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ENVELOPE FLAP REVERSING ATTACHMENT

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FIG. 2.

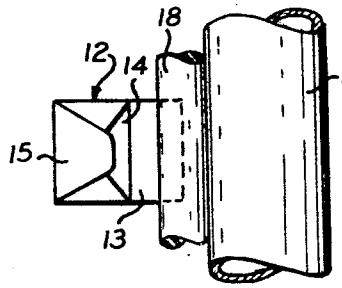
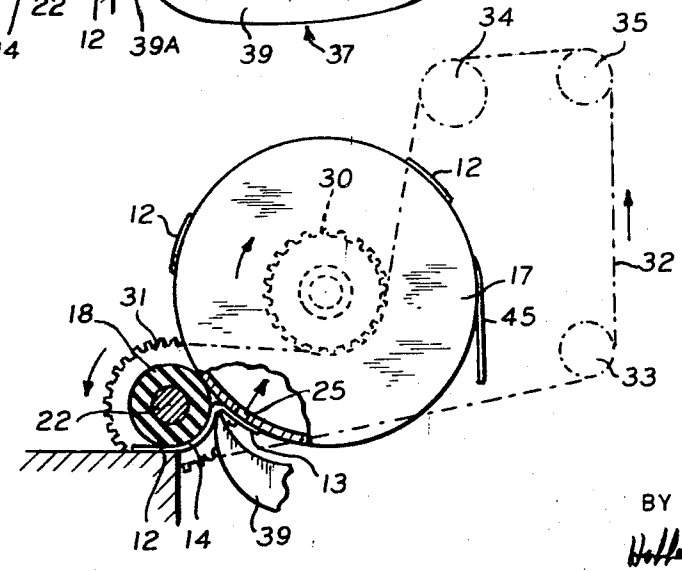


FIG. 1.

FIG. 3.



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ENVELOPE FLAP REVERSING ATTACHMENT

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ABSTRACT OF THE DISCLOSURE

An envelope flap reversing attachment in which an envelope with its flap extended is fed beneath a pressure roller having a resilient friction surface, and moving in counter rotation and in peripheral contact with a relatively large second roller or carrier drum connected to a source of negative pressure, and having a plurality of spaced apertures to transmit this negative pressure to an envelope on the drum. Lifter fingers are arranged between the pressure roller and carrier drum to move in timed synchronism with the advance of the envelope so as to apply pressure to the envelope at the fold line of the flap, forcing same into the bite between the pressure roller and carrier drum. Thereafter, the envelope with its flap folded over is caught in the bite between the roller and drum and carried about the surface of the drum to stripper fingers which remove the envelope and folded flap from the drum surface.

This invention relates in general to an improvement in or to a machine for making envelopes, and more specifically to a folding unit for use in conjunction with an envelope forming machine for effecting the reverse fold of the flap portion of the envelope.

Heretofore, numerous efforts have been made to provide an envelope forming machine with means for automatically effecting the reverse fold of the flap portion of the envelope. However, the known means for effecting the reverse fold of the flap as the envelope comes off the envelope forming machine are relatively complex and costly to manufacture and/or operate.

It is therefore an object of this invention to provide a reversing flap forming unit which is relatively simple in constructtion, relatively inexpensive to fabricate, and which is positive in operation.

Another object of this invention is to provide in conjunction with an envelope forming machine a reversing flap forming unit which can be readily adapted to an existing envelope forming machine and/or which can be readily incorporated into original equipment.

Another object of this invention is to provide a reversing flap forming unit for use in conjunction with an envelope forming machine which has the ability to handle or reversely fold the flaps of the envelopes as fast as the envelopes come off the envelope forming portion of the machine.

Another object of this invention is to provide a reversing flap forming unit which can be readily adapted to envelope forming machine so that the forming of the envelope and the reverse folding of the flap are sequentially performed in one continuing operation.

The foregoing objects, and other features and advantages of this invention are attained by a reversing flap forming unit which is readily adapted for use with an envelope forming machine. The function of the folding unit is to effect the fold of the flap portion of an envelope relative to the pocket portion thereof as the formed envelope emerges from an envelope forming machine. The folding unit of this invention comprises a pair of rotatably journalled, complementary rollers disposed in rolling engagement with respect to one another. A drive means is provided for effecting counter-rotation of the complementary rollers with respect to one another. One of the complementary rollers is defined as a carrier roller which is provided with means for fixedly securing the envelopes to a peripheral portion of the roller as the envelope emerges from the discharge end of an envelope forming machine. The other roller functions as a pressure roller. Lifter means are cooperatively associated with the respective pair of complementary rollers for guiding an intermediate portion of the envelope between the bite defined by the rolling peripheries of the respective rollers so that as the envelope is carried by one of the rollers between said rollers, the flap is reversely folded relative to the pocket portion of the envelope. Accordingly, the flap is creased along one edge of the pocket opening of the envelope as the envelope is carried on the periphery of the carrier roller during a flap forming operation. Means are also associated with the envelope carrier roller for stripping the envelope therefrom after the reverse fold of the flap has been formed.

In accordance with this invention, the means for fixedly securing the envelopes to the carrier roller of the folding unit comprises a source of negative pressure which is operatively connected to the carrier roll, the latter being provided with a series of openings spaced thereon on which a negative pressure is pulled. Accordingly, the portion of the envelope disposed opposite the respective openings of the carrier roller causes the envelope to become fast thereto when the vacuum or negative pressure is applied on the roller. In this manner the roller effects pickup of the envelopes as they emerge from the discharge end of the envelope forming machine.

A feature of this invention resides in a reversing flap forming unit which comprises a pair of complementary rollers that are connected into driving relationship with respect to one another so that one roller counter-rotates with respect to the other and which defines therebetween the means for effecting the reverse fold of the flap.

Another feature of this invention resides in the provision of lifter means cooperatively associated with the complementary roller which is specifically timed with respect thereto to positively lift or guide an envelope to the bite of the complementary rollers to initiate the reverse fold of the flap.

Another feature of this invention resides in the provision wherein the flap portion of the envelope can be reversely folded to either side of the pocket depending upon the manner in which the formed envelope comes off the envelope folding machine.

Other features and advantages will become more readily apparent when considered in view of the drawings and specification in which,

FIGURE 1 is a perspective view of the component parts of the reversing flap forming unit of the instant invention having portions thereof shown in section.

FIGURE 2 is a partial plan view of FIG. 1.

FIGURE 3 is an end elevational view of the reversing flap forming unit of FIG. 1 having portions thereof broken away and shown in section.

Referring to the drawings, there is shown therein a reversing flap folding unit **10** which is adapted to be connected onto the frame structure of an envelope forming apparatus (not shown). The envelope forming apparatus may be of any well known construction. Accordingly, the instant invention relates only to the flap folding unit **10** and it is preferably disposed adjacent to the discharge end **11** of an envelope forming machine.

As best seen in FIG. 1 the envelope **12**, as it emerges from the discharge end **11** of an envelope forming ma-

chine has the flap portion **13** thereof generally co-planar with respect to the adjacent side **14** of the pocket. Accordingly, depending upon the manner in which the envelope forming machine forms the blank from which the envelope is formed, the folded envelope will emerge from the discharge end thereof either with the pocket opening upwardly as shown in FIGURE 2 or with the pocket facing downwardly, as not shown. In either event, the flap **13** is reversely folded either to overlie the address portion **14** of the envelope or be reversely folded to overlie the back side **15** of the pocket as in the sealing position of the flap. Regardless of which way the envelope emerges from the discharge end of the envelope forming machine, the folding means **10** of the instant invention will effect an automatic, reverse fold of the flap portion **13**, the direction of fold being dependant on whether the envelope emerges with the pocket down or up.

Referring to the drawings, flap folding means **10** of the present invention comprise of a pair of complementary rollers **17** and **18** which are rotatably journalled to the frame of an envelope forming machine. The complementary rollers **17** and **18** include a relatively large diameters roller or drum **17** and an associated pressure roller **18** of relatively smaller diameter. The arrangement is such that the drum **17** and pressure roller **18** are disposed in rolling engagement with respect to one another.

In the illustrated form of the invention, the drum **17** is journalled to shaft **19**. The shaft **19** in turn is rotatably journalled in suitable bearing supports **20** disposed on the frame of the machine. The pressure roller **18** is also disposed on a shaft **22** which is rotatably journalled in suitable bearings on the machine.

In accordance with this invention, a means is provided for effecting the adjustment of one of the rollers with respect to the other to adjust the parallelism of the respective rollers **17** and **18**. In the illustrated form of the invention each bearing support **20** of the drum shaft **19** is provided with an adjustable set screw **23** which will function to push or pull the drum **17** parallel to the pressure roller **18** which is journalled to a shaft **22** which is fixed relative to the respective bearing supports thereof.

The drum **17** is provided with one or more row of openings **25** that extend longitudinally therealong. The ends of the drum are closed by suitable end closures. One end closure **26** of the drum is detachably connected to the cylindrical portion of the drum by a suitable strap means **27**. Means are provided in the head end portion of the drum to define a channel which is connected to a source of negative pressure, e.g. vacuum pump **28** and/or the like. Accordingly, with the drum sealed at the ends, it will be noted that when the vacuum pump **28** is placed in operation, a vacuum is pulled on the interior of the drum **17** causing a vacuum to be created in the vicinity of the openings **25** formed in the periphery of the drum. Accordingly, as will be hereinafter described, when an envelope **12** to be folded is brought into contiguous relationship with the holes **25** on the periphery of the drum **17**, the suction or vacuum acting on that portion of the envelope causes the same to be securely fixed to the periphery of the drum and is carried thereon when the unit is placed in operation.

A drive means is provided for driving the respective complementary drum **17** and pressure roller **18** in counter-rotation with respect to one another. To attain this end a sprocket **30** is secured to the drum shaft **19** adjacent one end thereof. Another sprocket **31**, disposed in a common plane with sprocket **30**, is journalled to shaft **22** of the pressure roller **18**. An endless chain **32** is threaded about the respective sprockets **30**, **31** connected to the drum shaft **19** and the pressure bar shaft **22** as seen in FIG. 3. A driving sprocket **33** and intermediate idler sprockets **34**, **35** are provided to define the complete endless flexible drive whereby actuation of the driving sprocket effects the drive of rollers. It will be noted that the manner in which the flexible drive or chain **32** is threaded about the sprockets **30** and **31**, imparts a clockwise rotation to carrier drum **17** as seen in FIG. 3, and a counterclockwise rotation to the pressure roller **18** in rolling engagement therewith.

As seen in FIG. 2, the pressure roller **18** is formed of rubber or other suitable material having non-skid characteristics. Accordingly, the pressure roller **18** is disposed immediately adjacent the take off of the envelope forming machine. As the respective envelopes **12** with the pockets formed thereon are advanced toward the pressure roller **18**, the envelopes are guided thereunder. The non-skid surface of the pressure roller in engaging the leading portion of the envelope advance the same toward the carrier drum **17**. The rotation of the drum **17** is timed to the operation of the envelope forming machine so that as the lead end of the envelope strikes the drum, openings **25** therein are disposed contiguous the envelope as seen in FIG. 1. The vacuum being pulled on the drum thus fixedly secures the envelope **12** to the peripheral portion of the drum **17** as the latter rotates.

In accordance with this invention, a lifter means **37** is provided for initiating the break or crease between the flap portion **13** of the envelope and the pocket forming portion thereof. As shown, the lifter means **37** comprises a rectangular bar **38** disposed parallel to the longitudinal axis of the carrier drum **17**. The bar **38** is mounted for oscillation on the frame means.

Connected to the bar **38** are a plurality of lifter fingers **39**. The free end **39A** of the respective fingers **39** are arranged to extend into the bite defined between the contacting peripheries of the respective rollers **17** and **18**. Means in the form of a suitable timing cam **40** is connected to the bar for effecting the rocking of the lifter fingers **39** toward and away from the rollers **17**, **18** in timed sequence with the rotation of the carrier roller **17** or drum and the operation of the envelope forming machine. Accordingly, timing cam **40** may be operatively connected to the drive of the rollers to effect synchronization or cooperation of movement between the lifters **37** and the drum **17**.

As best seen in FIG. 3, with the lead portion of the envelope fixedly secured to the peripheral portion of the drum as by the vacuum pressure applied thereto, the lifter fingers **39** are rocked so that the free end **39A** thereof will lead the intermediate end of the envelope into the bite defined between the contact points of the rollers **17** and **18**. In doing so, the non-skid surface of the pressure roller **18** will cause the envelope to be lead between the complementary rollers **17** and **18** thereby forming a crease at the juncture between the flap portion **13** of the envelope and the pocket portion thereof, the envelope being carried by the drum **17** upon passing by the pressure roller **18**.

In the illustrated form of the invention, it will be noted that as the envelope is emitted from the discharge end of the envelope forming machine with the pocket opening above the flap **13**, the flap **13** will be reversely folded to overlie the address side **14** of the envelope. Accordingly, as the carrier drum **17** continues in its revolution in a clockwise direction as indicated in FIG. 3, the envelope with the folded flap continues to be carried along the periphery of the drum.

If desired, a second pressure roller **42** is operatively associated with the carrier drum **17**. In the illustrated form of the invention, the second pressure roller **42** comprises a roller similar in construction to that of pressure roller **18**. However, the second pressure roller **42** is rotatably journalled between a pair of holding arms **43** which are resiliently biased toward the carrier drum **17** by means of a spring **44**. One end of the spring **44** is anchored to the holding arms **43** and the other end of the spring may be anchored at a suitable fixed point to the frame of the machine. Accordingly, the envelope **12** carried on the periphery of the drum is guided under both pressure rollers **18** and **42** to insure a positive crease or fold of the

flap portion 13 relative to the pocket portion of the envelope.

Because the cylinder or drum 17 is maintained under constant negative pressure or vacuum during the folding operation, means are provided for stripping the envelope 12 with the folded flap 13 from the periphery of the drum 17. In accordance with this invention, this is attained by providing a plurality of stripper fingers 45 adjacent the carrier drum. The arrangement is such that the stripper fingers 45 will slide under the envelope 12 being carried on the periphery of the drum and lift the envelope 12 off the surface thereof to break the vacuum holding the envelope in place on the drum. The envelope 12 is thus stripped from the drum 17 and it is thereafter positioned on a suitable conveyor (not shown) to carry the envelope with folded flap away from the folding unit 10 to the next operation which may be either packing the envelopes in suitable boxes or cartons or stuffing the envelopes with an appropriate material to be mailed or distributed therein.

Accordingly, it will be noted that the folding unit 10 herein described is relatively simple in structure and can be readily fabricated at minimum expense. In operation, the arrangement is such that it can handle the envelopes 12 at the same rate of speed as the folded envelopes are egressing from the envelope forming machine that forms the pocket portion thereof. Accordingly, a relatively simple and inexpensive unit is provided which can be readily adapted to existing equipment and/or which may be incorporated in original equipment at a minimum increase in the overall cost thereof.

While the instant invention has been described and illustrated with respect to a particular embodiment thereof, it will be readily appreciated and understood that variations and modifications may be made without departing from the spirit or scope of the invention.

What is claimed is:

1. For use in conjunction with an envelope forming means, the improvement of,
   (a) folding means for effecting the fold of the flap portion of an envelope relative to the pocket portion of the envelope as the envelope emerges from an envelope forming machine,
   (b) said folding means comprising a pair of rotatably journalled complementary rollers disposed in rolling engagement with one another,
   (c) means for effecting counter-rotation of said rollers with respect to one another,
   (d) means on one of said rollers for securing a portion of said envelope to a peripheral portion of said one roller as said envelope is guided under said rollers,
   (e) and lifter means cooperatively associated with said rollers for guiding an intermediate portion of said envelope between the rolling periphery of said rollers whereby said flap is folded relative to the pocket portion of the envelope to effect a crease thereat as said envelope is carried on the periphery of said one roller and between said pair of rollers,
   (f) said one of said rollers functions as a carrier for said envelope and the other roller serves as a pressure roller,
   (g) said carrier roller comprises a drum having a relatively large diameter,
   (h) said drum having a plurality of lines of spaced holes in the periphery thereof,
   (i) and a source of negative pressure operatively connected to said drum for pulling a negative pressure on said holes whereby said envelope is held to the peripheral portion of said drum during a folding operation by suction created by the negative pressure being pulled on said drum.

2. For use in conjunction with an envelope forming means, the improvement of,
   (a) folding means for effecting the fold of the flap portion of an envelope relative to the pocket portion of the envelope as the envelope emerges from an envelope forming machine,
   (b) said folding means comprising a pair of rotatably journalled complementary rollers disposed in rolling engagement with one another,
   (c) means for effecting counter-rotation of said rollers with respect to one another,
   (d) means on one of said rollers for securing a portion of said envelope to a peripheral portion of said one roller as said envelope is guided under said rollers,
   (e) and lifter means cooperatively associated with said rollers for guiding an intermediate portion of said envelope between the rolling periphery of said rollers whereby said flap is folded relative to the pocket portion of the envelope to effect a crease thereat as said envelope is carried on the periphery of said one roller and between said pair of rollers,
   (f) said lifter means including a plurality of pivotally mounted fingers adapted to rock toward and away from said rollers,
   (g) said fingers having their respective free ends movable toward a line of contact between said rollers to push the envelope between the contacting peripheries of said rollers to reverse the flap of the envelope as said envelope is carried between said rollers.

3. The invention as defined in claim 1 including a stripper finger adapted to engage said envelope to lift the same from the periphery of said roller to break the suction acting on the envelope to secure it to the periphery of the drum.

4. The invention as defined in claim 3 and including a second pressure roller disposed in rolling engagement with said drum,
   (a) said second pressure roller being angularly disposed about the circumference of said drum with respect to the first mentioned pressure roller,
   (b) and means for resiliently biasing said second pressure roller toward said drum.

5. For use in conjunction with an envelope making machine, the improvement of,
   (a) a folding means for reversely folding the flap portion of an envelope with respect to the pocket portion of an envelope,
   (b) said folding means comprising a pair of rotatably journalled complementary rollers disposed in rolling engagement with one another,
   (c) one of said rollers being a drum of large diameter relative to said other roller of said pair of rollers, and said other roller functioning as a pressure roller,
   (d) said drum having a line of spaced holes extending longitudinally along said drum,
   (e) a source of negative pressure operatively connected to said drum for pulling a vacuum on said holes,
   (f) means for adjusting the drum relative to said other roller, and
   (g) said other roller having a non-skid covering thereon,
   (h) a drive means for effecting counter-rotation of said drum and associated roller whereby the envelope to be folded is fed under said pressure roller and toward said drum,
   (i) lifter means cooperatively associated with said pair of rollers,
   (i) said lifter means including a plurality of fingers,
   (k) means for rocking said lifter fingers toward and away from said pair of rollers,
   (l) said fingers having their free ends arranged to present an intermediate portion of said envelope to be folded to contacting peripheries of said pair of rollers,
   (m) the co-action of said pair of rollers and lifter fingers being timed so that a portion of said envelope covers certain of said holes in said drum and is thereby fixedly secured relative thereto and carried therewith due to the negative pressure acting thereon

and whereby said complementary rollers crease said flap as said pair of rollers bite said envelope therebetween,

(n) a second pressure roller disposed in rolling engagement with said drum,

(o) and a stripper means for stripping the folded envelope off the surface of said drum,

(p) said stripper means including curved fingers conforming substantially to the shape of said drum,

(q) said curved fingers having their respective free end directed against the rotation of said drum to lift the envelope off the surface of the drum to break the vacuum acting on said envelopes.

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