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Whiteford

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[54] **APPARATUS FOR INVERTING MAILING ENVELOPES**

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[52] **U.S. Cl.** **198/238,** 198/165, 271/186

[51] **Int. Cl.** **B65g 47/24,** B65g 15/14

[58] **Field of Search** ..... 198/33 AC, 165, 238; 271/34, 35, 185, 186, 198–203, 2; 425/370

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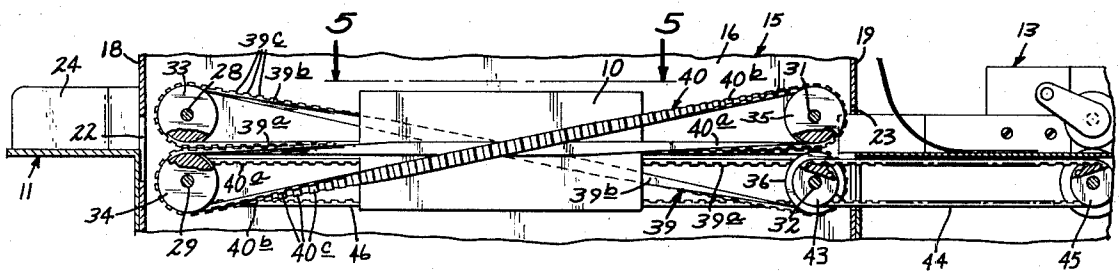
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Primary Examiner—Richard A. Schacher
Assistant Examiner—James W. Miller
Attorney, Agent, or Firm—Merchant, Gould, Smith & Edell

[57] **ABSTRACT**

A housing is disclosed having upper and lower spaced pulleys at each end. A pair of endless belts are provided, with each belt being operatively connected between an upper pulley at one end and the lower pulley at the other end. The belts are each provided with a single twist between the ends thereof. A mailing envelope inserted between the pulleys at one end will be engaged by the belts which are being driven to thereby carry the envelope to the other end. The envelope is inverted as it is carried by the twisted belts.

3 Claims, 9 Drawing Figures



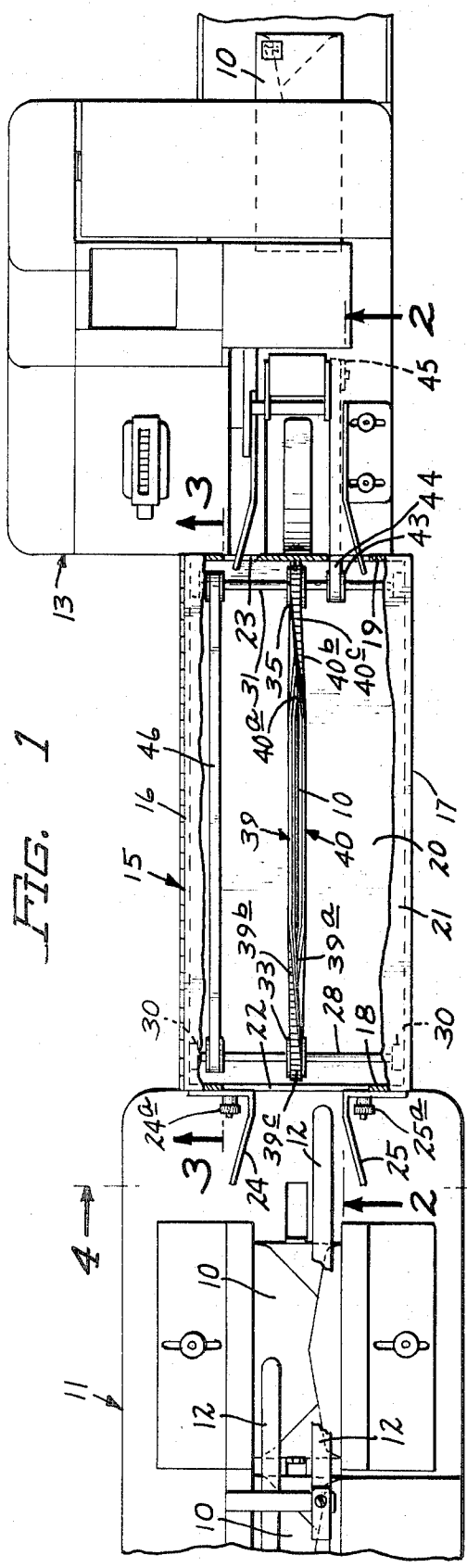


FIG. 1

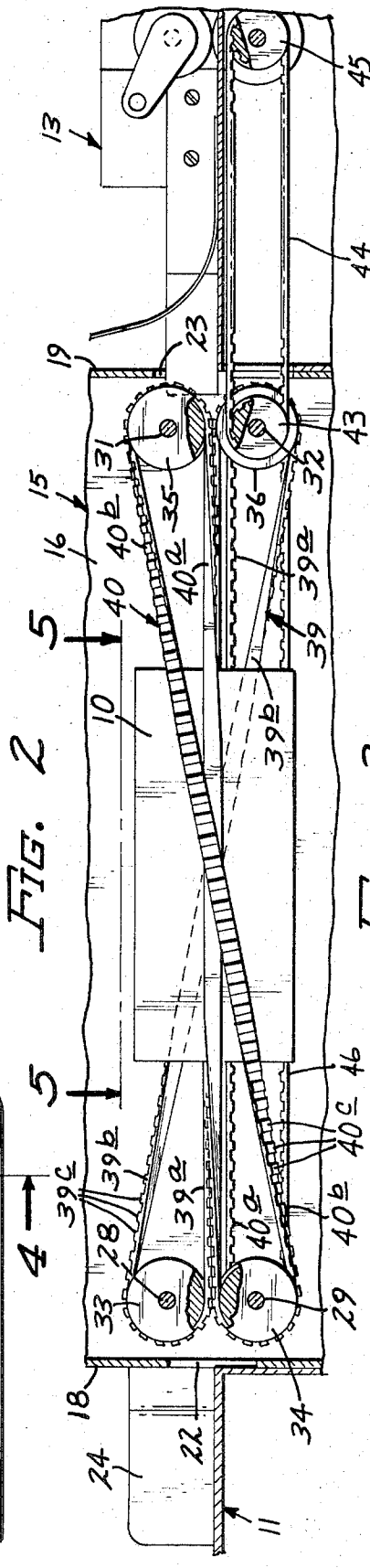


FIG. 2

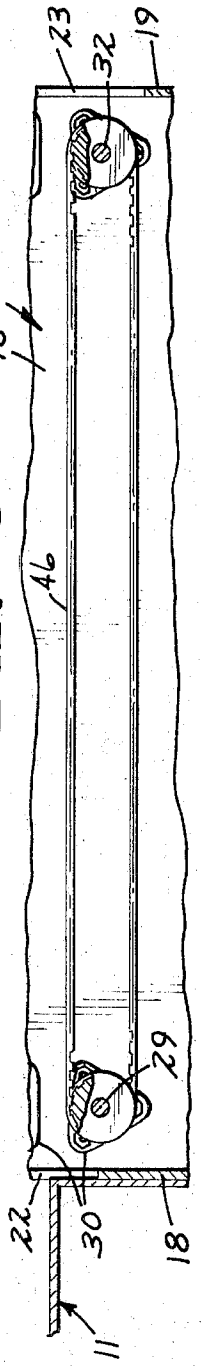


FIG. 3

FIG. 4

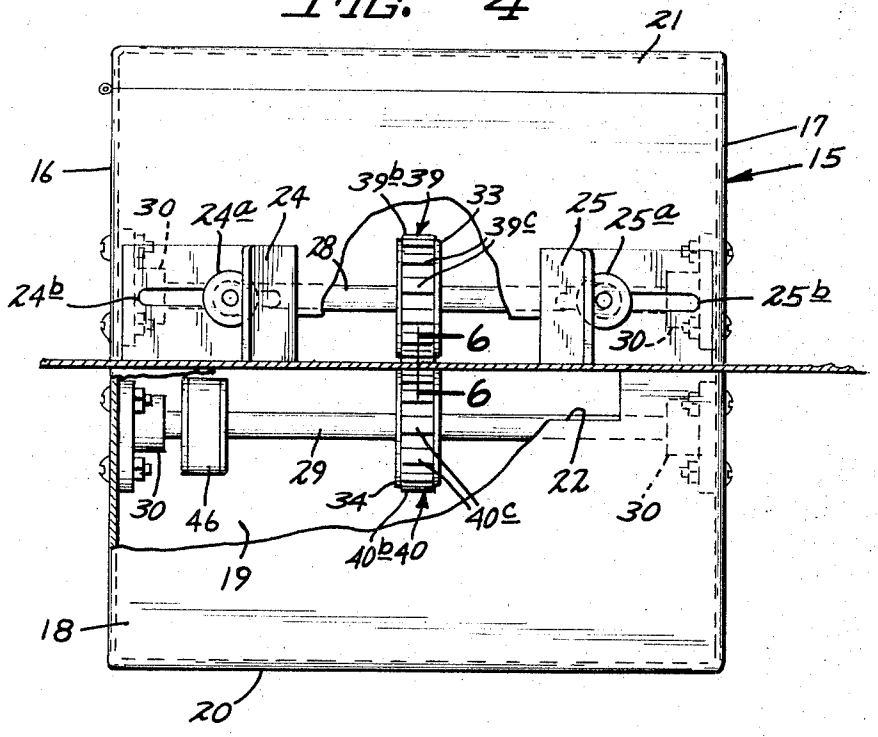


FIG. 5

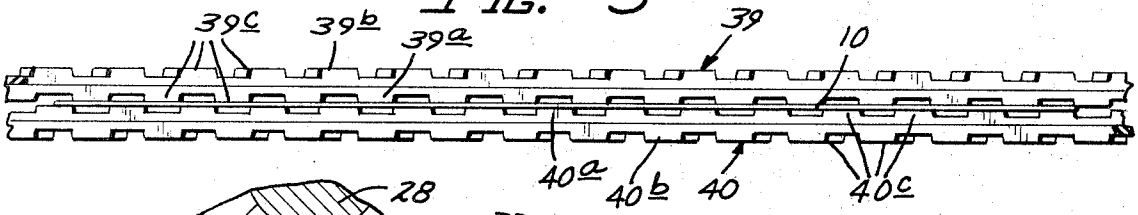
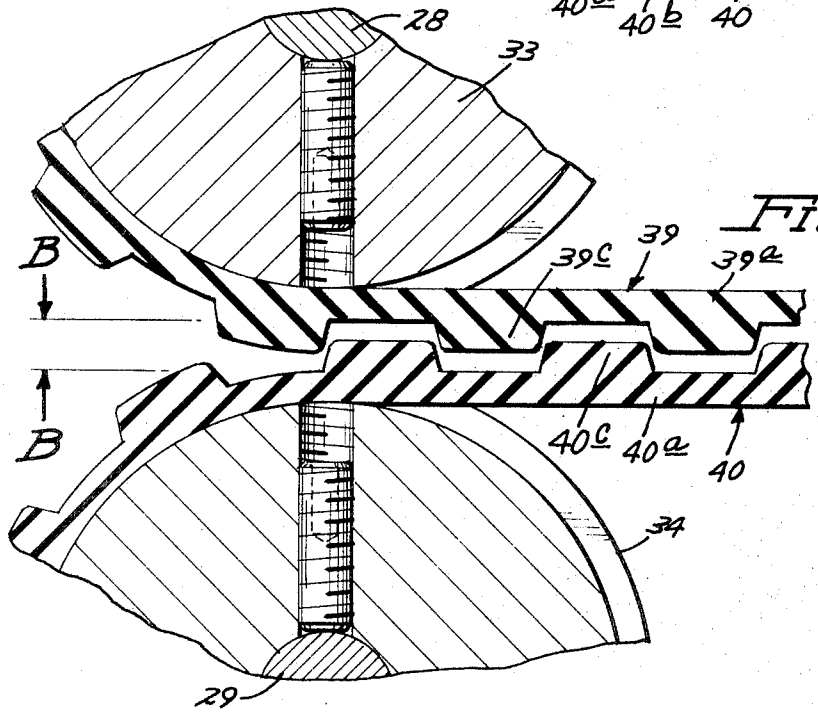


FIG. 6



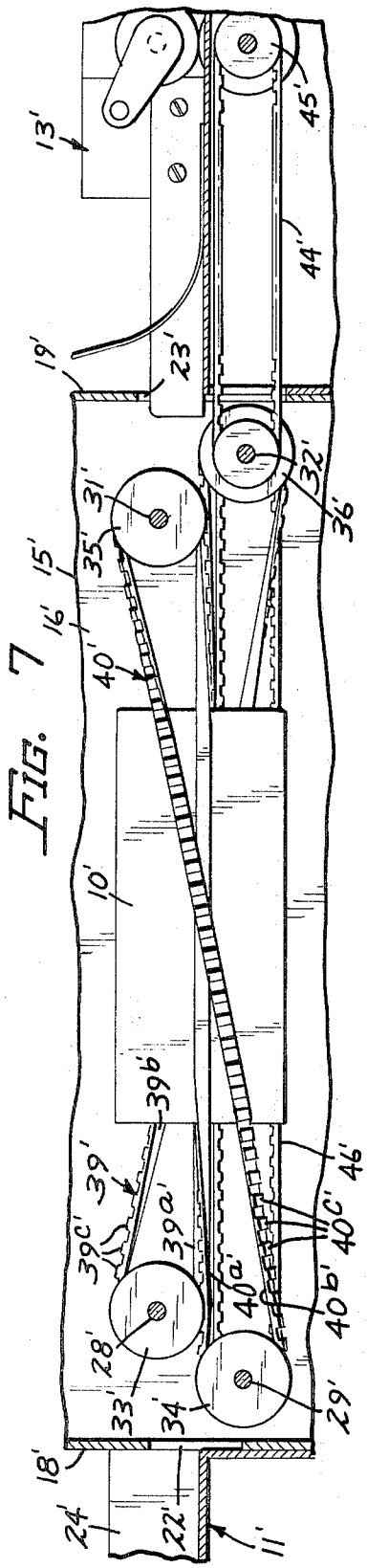


FIG. 7

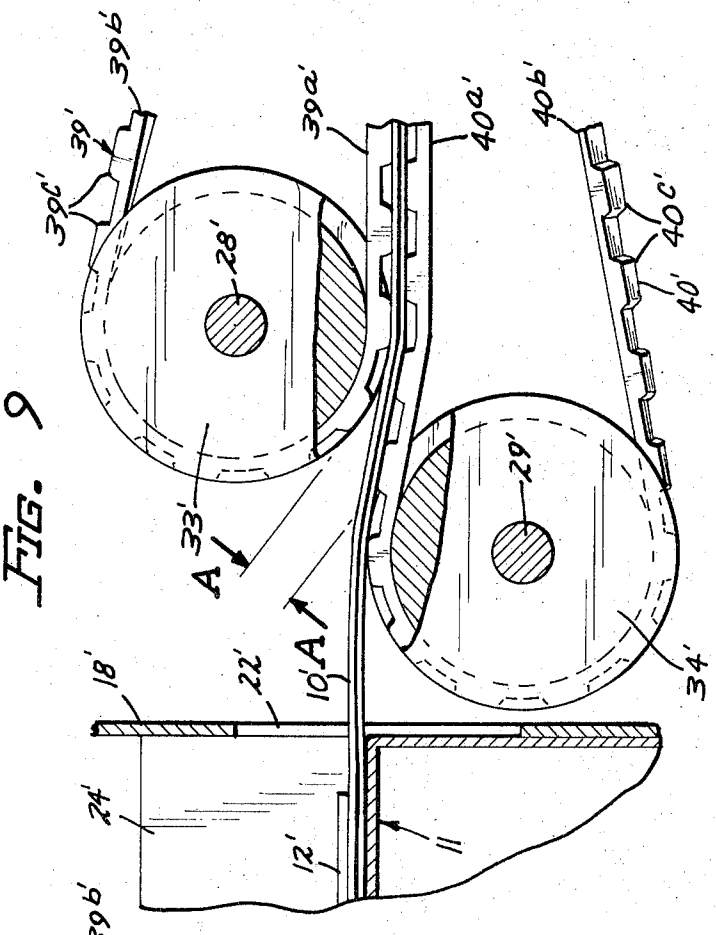


FIG. 9

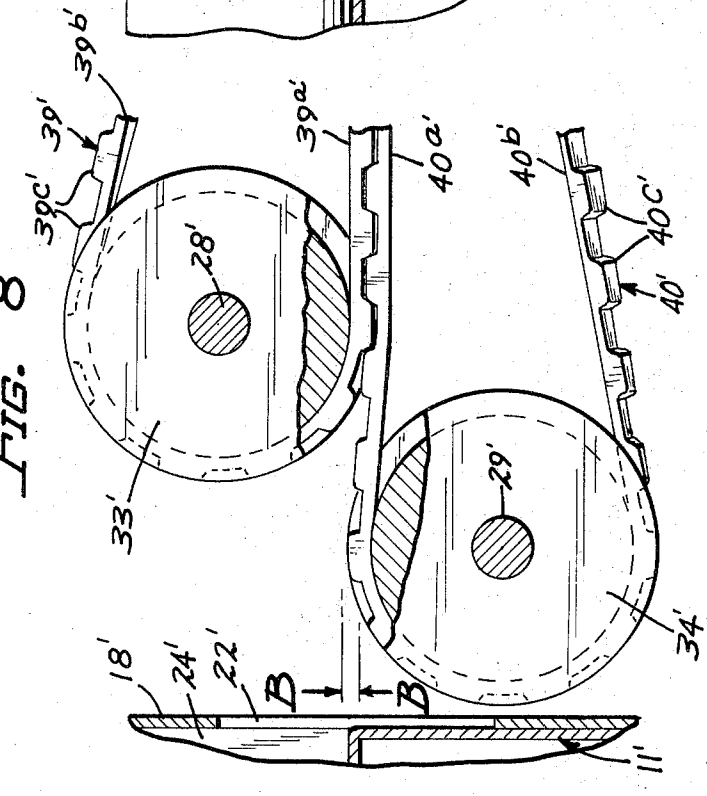


FIG. 8

APPARATUS FOR INVERTING MAILING ENVELOPES

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates generally to the field of automatic mailing machines, and more particularly relates to the construction of a machine designed to invert mailing envelopes being discharged from a sealing machine to place them in the proper position to be accepted by a stamp affixing machine.

2. Description of the Prior Art

In recent years, machines have been developed to automatically stuff, seal and stamp envelopes for mailing. One system in common use employs a machine that automatically seals the envelope and then ejects the envelope in a generally horizontal plane with the sealed flap on top. The next step in the mailing procedure is to affix a stamp to the envelope. Another machine is available which will automatically affix the stamp. However, the envelope must be inverted so that the flap is down before it is inserted into the stamp machine. In the past, the envelopes have either been inverted manually or else somewhat complicated and unreliable mechanisms have been provided to accomplish this turn-over function. Typically, these inverting machines have been complicated all out of proportion to the difficulty of the task they are performing.

SUMMARY OF THE INVENTION

The present invention provides a simple, inexpensive, reliable and practically fool-proof device for inverting mailing envelopes. A pair of endless belts are mounted in a side-by-side relationship between two pairs of spaced pulleys. The pulleys are mounted in a common plane for rotation about parallel axes. Each belt is provided with a single twist by rotating one end thereof 180° with respect to the other end. The inside or center span of each belt is substantially in contact with the inside or center span of the other belt substantially throughout the common length thereof. The upper pulleys are driven in one direction while the lower pulleys are driven in the other direction so that the common center spans of the belts move in the same direction. An envelope inserted between the pulleys at one end will be engaged between the common spans of the two belts and carried thereby to the other end of the belts, and because the belts are twisted, will be inverted during the trip. In the preferred embodiment, the envelope engaging surfaces of the two belts are provided with correspondingly spaced, matching teeth to provide positive engagement between the common spans of the belts. The engagement depth is very shallow so as not to injure envelopes being carried therebetween.

The mailing envelope inverting apparatus of the present invention can be operated at relatively high speed so that an envelope inserted at one end will pass through the unit and be inverted in no more than a fraction of a second. The unit will accept envelopes as fast as they are discharged from the sealing machine and will eject them in a position suitable for acceptance by the samp affixing machine. Because of the simplicity, reliability and speed of operation of the present invention, the step of turning over the envelopes between the sealing and stamping stations is no longer a delay causing step in the mailing procedure.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a plan view of a typical envelope sealing machine and stamp affixing machine with an inverting device according to the present invention mounted therebetween, portions of the housing of the inverting device being broken away;

FIG. **2** is an enlarged fragmentary view in vertical section taken along line **2—2** of FIG. **1**;

FIG. **3** is an enlarged fragmentary view in vertical section taken along line **3—3** of FIG. **1**;

FIG. **4** is an enlarged view in vertical section taken along line **4—4** of FIG. **1**, portions thereof being broken away;

FIG. **5** is an enlarged fragmentary plan view taken along line **5—5** of FIG. **2**;

FIG. **6** is a greatly enlarged fragmentary sectional view taken along line **6—6** of FIG. **4** showing how the toothed belts engage;

FIG. **7** is a view similar to that of FIG. **2**, showing a preferred embodiment of my invention;

FIG. **8** is a greatly enlarged fragmentary side view showing the relationship of the pulleys and belts at the entrance end of the preferred embodiment; and

FIG. **9** is a fragmentary view similar to that of FIG. **8** showing an envelope passing between the belts.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring now to the drawings, wherein like reference numerals will be used throughout the several views to indicate like elements of the invention, there is disclosed in FIG. **1** a series of machines designed to seal, invert and stamp mailing envelopes. The envelope **10** passes through a flap sealing machine **11** and emerges from beneath a hold-down member **12** with the sealed flap facing upwardly. The envelope **10** passes through the sealing machine **11** in an end-to-end manner rather than sideways, so that one end of the envelope emerges from the sealing machine. The envelope emerging from the sealing machine **11** must be inverted before it is fed into the stamp machine **13** which applies an appropriate stamp to the upper right-hand corner of the face of the envelope **10.** The first end of the envelope **10** to emerge from sealing machine **11** should also enter the stamp machine **13** first. However, the envelope must be turned over so that the flap faces downwardly. Machine **13** can be of the type shown in the co-pending U.S. patent application Ser. No. 157,374, filed June 28, 1971, and entitled "Postage Stamp Applicator." Of course, other types of stamp machines could be used as well.

The present invention relates to apparatus for inverting the mailing envelope **10** between its exit from the sealing machine **11** and its entry into the stamp machine **13.** The embodiment of the invention shown in FIGS. **1–6** includes a rectangular, box-like housing **15** having parallel, spaced side walls **16, 17** and parallel, spaced end walls **18, 19.** Housing **15** further includes a closed bottom **20** and a removable top **21.** End wall **18** is provided with an envelope inlet opening **22** near the center thereof, of appropriate size to permit the envelope **10** to enter housing **15** therethrough. A similar envelope outlet opening **23** is formed in end wall **19.** A pair of spaced guide members **24, 25** are mounted on opposite sides of the inlet opening **22,** on the outside of the housing **15,** facing toward the envelope emerging

from sealing machine **11** and adapted to guide the envelope into the opening **22**. The spacing of the guide members **24, 25** can be adjusted by means of a pair of adjustable locking nuts **24***a*, **25***a* which are threaded on studs extending from the end wall through appropriate slots **24***b*, **25***b* in the portions of the guide members which lie against the end wall **18.**

Extending between the side walls **16, 17** adjacent the inlet opening **22** are a pair of parallel shafts **28** and **29.** Shaft **28** is positioned directly above shaft **29.** The two shafts are perpendicular to the side walls **16, 17.** The ends of the shafts **28, 29** are rotatably mounted in individual bearing assemblies **30** which are bolted to the side walls.

A second pair of parallel shafts **31** and **32** extend between the side walls **16, 17** adjacent the envelope outlet opening **23.** The shafts **31, 32** are again perpendicular to the side walls, with shaft **31** positioned directly above shaft **32.** The ends of the shafts **31, 32** are also rotatably mounted in suitable bearing assemblies secured to the side walls. Although the bearing assemblies are shown to be fixedly mounted to the side walls, they could be adjustably mounted so that the shafts **28, 29** and **31, 32** could be moved farther apart to accommodate thicker envelopes.

Each of the four shafts has a pulley fixedly mounted at the center thereof. At the inlet end, a first or upper pulley **33** is mounted on shaft **28,** and a second or lower pulley **34** is mounted on shaft **29.** At the outlet end, a first or upper pulley **35** is mounted on shaft **31** and a second or lower pulley **36** is mounted on shaft **32.** All four pulleys **33, 34, 35, 36** lie in a common plane extending perpendicular to the shafts.

A pair of flexible, endless timing-type belts **39, 40** are mounted on the pulleys. Belt **39** is mounted for operative engagement with first pulley **33** at the inlet end and second pulley **36** and the outlet end. Belt **40** operatively engages first pulley **35** at the outlet end and second pulley **34** at the inlet end. The belts **39, 40** each have a single twist between the ends thereof which is obtained by rotating one end of the belt 180° with respect to its other end. For the purpose of describing this relationship, each belt **39, 40** can be considered to have two spans extending between the pulleys at the ends thereof. Thus, belt **39** has an inner span **39***a* extending from the bottom of pulley **33** to the top of pulley **36,** and an outer span **39***b* extending from the top of pulley **33** to the bottom of pulley **36.** Belt **40** has an inner span **40***a* extending from the top of pulley **34** to the bottom of pulley **35** and an outer span **40***b* extending from the bottom of pulley **34** to the top of pulley **35.** The term "inner" is used with respect to the inner spans **39***a* and **40***a* for two reasons. For one thing, the inner spans **39***a*, **40***a* run horizontally across the housing between the two sets of pulleys **33–34** and **35–36,** and because at the center of the housing where the belts intersect halfway between the two pairs of pulleys, the inner spans **39***a*, **40***a* lie between the outer spans **39***b*, **40***b*.

Preferably, the belts **39, 40** are each provided with matching, engageable teeth **39***c*, **40***c* as best shown in FIG. **6.** The belts **39, 40** have a smooth face which engages the pulleys. The faces of the belts having the teeth thereon thus face outwardly from the pulleys. The pulleys **33, 34** at the inlet end are spaced apart a predetermined distance such that an envelope inserted therebetween through the inlet opening **22** will be engaged by the belts **39, 40.** As viewed in FIG. **2,** the upper pulleys **33** and **35** are driven in a counterclockwise direction while the lower pulleys **34** and **36** are driven in a clockwise direction. The two inner spans **39***a*, **40***a* thus move together in the same direction, from left to right as shown in FIG. **2.** Th inner spans **39***a*, **40***a* engage each other over the entire distance between the inlet pulleys **33–34** and the outlet pulleys **35–36.** Thus, an envelope **10** inserted between them at the inlet end will be carried by the two inner spans **39***a*, **40***a* to the outlet end of the housing **15.** Because of the previously described twist in the belts, the envelope will be inverted or flipped as it travels through the housing. Thus, the envelope **10** will be ejected from between the pulleys **35, 36** through the outlet opening **23** for engagement by apparatus on the stamp machine **13.**

As shown in FIG. **6,** the teeth on the belts preferably engage a very slight amount to help prevent slippage between the belts and to better engage the envelope **10** being carried therebetween. The depth of the engagement of the teeth is very short so as to prevent damage to the envelopes **10.** In actual practice, this results in no damage to the envelopes **10** although a minor impression of the teeth can be seen on the envelopes **10.**

To drive the pulleys **33–36,** a separate drive pulley **43** is mounted on shaft **32** and is connected by means of a drive belt **44** to a drive pulley **45** on stamp machine **13.** If desired, however, a separate drive motor could be provided within the housing **15.** Drive pulley **43** causes rotation of drive shaft **32** and pulley **36** mounted thereon. Pulley **36** drives belt **39** which in turn drives pulley **33** and shaft **28.** By virtue of the mating teeth on the two belts, belt **39** drives belt **40** at the same speed. In order to absolutely prevent slippage between the belts, I have also added a second drive belt **46** which operatively engages drive pulleys mounted on shafts **29** and **32** adjacent side wall **16.** Belt **46** thus transfers drive power directly from driven shaft **32** to shaft **29.** Because shaft **32** engages belt **39** and shaft **29** engages belt **40,** both belts are driven at exactly the same speed so that no slippage between them can occur. Actually, the system will operate without difficulty under most conditions without belt **46** by virture of engagement between the teeth on the two belts. However, belt **46** does insure that no slippage between the belts will occur.

In the embodiments shown, the envelope engaging surfaces of the two belts are provided with matching teeth. However, if other means are provided to drive the two belts, it is only necessary that they move together at a common speed in a close relationship so as to frictionally engage an envelope between them. The frictional engagement must be sufficient to prevent slippage of the envelope with respect to the belt as it travels through the housing. In actual practice, the pulleys operate at a high rate of speed so that the envelope is carried through the housing **15** in a fraction of a second. The envelope **10** enters the housing **15** with the flap facing upwardly as shown in FIG. **1.** As it enters the housing, it passes between the toothed belts on pulleys **33** and **34** and is engaged by the teeth on the inner spans **39***a*, **40***a*. The inner spans carry the envelope between them to the right as shown in FIG. **2** and because the belts have a single twist from one end to the other, the envelope is inverted as it is carried through the housing. It is thus ejected from between pulleys **35** and **36** with the flap facing downwardly.

In FIGS. 7–9, there is disclosed an improved and preferred embodiment of my invention. Because the structure is generally the same, except for the location of the pulleys, the same reference numerals will be used together with a prime notation. The basic difference between this preferred embodiment and the earlier described embodiment is that the shafts **28'**, **29'** and **31'**, **32'** are no longer vertically aligned. The two upper shafts **28'** and **31'** are mounted closer together than the two lower shafts **29'** and **32'**. The four shafts **28'**, **29'**, **31'** and **32'** are still parallel to each other, and the four pulleys **33'**, **34'**, **35'** and **36'** still lie in a common vertical plane. The upper shafts **28'** and **31'** have been moved an equal distance toward each other in a horizontal plane. Each has been moved inwardly a distance corresponding to about two-thirds or three-quarters of the diameter of the pulleys. Because the two top shafts **28'** and **31'** are moved toward each other an equal distance, the two belts **39'** and **40'** are still of equal length. The belts **39'**, **40'** are mounted on the pulleys exactly as before and operate in the same manner to carry envelopes and invert them between the ends thereof.

As best shown in FIGS. **8** and **9**, the result of moving the shafts out of vertical alignment is that the pulleys at each end are then spaced further apart. FIG. **8** shows the relationship of the two entrance pulleys **33'**, **34'**. It will be noted from FIG. **8** that the two pulleys **33'** and **34'** are now spaced a considerable distance apart, as compared to the distance between the same pulleys in the other embodiment, as shown in FIG. **6.** In the embodiment of FIGS. **1–6,** the distance between the two pulleys at each end establishes a maximum thickness of envelope that can be carried therebetween. The embodiment of FIGS. **1–6** will basically accommodate one thickness of envelope. As opposed to this, the preferred embodiment shown in FIGS. **7–9** will accommodate a wide range of envelope thicknesses, without adjustment. As shown in FIG. **8,** the belts under normal circumstances engage each other in the same manner as that previously described with reference to the other embodiment. However, in the event a much thicker envelope is being mailed, the belts **39'**, **40'** of this embodiment can move apart as required to accommodate the thicker envelope, as shown in FIG. **9.** The distance between the two pulleys **33'**, **34'** is no longer the same limiting factor that it was in the other embodiment. The effective distance between the two pulleys **33'**, **34'** is now A—A as shown in FIG. **9,** rather than the distance B–B of the earlier embodiment. It should be emphasized that the distance between the inner spans **39*a'*** and **40*a'*** will automatically adjust to accommodate envelopes ranging in thickness from smaller than B—B up to A—A. Of course, to permit this accommodation, there must be at least a minimum amount of slack in the belts. However, I have observed that the belts can be relatively tight and still provide sufficient slack to accommodate the thicker envelopes.

The present invention thus provides a simple and effective means of inverting or flipping envelopes in an automated mailing system. The novel features of the present invention are defined in the following claims.

What is claimed is:

1. Apparatus for inverting mailing envelopes, comprising:

a. a housing having a pair of parallel side walls, and a pair of parallel end walls with an envelope inlet opening in one end wall and an envelope outlet opening in an opposite end wall;

b. a first pair of parallel shafts extending between said side walls adjacent said inlet opening, and a second pair of shafts parallel with said first pair extending between said side walls adjacent said outlet opening;

c. first and second correspondingly located pulleys on each pair of shafts positioned adjacent said openings, said pulleys lying in a common plane extending normal to said shafts;

d. a pair of flexible endless belts having external envelope engaging surfaces, each of said belts having a single twist between the ends thereof and being operatively engaged with a first pulley adjacent the other opening, said pulleys on each pair of shafts being spaced a predetermined distance apart such that an envelope engaging surface of one belt opposes an envelope engaging surface of the other belt so that an envelope inserted therebetween will be engaged by said pair of belts, said envelope engaging surfaces comprising matching, engageable teeth; and

e. means for driving said first pulleys in one direction and said second pulleys in the other direction so that the envelope engaging surfaces of said belts move in the same direction to carry envelopes from said inlet opening to said outlet opening and to invert the envelopes as they are being carried therebetween.

2. Apparatus for inverting mailing envelopes, comprising:

a. a housing having opposite first and second ends;

b. first and second rotatable, spaced pulleys mounted adjacent said first end, and first and second correspondingly positioned, rotatable spaced pulleys mounted adjacent said second end, said pulleys being mounted in generally the same plane for rotation about generally parallel axes;

c. a pair of endless belts extending between said ends, each of said belts operatively engaging one of said first pulleys and the second pulley at the opposite end of the housing, and each of said belts having a single twist between the pulleys obtained by rotating one pulley engaging end thereof 180° with respect to its other pulley engaging end, each of said belts comprising an inner span and an outer span extending between said pulleys and said inner spans extending in aligned, substantially contacting relationship;

d. said pulleys at each end being spaced apart so that an envelope inserted therebetween will be engaged between said two inner spans of said belts mounted thereon substantially throughout the length thereof;

e. means for driving said first pulleys in one direction and said second pulleys in the other direction to carry envelopes between said belts from said first end to said second end and to invert the envelopes as they are carried therebetween; and

f. said belts having envelope engaging surfaces comprising matching, engageable teeth.

3. Article inverting apparatus, comprising:

a. a first pair of first and second rotatable pulleys;

b. a second pair of first and second rotatable pulleys correspondingly positioned with respect to said

first pair of rotatable pulleys and spaced therefrom;

c. means mounting said pulleys on parallel axes for rotation in a common plane and to permit an article to be inverted to pass between each pair of said pair of pulleys;

d. a pair of endless belts having outer article engaging surfaces, one of said belts extending between said first pulley and said second pulley on said first and second pair of pulleys respectively and the other of said belts extending between said second pulley and said first pulley of said first and second pair of pulleys respectively so that portions of said belts extend substantially parallel with said surfaces in substantial contact;

e. each of said belts having a single twist between the pulleys on which it is mounted;

f. means for driving said first pulleys in one direction and said second pulleys in the opposite direction so that the article engaging surfaces thereof move in the same direction to carry articles received between said belts from said first pair of pulleys to said second pair of pulleys and invert the articles as they are carried therebetween; and

g. said article engaging surfaces comprising matching engageable teeth.

* * * * *