July 16, 1968 W. L. REINEMAN 3,392,638

ENVELOPE FOLDING MACHINE

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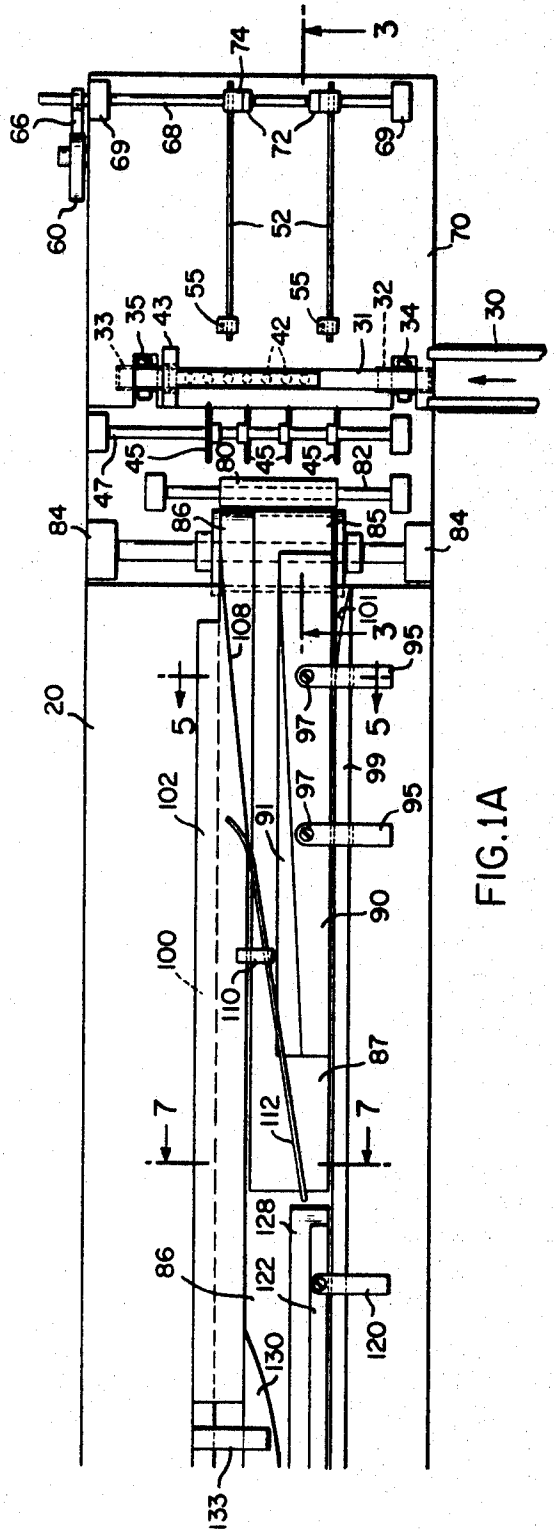


FIG. 1A

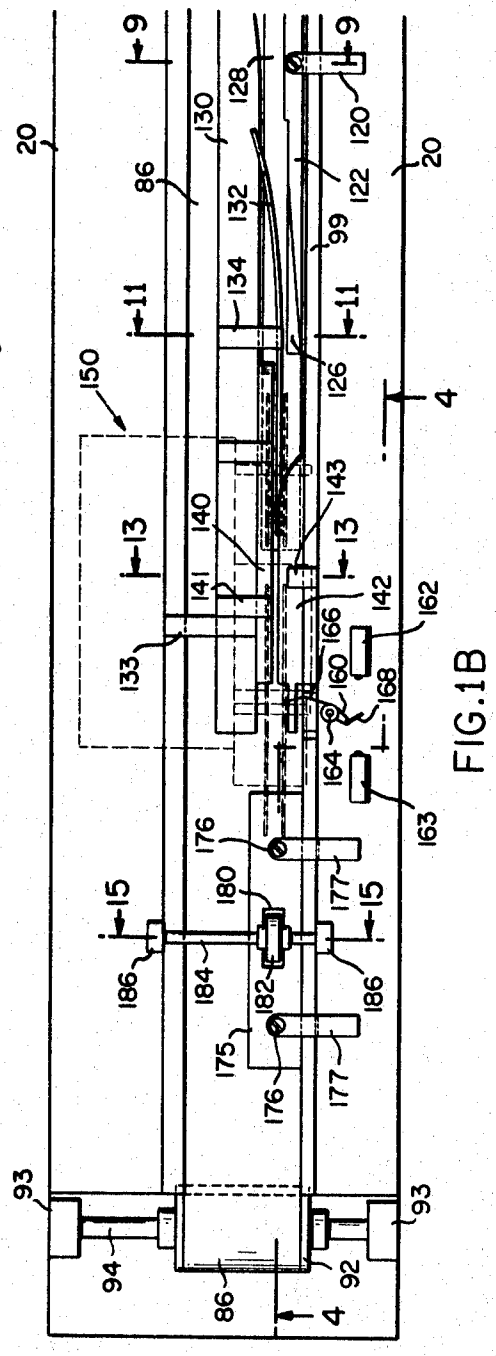


FIG. 1B

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ENVELOPE FOLDING MACHINE

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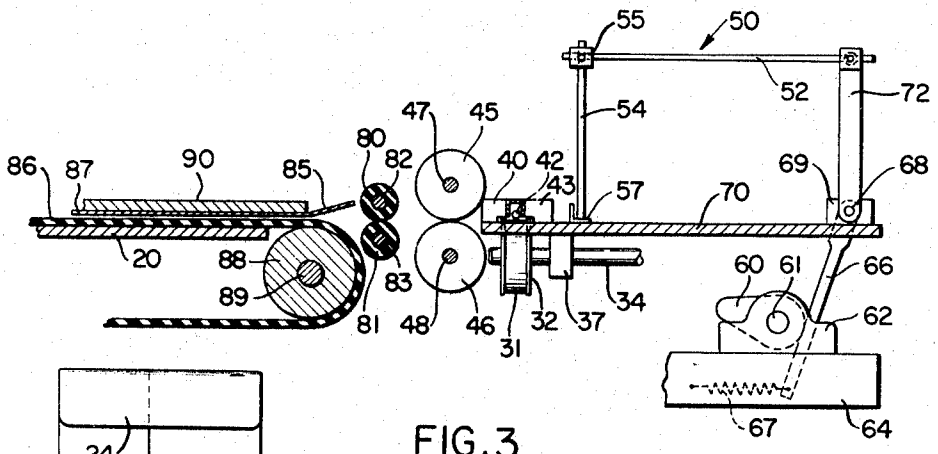


FIG. 3

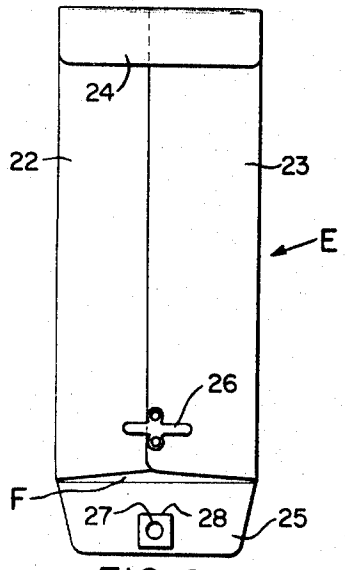


FIG. 2

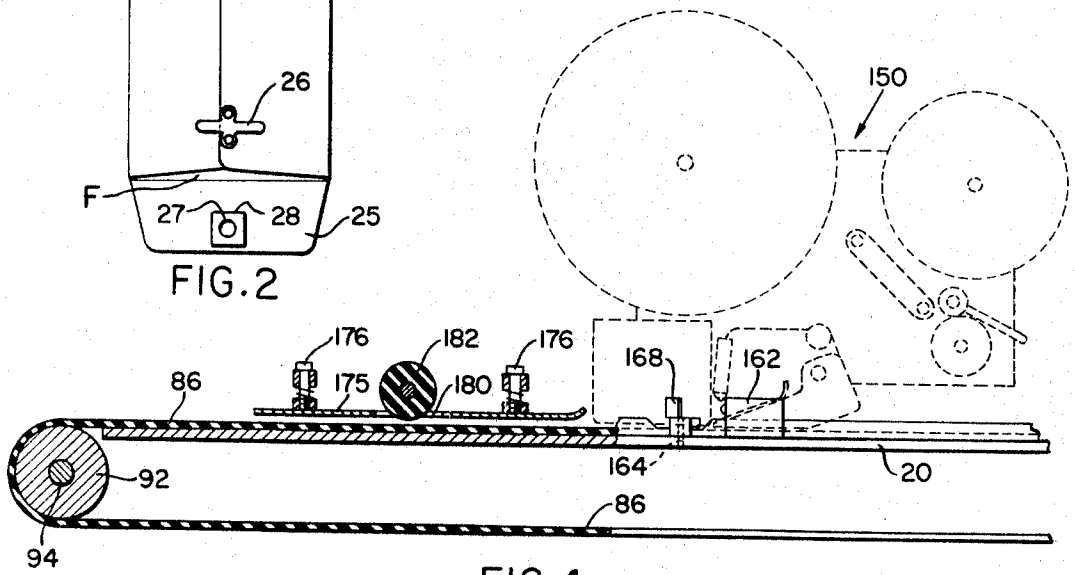


FIG. 4

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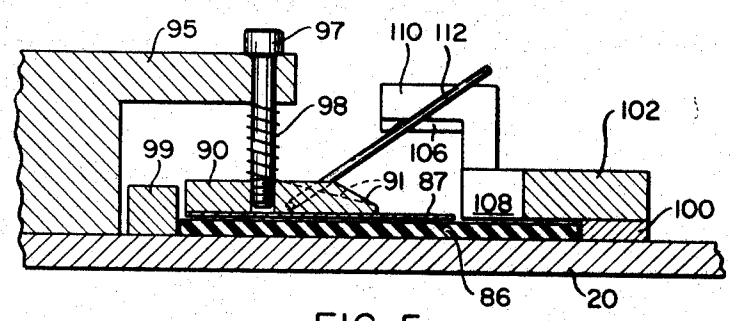


FIG. 5

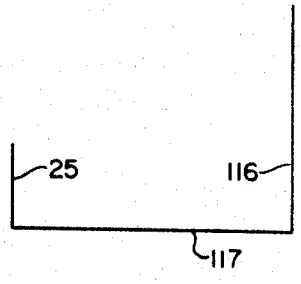


FIG. 6

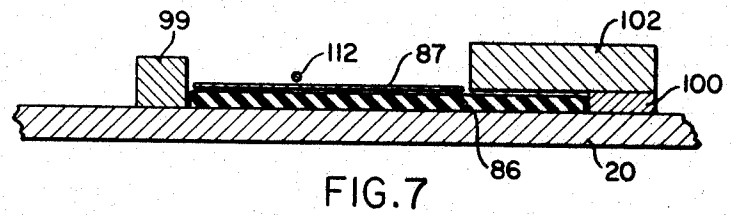


FIG. 7

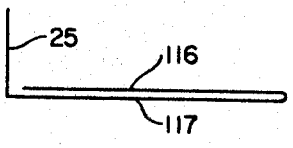


FIG. 8

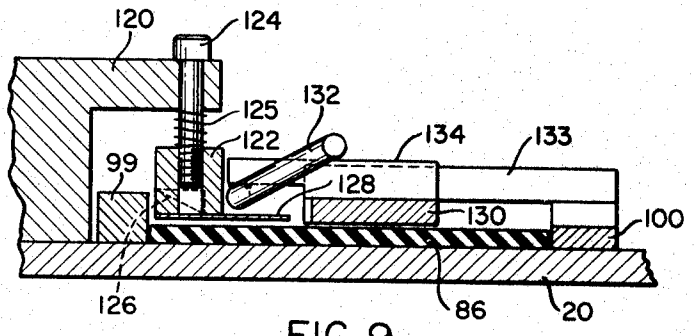


FIG. 9

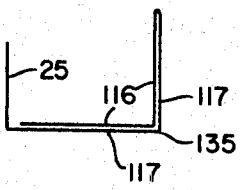


FIG. 10

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ENVELOPE FOLDING MACHINE

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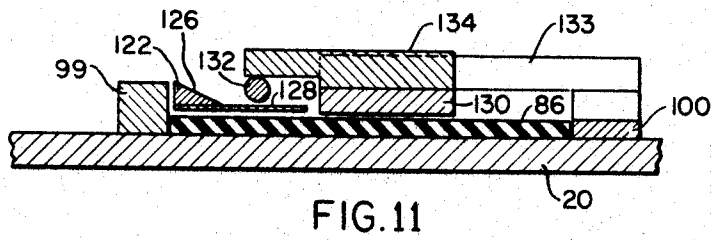


FIG.11

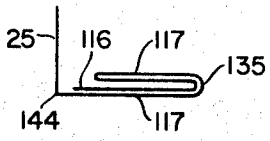


FIG.12

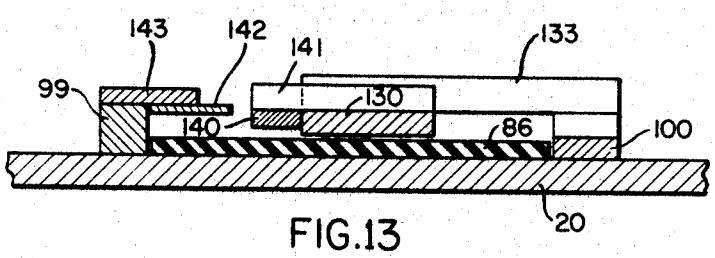


FIG.13

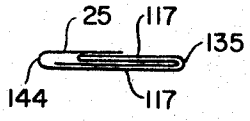


FIG.14

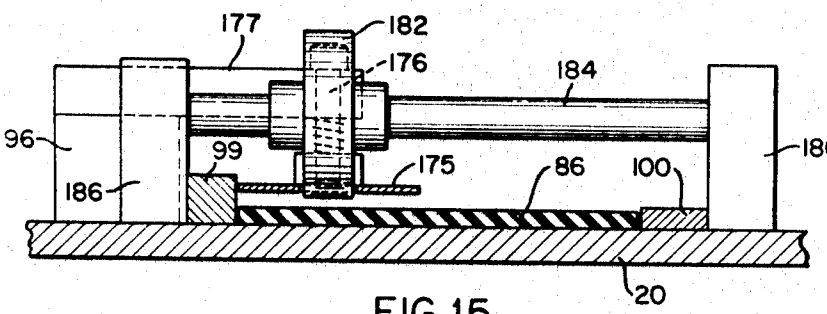


FIG.15

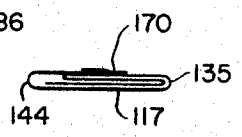


FIG.16

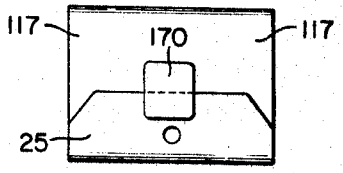


FIG.17

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United States Patent Office 3,392,638 Patented July 16, 1968

3,392,638

ENVELOPE FOLDING MACHINE

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Filed June 20, 1966, Ser. No. 558,865
3 Claims. (Cl. 93—84)

ABSTRACT OF THE DISCLOSURE

Apparatus for folding envelopes; and, more particularly, to machines for folding envelopes used in mailing exposed photographic film to processors for development and printing.

When a person purchases a roll of film, he may be required to pay not only for the roll but also for developing and printing the exposed film. In other instances, he may merely pay the price for the roll of film itself, and, if he wishes, may at the same time pay the charge for developing and printing the film. In either case, he receives a bag or envelope in which to mail the roll of film, after it has been exposed, to the processor for development and printing. Up until relatively recently the carrier was a cloth sack with a tag on it bearing the name and address of the processor, and the return address of the photographer. Because cloth sacks are expensive, efforts have been made to develop satisfactory paper envelopes in which to mail the exposed film.

One problem with envelopes is to be able to fold them within small enough a compass to go into the box or carton in which the roll of film itself is packed for sale. In order for the paper envelopes to be practical, it must be possible to fold them into the desired compass at high speed, and to provide means for holding the envelopes folded until they are ready for use.

The primary object of the present invention is to provide a machine for high speed folding envelopes of the character described into the desired compass.

Another object of the invention is to provide a machine for folding the described envelopes and for automatically applying a sticker to the folded envelope to hold it in folded position.

Other objects of the invention will be apparent hereinafter from the specification and from the recital of the appended claims, particularly when read in conjunction with the accompanying drawings.

In the drawings:

FIGS. 1A and 1B together are a plan view of an envelope folding machine built according to one embodiment of this invention;

FIG. 2 is a rear view of an envelope, such as may be folded in a machine built according to the present invention;

FIG. 3 is a fragmentary longitudinal sectional view taken on the line 3—3 of FIG. 1A looking in the direction of the arrows;

FIG. 4 is a part side elevation, part longitudinal sectional view taken on the line 4—4 of FIG. 1B;

FIG. 5 is a fragmentary transverse section on the line 5—5 of FIG. 1A looking in the direction of the arrows;

FIG. 6 is a diagrammatic view showing the first folds made in the envelope by the means illustrated in FIG. 5;

FIG. 7 is a section on the line 7—7 of FIG. 1A, looking in the direction of the arrows;

FIG. 8 is a diagrammatic view illustrating the fold made in an envelope by the portion of the machine illustrated in FIG. 7;

FIG. 9 is a section on the line 9—9 of FIG. 1B looking in the direction of the arrows;

FIG. 10 is a diagrammatic view showing the fold made by the portion of the apparatus illustrated in FIG. 9;

FIG. 11 is a section on the line 11—11 of FIG. 1B looking in the direction of the arrows;

FIG. 12 is a diagrammatic view illustrating the fold in the envelope made by the portions of the machine illustrated in FIG. 11;

FIG. 13 is a section on the line 13—13 of FIG. 1B looking in the direction of the arrows;

FIG. 14 is a diagrammatic view showing the last fold made in the envelope by the portion of the apparatus illustrated in FIG. 13;

FIG. 15 is a section on the line 15—15 of FIG. 1B looking in the direction of the arrows; and

FIG. 16 is a diagrammatic view showing the label applied to the folded envelope to hold the folds in place.

The envelope to be folded is fed into the machine illustrated bottom end first, and then is fed transversely between scoring rollers which indent the envelope at spaced points along its length along the lines on which it is subsequently to be folded. From the scoring rollers the envelope is delivered onto an endless belt so that it extends transversely of the direction of travel of the belt. The belt carries the envelope under folding bars which first effect folds in the envelope adjacent its top and approximately half-way the remainder of its length, which then successively fold the latter part of the envelope over on itself, and the top portion of the envelope down onto the uppermost fold of the rest of the envelope. As the belt carries the now completely folded envelope along, the envelope trips a lever causing a flag to be swung clear of a photoelectric cell, so that a beam of light can energize the cell to trip conventional apparatus that delivers and affixes a label to the envelope, adhering it to the top flap of the envelope and to the topmost fold of the rest of the envelope, thereby to hold the folded envelope securely in folded position. The folded envelope is then discharged from the machine.

Referring now to the drawings by numerals of reference, 20 denotes a bed or plate, which may be supported in any suitable manner, as by legs (not shown) above the floor of the factory in which the machine is being used.

An envelope, such as is to be folded, is denoted at E in FIG. 2. It may be made from a single sheet of paper, folded upon itself to provide a front F, two rear flaps 22 and 23, a bottom flap 24 which is folded over the bottoms of the rear flaps, and glued thereto, and a top flap 25 which is adapted to be fastened over the rear flap by a conventional winged fastener 26 that is riveted to the rear flaps, and that is adapted to be passed through the hole 27 in a pasteboard grommet 28 and in the top flap 25 to secure the top flap in position. The grommet is glued to the back of the top flap 25.

The envelopes to be folded are fed to the machine flat with the bottom end forward, the sides being guided between parallel rails 30 (FIG. 1A). A conventional feeding mechanism pushes the envelopes successively off the rails onto an endless belt 31, which travels over pulleys 32 and 33 that are secured to shafts 34 and 35, respectively, one of which is driven by a motor (not shown) or from any other suitable source of power.

The envelopes are held down on the belt by a ball slide, whose balls 42 contact the envelopes. This ball slide is mounted above a table 70, above the belt 31. A stop 43 on the table extending over the belt serves to limit the inward movement of the envelopes so that each will be properly aligned for processing.

The envelopes are pushed from under slide 40 in between pairs of scoring rollers. The upper rollers of each pair are denoted at 45, and the lower rollers at 46 (FIGS. 1A and 3). The upper rollers are mounted on a shaft 47 and the lower rollers on a shaft 48.

The scoring rollers of each pair are set so close to one another that the envelopes just pass between them; and the different pairs of scoring rollers are spaced axially in accordance with the distance apart of the transverse folds to be made in the envelopes. The scoring rollers serve to condition the envelopes for subsequent easy folding along the several scoring lines.

For pushing the envelopes off the belt **31** in between the scoring rollers, any conventional or suitable pushing mechanism may be employed. That shown comprises a frame **50** (FIG. 3), comprising a pair of parallel upper rods **52** from the forward ends of which depend two parallel rods **54** that are secured to the forward ends of the rods by block and setscrew combinations **55**. Angle iron shoes **57** are secured to the lower ends of the rods **54**. The upright web portions of these shoes engage the sides of the envelopes to push the envelopes off the belt **31** in between the scoring rollers **45**, **46** when the pusher **50** is moved forward.

Reciprocation of the pusher **50** is effected by a rotary cam **60** (FIGS. 1A and 3), which is secured to a shaft **61** that is journaled in pillow blocks **62** which are secured to a plate **64** that is carried in the frame of the machine. Cam **60** engages a lever **66**, which is held against the periphery of the cam by a coil spring **67** that is connected at one end to the lower end of the lever **66** and at its opposite end to the block **64**. Lever **66** is connected at its upper end to a horizontal shaft **68**, which is journaled in pillow blocks **69** on table **70**. Secured to the shaft **68** are two parallel arms **72** which are connected by setscrew and block combinations **74** to the rear ends of rods **52**.

Shaft **61** is driven by a motor (not shown) or by any other suitable or convenient means. As the cam **60** revolves, it rocks the lever **66** back and forth, which imparts rocking movement to shaft **68**, and through the arms **72** to the frame **50** to effect reciprocation of the shoes **57**.

From the scoring rollers **45**, **46** the envelopes pass between rotary feed rollers **80**, **81** (FIG. 3), which are secured to parallel shafts **82**, **83**, respectively. One of the feed rollers may be driven by a motor or any other suitable means.

From feed rollers **80**, **81**, the envelopes are fed onto an endless belt **86** which runs over pulleys **88** and **92** (FIGS. 1A, 1B, 3 and 4) that are secured to shafts **89** and **94**, respectively. These shafts are journaled in pillow blocks **84** (FIG. 1A) and **93** (FIG. 1B), respectively; and shaft **94** may be driven by a motor or by any other suitable means.

From the feed rollers **80**, **81** (FIG. 3), each envelope passes under the flexible lip **85** of a plate **87** and is engaged by the inwardly curved front portion **101** of a bar **99**, that extends along the full length of the machine at one side of belt **86**. Plate **87** is brazed or welded or otherwise secured to the bottom face of a bar **90** (FIGS. 1A and 5), which is slightly spaced from bar **99** and is mounted parallel thereto. Bar **90** is beveled off at the juncture of its top and inside edges, as shown in FIGS. 1A and 5, in such way that the width of the bevel surface **91** increases from front to rear. Plate **87** and bar **90** are resiliently suspended from the overhanging arms of brackets **95** that are fastened to plate **20** to overhang bar **99**. Bolts **97** carried by the bracket arms **95** thread into bar **90** to support the bar; and coil springs **98** are interposed between the bracket arms and bar **90**.

Bar **99** acts as a guide along one side of belt **86**. At the other side of the belt **86** there is another guide bar **100** secured to plate **20**. On this bar **100** there is mounted and secured a bar **102** (FIGS. 1A and 5). The side face **103** of the bar **102** is inclined from front to back, converging toward the opposed face **91** of the rail **90** rearwardly. Secured by a bracket **110** to the bar **102** is a wire rod **112**, which is curved across the top of bar **102**, and extends over the rear end of bar **90** and over the rear of plate **87**, as shown in FIGS. 1A and 5.

The curved face **101** of bar **99** engages the envelope

adjacent the tab end **25** thereof as the envelope enters onto belt **86** and gradually bends this end of the envelope upwardly to the position shown at **25** in FIG. 6. At the same time, the bar **90** through its inclined face **91** in cooperation with wire **112** effects an upward fold of the envelope approximately half-way of its length as denoted at **116** in FIG. 6. The rear end of wire **112** then bends the part **116** of the envelope down over the part **117**, as shown in FIG. 8.

Suspended by a bracket arm **120** above bar **99** (FIG. 9) is a bar **122** which is supported from bracket arm **120** by a bolt **124** that threads into the bar **122**. A coil spring **125**, that is interposed between the bracket **120** and the bar **122**, serves to press the bar **122** constantly downwardly. The bar **122** has a rearwardly-extending portion of reduced cross-section at its rear which has an inclined upper surface **126**, as shown in FIGS. 1B, 9 and 11. Fastened to the underface of the bar **122**, as by brazing or welding, is a plate **128**.

Suspended from plate **100** by two arms **133** (FIGS. 1A, 1B and 9) to project laterally over the belt **86** is a plate **130**, which is curved at its forward end, as shown in FIGS. 1A. This plate carries a bracket arm **134** which has mounted thereon a curved rod **132** (FIGS. 1B and 9) that extends downwardly over the plate **128**. Plate **130**, rod **132** and surface **126** together effect fold of the portions **116** and **117** of the envelope approximately midway of their lengths at score line **135**, as shown in FIG. 10.

The envelope is carried by belt **86** under rod **132** so that the further portions of the bars **122** and **134** then effect downward folding of the portions **116** and **117** of the envelope along the score line **135** as shown in FIG. 12.

Supported by the arm **141** from bar **130** (FIGS. 1B and 13) is a strap **140** which cooperates with a plate **142** to effect downward fold of the top portion **25** of the envelope, over the previous folds, along the score line **144**, as shown in FIG. 14. Plate **142** is carried by an arm **143** (FIG. 13) from bar **99**.

Mounted above the track and the conveyor belt is conventional apparatus, designated as a whole at **150** (FIG. 1B), for dispensing labels. This apparatus forms no part of the present invention. It is adapted to hold a roll of labels and, when actuated, cuts off a label, delivers it on top of the topmost fold of the envelope, and causes it to adhere to the envelope by air pressure.

As the envelopes folded as shown in FIG. 14 travel with belt **86**, they come in contact with a pivoted lever **160** (FIG. 1B), one arm **166** of which extends over the belt **86** to be engaged by the folded envelope. The other arm **168** of the lever is disposed between the light beam projector **162** and the photoelectric eye **163**. The photoelectric eye **163** is electrically connected to the label dispenser **150** in such way that when the arm **168** is rocked out of registry with the light beam, the apparatus **150** is actuated to dispense a label, and to blow a blast of air at the label to affix it to the envelope. The label is shown in FIGS. 16 and 17 at **170** affixed to the envelope. The plates **140** and **142** are cut away as shown in FIG. 13 to permit the label to be dispensed from apparatus **150** onto the folded envelope.

From under the label dispenser, the belt **86** conveys the now-folded and sealed envelope under a pressure plate **175** (FIGS. 4, 15 and 1B), which is suspended by means of bolts **176** from arms **177** that are fastened at their outer ends to the bar **96**.

There is an opening **180** in the plate **175** through which there protrudes a pressure roller **182** which is fastened on a shaft **184** that is journaled at opposite ends in pillow blocks **186** fastened to the plate **20**. The roller **182** and pressure plate **175** serve to affix the label **170** securely to the envelope and press the envelope firmly into its folded form. The now-folded and sealed envelope is then carried by belt **86** over pulley **92** (FIG. 1B) and discharged from the machine into a chute or the like.

While the invention has been described in connection with a specific embodiment thereof, it will be understood that it is capable of further modification, and this application is intended to cover any variations, uses, or adaptations of the invention following, in general, the principles of the invention and including such departures from the present disclosure as come within known or customary practice in the art to which the invention pertains and as may be applied to the essential features hereinbefore set forth, and as fall within the scope of the invention or the limits of the appended claims.

Having thus described my invention, what I claim is:

1. A machine for folding envelopes which has a top portion and a body portion and which are adapted for use for mailing exposed photographic film for processing, comprising

(a) a conveyor for conveying an envelope through the machine from a delivery point to a discharge point,

(b) means disposed to engage the envelope as it is carried through the machine for first folding the body portion of the envelope on itself and then folding the top portion of the envelope over the folded body portion, and

(c) means for affixing a label to the envelope to secure the top portion over the folded body portion, wherein said folding means first bends the top portion of the envelope upwardly from the body portion of the envelope and simultaneously bends the remaining portion of the envelope upwardly at a point approximately half-way of the length of said remaining portion, then folds said upwardly bent part of said remaining portion down onto the rest of the remaining portion, then folds said remaining portion again onto itself, and then folds the top portion over the so-folded body portion.

2. A machine for folding envelopes which have a top portion and a body portion and which are adapted for use for mailing exposed photographic film for processing, comprising

(a) a conveyor for conveying an envelope through the machine from a delivery point to a discharge point,

(b) means disposed to engage the envelope as it is carried through the machine for first folding the body portion of the envelope on itself and then folding the top portion of the envelope over the folded body portion, and

(c) means for affixing a label to the envelope to secure the top portion over the folded body portion, and equipped with means for dispensing labels, wherein a double-armed lever is pivoted intermediate its ends alongside said conveyor with one arm of the lever in position to be engaged by the folded envelope and with the other arm disposed between a light source and a photoelectric eye, so that said other arm will be rocked out of the way when the folded envelope engages said one arm, and said photoelectric eye is connected to said dispensing means to actuate the same.

3. A machine for folding envelopes which have a top portion and a body portion and which are adapted for use for mailing exposed photographic film for processing, comprising

(a) a conveyor for conveying an envelope through the machine from a delivery point to a discharge point,

(b) means disposed to engage the envelope as it is carried through the machine for first folding the body portion of the envelope on itself and then folding the top portion of the envelope over the folded body portion, and

(c) means for affixing a label to the envelope to secure the top portion over the folded body portion, and equipped with means for dispensing labels, and having means disposed to lie in the path of a folded envelope, after the envelope has been folded, and before it reaches said affixing means, and operable by the folded envelope to cause said dispensing means to dispense a label onto the envelope.

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