United States Patent [19]

Helm

[11] **3,745,894**

[45] **July 17, 1973**

[54] **FLAP FOLDING APPARATUS**

[75] Inventor: **Herbert W. Helm,** Hollidaysburg, Pa.

[73] Assignee: **Smithe, F. L., Machine Company, Inc.,** Duncansville, Pa.

[22] Filed: **Aug. 24, 1971**

[21] Appl. No.: **174,404**

[52] **U.S. Cl.** **93/61,** 93/49

[51] **Int. Cl.** **B31b 1/34**

[58] **Field of Search** 93/63, 49, 61, 62

[56] **References Cited**

UNITED STATES PATENTS

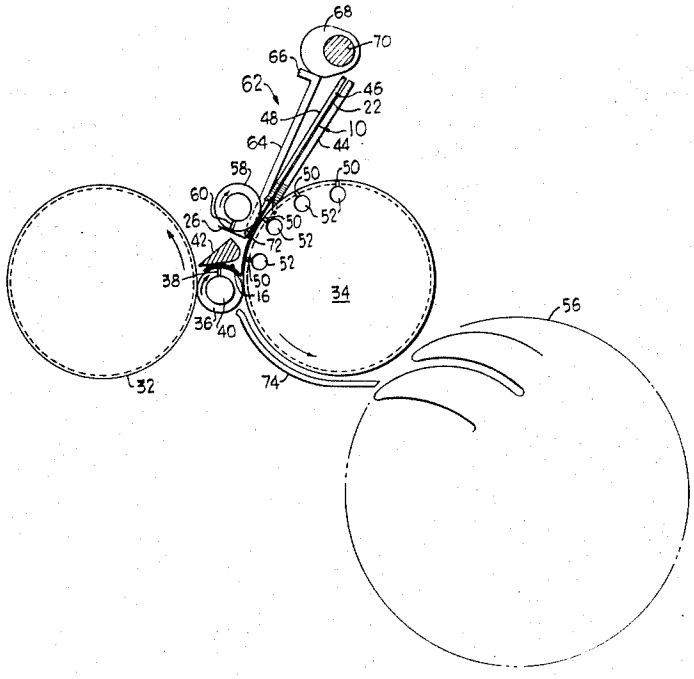
3,668,982	6/1972	Stemmler	93/62
3,643,555	2/1972	Ehlscheid	93/62

Primary Examiner—Andrew R. Juhasz
Assistant Examiner—John Sipos
Attorney—Stanley J. Price, Jr.

[57] **ABSTRACT**

A machine for making envelopes and the like includes apparatus for folding both a top closure flap and a second latex fold flap in the bottom flap portion of the envelope blank. A feed roll feeds the envelope blank with the closure flap trailing onto a closure flap cylinder. The body of the envelope blank is conveyed along the surface of a folding cylinder onto support slats until the envelope blank front edge engages a stop member. The closure flap is engaged by vacuum on the closure flap cylinder and the latex fold flap is engaged by a second flap cylinder. A cam actuated tucker engages the bottom flap adjacent the score line for the latex fold flap and urges the envelope blank downwardly on the support slats. The rotating folding cylinder engages the body portion of the envelope blank and conveys the envelope blank toward a delivery device. Both the closure flap and the latex fold flap are engaged by the respective closure flap cylinders and are folded along the score lines by rotation of the respective flap cylinders in a direction opposite to the folding cylinder. Both of the flaps are creased along the fold line by the closure flap cylinder. The envelope blank is then transferred from the folding cylinder to a suitable spiral delivery.

9 Claims, 2 Drawing Figures



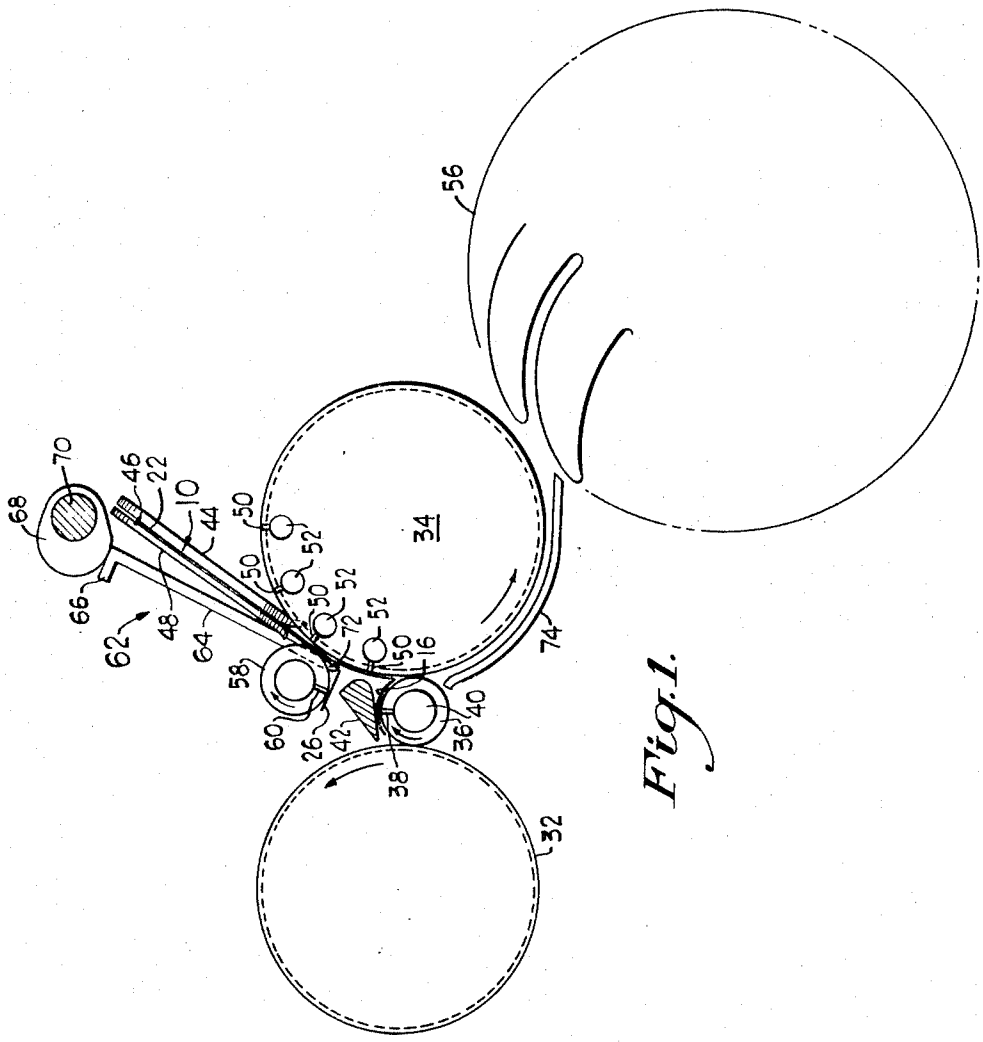

56
34
70
68
46
22
10
44
50
52
66
48
62
64
58
60
26
42
38
36
40
16
74
32

Fig. 1.

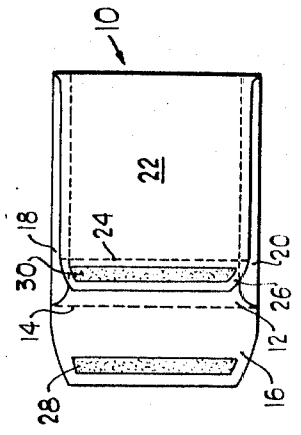

10
22
18
24
20
30
26
14
12
28
16

Fig. 2.

FLAP FOLDING APPARATUS

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to envelope flap folding apparatus and more particularly to apparatus for simultaneously folding the closure flap and a latex fold flap formed from a portion of the envelope blank bottom flap.

2. Description of the Prior Art

Envelope machines include apparatus for folding the closure flap after the side and bottom flaps of the envelope blank have been folded and adhesively secured to the envelope body portion. U.S. Pats. Nos. 3,008,382 and 3,116,668 illustrate such apparatus. cylinder so that upon rotation of said folding cylnder, a closure

As described in U.S. Pat. No. 3,460,444, envelope blanks having self adhesive sealing flaps have a strip of latex or similar adhesive applied to the closure flap and to an area of the bottom flap which is in underlying relation with the closure flap when the closure flap is in a closed folded position. The adhesive on the closure flap engages the strip of adhesive on the bottom flap to provide a self sealing envelope. To provide envelopes with this self sealing feature in an unsealed condition, it is necessary to fold the portion of the bottom flap having the strip of adhesive thereon so that when the top closure flap is folded into overlying relation with the bottom flap it does not engage the strip of adhesive on the bottom flap. To seal the envelope the folded portion of the bottom flap is unfolded so that the adhesive thereon engages the adhesive on the top closure flap. There is a need for apparatus to simultaneously fold the top closure flap and to fold the latex fold flap so that self sealing envelopes may be formed with the top closure flap folded in an unsealed condition.

SUMMARY OF THE INVENTION

This invention relates to apparatus for folding both the closure flap and the latex flap of an envelope and includes a feed cylinder for transferring the envelope blank to a closure flap cylinder positioned adjacent thereto. The closure flap cylinder transfers the envelope blank with the closure flap trailing along the surface of a folding cylinder onto a support device. The closure flap is engaged to the surface of a closure flap cylinder and the latex fold flap is engaged by a latex fold flap cylinder. Means are provided to urge the envelope blank toward the closure flap cylinder and the folding cylinder engages the body portion of the envelope blank. Rotation of the folding cylinder in a direction opposite to the flap cylinder folds both the closure flap and the latex fold flap as the envelope blank is conveyed by the folding cylinder to a suitable delivery device.

Accordingly, the principal object of this invention is to provide flap folding apparatus for both the closure flap and the latex fold flap.

Another object of this invention is to provide flap folding apparatus with positive means to move the envelope blank downwardly with the rotating folding cylinder.

These and other objects and advantages of this invention will be more completely disclosed and described in the following specification, the accompanying drawings and the appended claims.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a schematic view of a portion of an envelope making machine illustrating schematically the apparatus for folding both the closure flap and the latex fold flap.

FIG. 2 is a bottom plan view of an envelope blank illustrating the score lines for the closure flap and the latex fold flap and the latex or adhesive strips on the closure flap and latex fold flap.

DESCRIPTION OF THE PREFERRED EMBODIMENT

This invention may be employed with apparatus similar to that illustrated in U.S. Pats. Nos. 3,008,382 and 3,116,668. Detailed descriptions of the vacuum rolls, the flap rolls and the other apparatus for folding closure flaps and the manner in which the apparatus is mounted in the envelope machine frame is shown in the prior art and will not be repeated herein. The present invention will be described as it relates to apparatus disclosed in the above enumerated patents and for this purpose the above enumerated patents are incorporated herein by reference.

Referring to the drawings and particularly FIG. 2, there is illustrated an envelope blank generally designated by the numeral **10** that has a body portion **12** with a transverse closure flap score line **14** extending thereacross and forming a top or closure flap **16.** The body portion has a pair of side flaps **19** and **20** adhesively secured to a bottom flap **22** to form the envelope **10.** The bottom flap **22** has a transverse score line **24** therein to form an upper latex fold flap **26.**

The closure flap **16** has a strip of latex or similar adhesive **28** applied thereto and the latex fold flap has a similar transverse strip of latex or other adhesive **30** secured thereto. The closure flap **16** is arranged to be folded along score line **14** with the latex adhesive strip **28** in overlying relation with the latex strip **30** on the latex fold flap **26** to provide a self adhesive sealing flap whereon the closure flap **16** may be sealed by pressure alone without being previously moistened. The adhesive strip **28** adhesively engages adhesive strip **30** by pressure alone. To prevent the closure flap **16** from adhesively engaging the closure flap portion **26** of bottom flap **12,** it is necessary to fold the latex flap **26** so that the underside of the latex flap **26,** i.e. the surface without the latex adhesive thereon, is in contact with the adhesive strip **28** on closure flap **16** when closure flap **16** is in a folded position.

The apparatus for folding the closure flap **16** and the latex flap **26** is illustrated in FIG. 1. An envelope blank is conveyed by means of feed roll **32** from the preceeding portions of an envelope machine where an envelope is formed from an envelope blank and has the bottom flap **22** adhesively secured to the side flaps **18** and **20** and adhesive strips **26** and **28** applied thereto as previously discussed. The fold or score lines **14** and **24** have been impressed on the envelope **10** prior to the envelope being transferred to the feed roll **32.** The feed roll **32** may have any desirable configuration and may be segmented or may utilize vacuum ports to convey the envelope thereon.

The envelope **10** is positioned on the feed roll **32** with the closure flap trailing and the bottom flap **22** adjacent the surface of the feed roll. The envelope **10** is transferred from the feed roll along the surface of a folding

cylinder 34 by passing over the surface of closure flap cylinder 36. The envelope 10 is frictionally engaged by the feed roll 32 and the closure flap cylinder 36. Rotation of closure flap cylinder 36 on shaft 40 in a clockwise direction and the feed roll 32 in a counterclockwise direction as viewed in FIG. 1 conveys the envelope blank upwardly between the guide plate 42 and the surface of folding cylinder 34. The vacuum ports 38 on closure flap cylinder 36 are arranged to engage the closure flap portion 16 of envelope blank 10. The envelope blank is conveyed upwardly on slats 44 until the lower edge of the bottom flap 22 abuts a stop member 46. Stop guides 48 are provided to maintain the envelope 10 on the slats 44 and prevent buckling of the envelope 10.

The folding cylinder 34 has a plurality of vacuum ports 50 opening onto the peripheral surface to provide a negative pressure or suction on the surface of folding cylinder 34. The vacuum ports 50 are connected to transverse passageways 52 that are suitably connected to a vacuum pump or the like to provide a negative pressure at the vacuum ports 50 on the surface of the vacuum cylinder 34.

The envelope blank body portion 12 is engaged to the surface of folding cylinder 34 by the negative pressure at ports 50 and rotation of the vacuum cylinder 34 in a counter-clockwise direction, as viewed in FIG. 1, moves the envelope 10 downwardly on the slats 44 toward the spiral delivery wheel 56. The closure flap cylinder 36 engages the top or closure flap 16 by means of vacuum through vacuum port 38 and rotation of the closure flap cylinder 36 in a clockwise direction folds the closure flap 16 along the score or fold line 14 as the scored portion of the envelope passes in the nip between the closure flap cylinder 36 and the folding cylinder 34.

A latex fold flap cylinder 58 is provided adjacent to the folding cylinder 34 and has a plurality of transverse vacuum ports 60 that are arranged to engage the latex fold flap 26. Rotation of the latex fold flap cylinder 58 in a clockwise direction lifts the latex fold flap 26 away from the envelope body portion 12.

A tucker device generally designated by the numeral 62 is provided to urge the envelope downwardly with the folding cylinder 34 while the latex fold flap is being lifted away from the envelope body portion 12 by latex fold flap cylinder 58. The tucker mechanism includes one or more rods 64 with a flanged end portion 66. A cam 68 is mounted on a rotatable shaft 70 and is arranged to abut the flanged portion 66 of rod 64 and by rotation of shaft 70 moves the rod 64 downwardly relative to the slats 44. The front edge 72 of rod 64 preferably engages the bottom flap 22 along the fold line 24 to urge latex fold flap 26 against a portion of the guide plate 42 and to positively disengage the latex fold flap 26 from the latex fold flap cylinder 58. The rotation of the folding cylinder 34 moves the latex fold flap 26 in a reverse fold position into the nip between the closure flap cylinder 36 and the surface of folding cylinder 34 to thus crease the latex fold flap along the score line 24. With this arrangement both the closure flap 16 and the latex fold flap 26 are folded in one flap folding operation on the envelope 10 as the envelope 10 is conveyed by folding cylinder 34 to the spiral delivery 56. A suitable guide 74 is provided for the envelopes 10 as they are conveyed from the folding cylinder 34 to the spiral delivery 56.

It should be understood that apparatus other than the tucker rod 64 may be employed to urge the envelope blanks downwardly along the slats 44 and onto the surface of the folding cylinder 34. For example, suitable air blast means may be provided to function in a manner similar to the tucker rod 64.

According to the provisions of the patent statutes, we have explained the principle, preferred construction and mode of operation of our invention and have illustrated and described what we now consider to represent its best embodiment. However, it should be understood that, within the scope of the appended claims, the invention may be practiced otherwise than as specifically illustrated and described.

We claim:

1. Apparatus for folding the closure flap and the latex fold flap of an envelope blank comprising,
   - a folding cylinder arranged to rotate in a first direction,
   - means on said folding cylinder to engage the body portion of an envelope blank,
   - a closure flap cylinder positioned adjacent to said folding cylinder and arranged to rotate in a direction opposite to said folding cylinder,
   - means on said closure flap cylinder to engage the closure flap of an envelope blank,
   - a latex fold flap cylinder positioned adjacent to said folding cylinder and above said closure flap cylinder, said latex fold flap cylinder arranged to rotate in a direction opposite to said folding cylinder,
   - means on said latex fold flap cylinder to engage the latex fold flap, and
   - said closure flap cylinder and said latex flap cylinder arranged to engage the respective closure flap and latex fold flap while the envelope blank body portion is engaged to the surface of said folding cylinder so that upon rotation of said folding cylinder, closure flap cylinder and latex flap cylinder, said envelope blank is conveyed on said folding cylinder and the closure flap and latex fold flap of said envelope blank are folded.

2. Apparatus for folding the closure flap and the latex fold flap of an envelope blank as set forth in claim 1 which includes,
   - a guide plate positioned between said closure flap cylinder and said latex fold flap cylinder and adjacent to said folding cylinder,
   - said guide plate arranged to urge said latex fold flap toward the envelope blank bottom flap after said latex fold flap is disengaged from said latex fold flap cylinder.

3. Apparatus for folding the closure flap and the latex fold flap of an envelope blank as set forth in claim 1 which includes,
   - a support member positioned tangent to the periphery of said folding cylinder,
   - said support member arranged to receive envelope blanks and position said envelope blanks for engagement by said folding cylinder.

4. Apparatus for folding the closure flap and the latex fold flap of an envelope blank as set forth in claim 1 which includes,
   - means to urge the envelope blank against the surface of the folding cylinder and disengage the latex fold flap from said latex fold flap cylinder.

5. Apparatus for folding the closure flap and the latex fold flap of an envelope blank as set forth in claim 1 which includes,

a tucker device positioned adjacent to said folding cylinder,

said tucker device arranged to engage the envelope blank adjacent the score line for the latex fold flap and move with the envelope blank as the envelope blank is conveyed by the rotation of said folding cylinder.

6. Apparatus for folding the closure flap and the latex fold flap of an envelope blank as set forth in claim 5 in which said tucker device includes,

a tucker rod movable toward and away from said latex fold flap cylinder, and

cam means operable upon rotation to move said tucker rod.

7. Apparatus for folding the closure flap and the latex fold flap of an envelope blank as set forth in claim 1 which includes,

a feed roll positioned adjacent to said folding cylinder with said closure flap cylinder positioned therebetween,

said feed roll arranged to convey envelope blanks with the closure flap trailing onto the surface of said folding cylinder,

said feed roll arranged to rotate in said first direction.

8. Apparatus for folding the closure flap and the latex fold flap of an envelope blank as set forth in claim 1 which includes suction means on said latex fold flap cylinder operable to engage the upper portion of the bottom flap of an envelope blank to the surface of said latex fold flap cylinder.

9. Apparatus for folding the closure flap and latex fold flap of an envelope blank as set forth in claim 1 in which,

said closure flap cylinder is positioned closely adjacent to said folding cylinder so that said closure flap and latex fold flap are creased on respective fold lines between the nip of said closure flap cylinder and folding cylinder.

* * * * *