilled in the art.

While I have described a specific embodiment of my invention it is apparent that changes and modifications may be made therein, and though so changed or modified a structure may still fall within the ambit of my invention.

I claim:

1. In a machine for forming envelopes, each having a body and a seal flap extending therefrom, from a flat blank, said machine including a delivery table to which completed envelopes having free seal flaps may be delivered:

spiral wheel means for delivering finished envelopes to said delivery table;

conveyor and roll means for conducting formed envelopes toward said spiral wheel means; and

support means capable of supporting either first deflector means to conduct said envelopes to means for folding said free seal flaps prior to delivery to said spiral wheel means, or second deflector means to conduct said envelopes to said spiral wheel means with seal flaps extended.

2. In a machine for forming envelopes, each having a body and a seal flap extending therefrom, from a flat blank, said machine including a delivery table to which completed envelopes having free seal flaps may be delivered, the combination of:

spiral wheel means for delivering finished envelopes to said delivery table;

an envelope receiving chute;

first roll means for driving envelopes into said chute;

second roll means for simultaneously withdrawing envelopes from said chute, folding said seal flaps, and driving said envelopes toward said spiral wheel means;

feed means for conducting envelopes to said first roll means;

deflector means removably mounted on support means in said machine for guiding envelopes in said machine while envelopes are being manufactured and delivered therein; and

support means in said machine for said deflector means.

3. The machine claimed in claim 2 wherein said deflector means is removable from said support means and may be replaced by second deflector means capable of guiding envelopes directly from said feed means to said spiral wheel means for delivery to said delivery table with seal flaps extended.

4. The combination claimed in claim 2 wherein said feed means comprises conveyor means and a pair of rolls for conducting envelopes to said first roll means along a horizontal path, said first roll means is situated above said horizontal path, said delivery table is substantially horizontally disposed and wherein envelopes leaving said second roll means do so in substantially vertical disposition, said deflector means comprising:

a deflector plate portion disposed adjacent said pair of rolls below said horizontal path, said deflector plate portion inclining upwardly away from said pair of rolls, whereby an envelope being formed will be guided from said pair of rolls to said first roll means; and

a deflector finger portion disposed below said second roll means, said deflector finger portion being directed in substantially the same direction as a portion of an arcuate slot in said spiral wheel means whereby envelopes upon emerging from said second roll means will be guided into an arcuate slot of said spiral wheel means.

5. The combination claimed in claim 4 including: stationary fingers extending upwardly from said delivery table to intersect the path of travel of an envelope carried within a slot in said spiral wheel means whereby such envelope will be lifted out of said spiral wheel and conducted to said delivery table.