Sept. 22, 1970 W. W. SMITH 3,529,756

ENVELOPE AND APPARATUS FOR OPENING SAME

Filed May 2, 1968 2 Sheets-Sheet 1

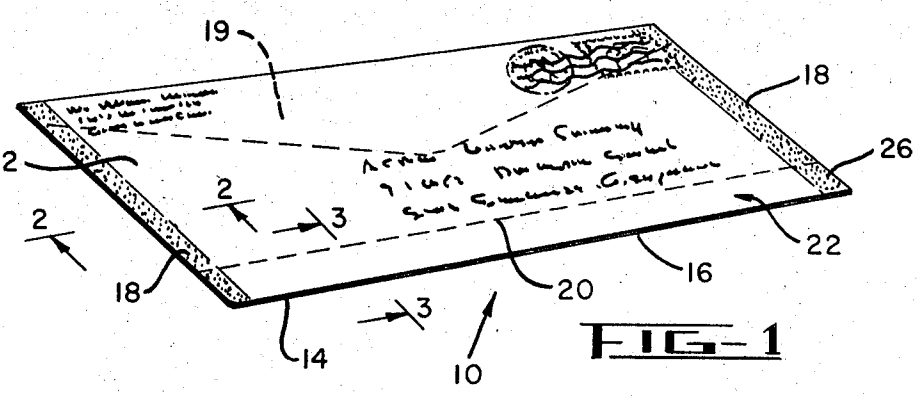


FIG-1

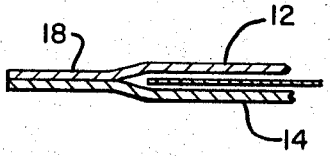


FIG-2

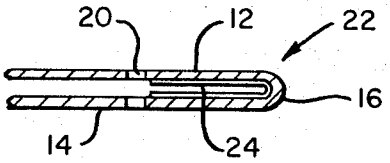


FIG-3

FIG-4

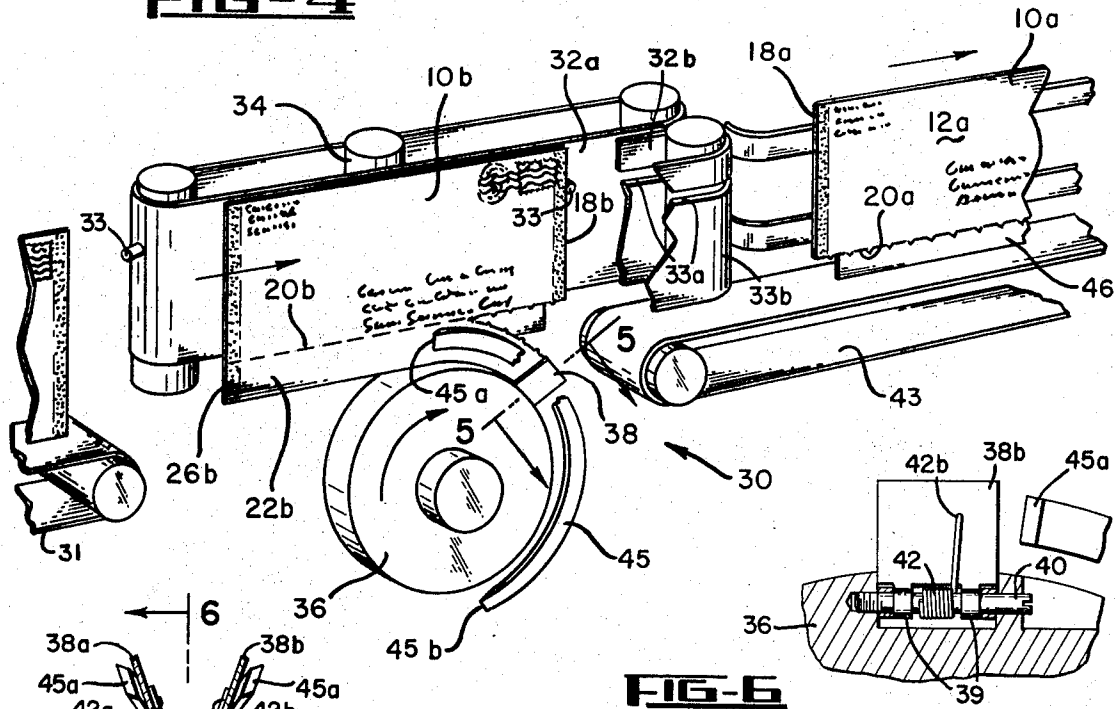


FIG-6

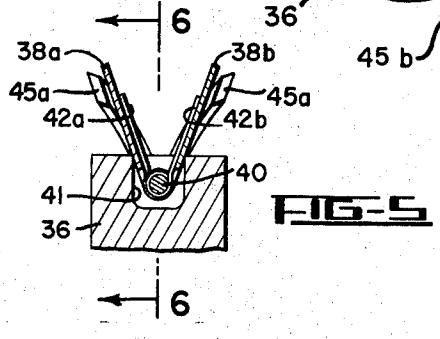


FIG-5

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Filed May 2, 1968 2 Sheets-Sheet 2

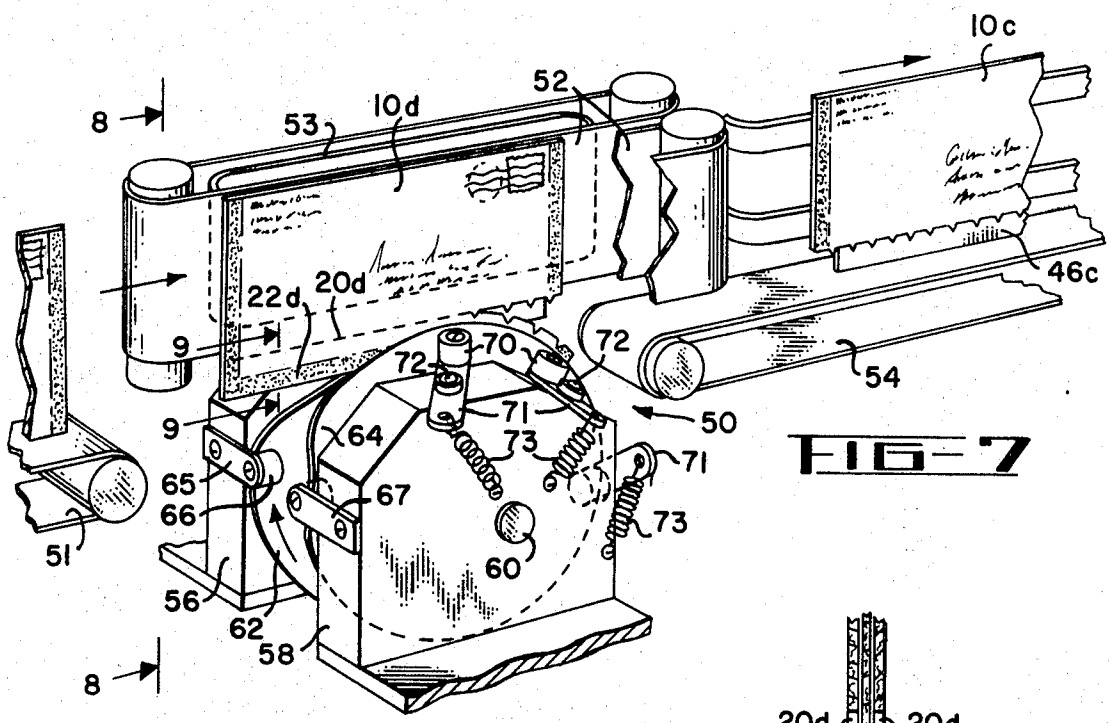


FIG-7

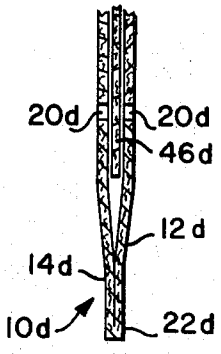


FIG-9

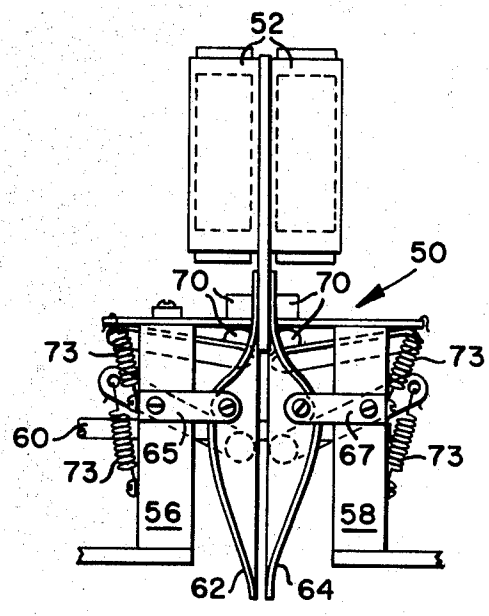


FIG-8

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United States Patent Office 3,529,756 Patented Sept. 22, 1970

3,529,756

ENVELOPE AND APPARATUS FOR OPENING SAME

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Int. Cl. B26f 3/02; B65h 35/10
U.S. Cl. 225—99 5 Claims

ABSTRACT OF THE DISCLOSURE

An envelope perforated through both panels along the bottom edge to form a tear strip with the panels being adhered together along the side edges to prevent intrusion of the contents into an area at each side of sufficient width to grasp. Hence, the tear strip may be grasped and severed without damage to the contents. The apparatus includes a conveyor which holds the envelope firmly in the area outside of the tear strip and carries it along a fixed path. A stripping wheel is rotated to carry a small clamp across the path traversed by the tear strip at the speed of the conveyor so that the clamp embraces the tear strip within the adhered area. Cam means cause the stripping clamp to grasp the tear strip and, as it rotates away from the conveyor, it severs the tear strip. A modified form of the apparatus includes a pair of flexible discs that take the place of the stripping wheel and clamp. These discs are mounted for rotation on opposite sides of the fixed path traversed by the tear strip and are adapted to grasp the tear strip between adjacent circumferential margins of the discs. Upon rotation of the discs, the gripped tear strip is severed from the envelope.

This invention relates to an envelope and an apparatus for opening the same, more specifically, to an envelope which may be readily opened without damage to its contents.

Machines for opening envelopes are not novel per se. For example, in one type of machine the envelope is slit along the top edge so that the front and back panels may be spread apart by hand for removal of the contents. Such devices suffer a disadvantage in that they occasionally sever the contents of the envelope and, in fact, it is difficult to avoid this when the contents extend to the edge being slit. This is particularly troublesome when the contents include coded punched cards which are commonly employed in billing statements for subsequent computer operation.

It is, therefore, an object of this invention to provide an improved envelope having a tear strip to facilitate opening thereof.

It is a further object of this invention to provide an envelope which can be readily opened, and which when opened exposes the contents to facilitate removal thereof.

It is a further object of this invention to provide an envelope having a tear strip which may be grasped for opening the envelope with the insurance that the contents will not be damaged.

It is a further object of this invention to provide an apparatus for removing tear strips from envelopes and the like.

In carrying out this invention, an envelope including front and back panels is provided with a sealable closure flap along the top edge and a tear strip along the bottom of the envelope. The tear strip is formed by perforations extending through both panels along coincidental lines parallel to and spaced from the bottom edge so that contents of the envelope extending to the bottom edge will protrude from the severed opening after the tear strip is removed. The envelope panels are adhered together along both sides in strips sufficiently wide to permit engagement by grasping means. The adhered side strips prevent the contents of the envelope from extending to the side edge so that when the tear strip is gripped at an edge, the contents will not be disturbed. The tear strip is preferably provided with reinforcing lining to increase the tear strength of the tear strip so the tearing will be restricted to along the perforated lines. The envelope opening apparatus includes a conveyor with means for gripping the envelope firmly to carry it along a fixed path. Such means may include adjacent pinch-grip belts which firmly engage opposite sides of the envelope with the tear strip extending beyond adjacent edges of the belts. A rotating stripping wheel is positioned adjacent to the conveyor and is rotated in timed relationship with the conveyor and at the same linear velocity. The stripping wheel is provided with a pair of grip fingers which embrace the tear strip at the leading edge within the area of the adhered side strips. Then, after the grip fingers are actuated to grasp the tear strip, continued rotation of the wheel carries the stripping fingers away from the conveyor to pull the tear strip free of the remainder of the envelope. Thereafter the fingers are spread to release the tear strip.

Other objects and advantages of this invention will become apparent from the description that follows when read in conjunction with the accompanying drawing wherein:

FIG. 1 is an isometric view of an envelope embodying features of this invention.

FIG. 2 is a partial section view taken along line 2—2 of FIG. 1.

FIG. 3 is a partial section view taken along line 3—3 of FIG. 1.

FIG. 4 is an isometric view partially broken away, of an apparatus for opening the envelope of FIG. 1.

FIG. 5 is a fragmentary section taken along line 5—5 of FIG. 4 but showing the fingers 38*a*, 38*b* at an open position just prior to engagement with cams 45.

FIG. 6 is a fragmentary section taken along line 6—6 of FIG. 5.

FIG. 7 is a perspective view of a modified form of envelope and opening apparatus.

FIG. 8 is a section taken on the line 8—8 of FIG. 7.

FIG. 9 is a partial section of a modified form of envelope taken on the line 9—9 of FIG. 7.

Referring now more particularly to FIGS. 1 to 3, the envelope 10 comprises front and rear panels 12 and 14 which may simply be folded over at 16 to form the lower edge and glued together in strips 18 extending along the side edges to form a complete enclosure. As is customary, a flap 19 extends from the front panel in order to seal the envelope in the conventional manner. The width of the glued side strips 18 must be sufficient to accommodate grasping means hereinafter to be described.

Along lines generally parallel to the bottom edge 16 and spaced inwardly therefrom are coextensive perforations 20 in both the top and bottom panels 12 and 14 forming a tear strip 22 which may be severed from the remainder of the envelope 10. As illustrated in FIG. 3, the tear strip is preferably provided with a lining 24 of some suitable reinforcing material such as polyester or Mylar bonded to the strip to give additional tear strength to the tear strip 22 so that the tearing will be confined to the perforated lines 20 and will not wander toward the bottom edge 16 of the envelope and separate the tear strip 22 before it has severed across the full width of the envelope to open it completely.

The glued side strips 18 not only secure the envelope sides to complete the enclosure, but prevent the intrusion of envelope contents into the strip along the side

edges. Hence, the tear strip **22** may be grasped in the corner areas **26** common to the tear strip **22** and the glued edges **18** and severed from the remainder of the envelope without touching the contents within.

Apparatus **30** for opening the envelope of FIGS. 1 to 3 is illustrated generally in FIG. 4 and may comprise suitable conveyor means such as the three pinch belts **32***a*, **32***b* and **33***b* to which envelopes **10***a*, **10***b* are fed by any suitable means, as by a conveyor **31**. The rate at which the envelopes are fed by conveyor **31** is greater than the speed of the three pinch belts. Alignments lugs **33** project from one pinch belt **32***a* and corresponding mating slots **33***a* are provided between the pinch belts **32***b* and **33***b*. Thus, each envelope is aligned with the leading edge **18***b* abutting an alignment lug **33**. In the position of envelope **10***b*, it is firmly grasped between the belts **32***a*, **32***b* and **33***b* and between a pair of pinch rolls **34** (one only being shown), with the tear strip **22***b* being below and free of the gripping pressure.

Rotatably mounted adjacent to pinch belts **32***a*, **32***b* and **33***b* is a stripping wheel **36** which rotates at a rate to carry a pair of stripping fingers **38***a* and **38***b* (FIG. 5), which are pivotally carried in side-by-side relation in a recess **41** in the circumference of the wheel, at the same velocity as the pinch belts **32***a*, **32***b* and **33***b*. As shown in FIG. 6 in connection with finger **38***a*, each finger includes a pair of curled projections **39** which are rotatably mounted on a pin **40** that is threaded into the wheel and spans the recess **41** in the periphery of the wheel. A coil spring **42**, disposed around the pin **40**, has end portions **42***a* and **42***b* which bear against the inside surfaces of the fingers **38***a* and **38***b*, respectively, and pivot them on pin **40** in an outward direction to the open position shown in FIG. 5 wherein the outer surfaces of the fingers bear against the side edges of the opening **41** in the wheel periphery. Hence, by proper timing of the wheel **36**, with the alignment lugs **33** on the pinch belts **32***a*, **32***b* and **33***b*, the gripping fingers can be moved upwardly to embrace the tear strip **22** within the adhered area **26***b* at the leading edge **18***b* of the envelope **10***b*.

Since the gripping fingers are normally held in the open position of FIG. 5 by the coil spring **42**, they will be in that position as they move up to embrace the corner area of the tear strip **22***b*. Then, as the stripping fingers and envelope move along at the same velocity, the fingers are forced together to grasp the tear strip firmly. This may be accomplished by suitable means such as a pair of identical oppositely disposed arcuate cams **45** disposed in opposed, side-by-side relation on each side of the path of movement of the gripping fingers to force them together when they first engage the cams at **45***a*. Thereafter, as continued rotation of the stripping wheel **36** carries the grip fingers **38***a* and **38***b* away from the path traversed by the belts **32***a*, **32***b* and **33***b*, the fingers pull the tear strip **22***b* away from the envelope held in the firm grip of the pressure rolls **34** and the pinch belts **32***a*, **32***b* and **33***b*. Finally, when the envelope is completely severed, the grip fingers move free of the pressure cams at **45***b* and separate to release the tear strip **22***b* and drop it into a suitable waste container (not shown). In the meantime, the envelope continues along a conveyor **43**, as shown by envelope **10***a*, with the contents **46** protruding from the severed opening **20***a* so that they may be readily removed manually or by any suitable automatic means without requiring the envelope panels **12***a* to be spread to facilitate removal.

In a preferred embodiment the glued strips **18** are ⅜" wide and the distance between the strips **18** is about 8 inches. The tear strip **22** is ¾" and the overall height of the envelope is 3½". With these dimensions, a business card 3¼" x 7⅜" will be free of the side strips **18**, as shown in FIG. 2 and will project down into the cavity provided by the tear strip **22**, as shown in FIG. 4.

The modification shown in FIGS. 7 and 8 eliminates the need for precise timing between envelopes **10** and an

opening apparatus **50**. The envelopes are fed by a conveyor **51** to a position between a pair of pinch belts **52**. No alignment lugs are provided on the pinch belts since timing is unnecessary. A pair of pinch shoes **53** (only one being shown in FIG. 7) resiliently urge the pinch belts into gripping relationship with an envelope **10***d* that has a tear strip **22***d* extending below the belts. This tear strip is removed by the letter opening apparatus and opened envelopes **10***c* are carried away from the pinch belts by a conveyor **54**.

Spaced bearing blocks **56** and **58** are positioned below the pinch belts **52** on opposite sides thereof. A drive shaft **60** is journaled in the bearing blocks and driven by a motor, not shown. Mounted on the drive shaft are a pair of flexible discs **62** and **64** which can be made of rubber, a suitable plastic or a plasticized cloth. The peripheral portions of the flexible discs extend upwardly on opposite sides of the tear strip **22***d* with those portions facing conveyor **51** being spread apart in an envelope receiving position while those portions facing conveyor **54** are resiliently urged together in an envelope gripping position.

A mounting arm **65** extends inward from bearing block **56** and spread roller **66** is rotatably mounted thereon in a position to engage the inner face of the peripheral portion of flexible disc **62**. Mounting arm **67** extends inward from bearing block **58** and spread roller **68** is rotatably mounted thereon in a position to engage the inner face of the peripheral portion of flexible disc **64**. These spread rollers are actuating means to open the flexible discs in an envelope receiving position facing conveyor **51**.

The flexible discs **62** and **64** are resiliently urged together by actuating means such as tapered rollers **70** through a quadrant extending from the uppermost portion of the discs to the disc portion facing conveyor belt **54**. These rollers are mounted in upper, intermediate and lower pairs on opposite sides of the flexible discs. Each tapered roller is rotatably supported at the inner end of an arm **71** and each arm is pivotably supported at its midportion on a pin **72** that projects outward from one of the bearing blocks. The outer end of each arm is connected to a bearing block by a spring **73** that resiliently urges the inner end of the arm to force the tapered roller against its associated flexible disc. In order to compensate for the angular disposition of the flexible discs due to bending into a gripping position, the rollers are tapered inwardly towards shaft **60**.

The envelopes opened by opening apparatus **50** can be the same as envelope **10**, shown in FIG. 1. Even though the contents of the envelope extend downward between the tear strip **22**, the pressure of the pinch belts **52** gripping that portion of the envelope above perforation line **20** is sufficient to prevent the contents from being withdrawn with the tear strip.

For extra safety, a modified form of envelope **10***d*, as shown in FIGS. 7 and 9, can be used. Throughout the lower portion of a tear strip **22***d*, both top panel **12***d* and bottom panel **14***d* are glued together. Thus, the contents **46***d* of the envelope are restricted above the glued portion of the lower tear strip and out of gripping position between the flexible discs **62** and **64**.

In operation, envelopes **10** are fed by conveyor **51** to a position between pinch belts **52**. Shoes **53** maintain the pinch belts in gripping relationship with an envelope such as **10***d*. The tear strip **22***d* extends below the pinch belts and is drawn between the flexible discs **62** and **64**. Regardless of timing, the flexible discs grip the tear strip when it reaches a point opposite the upper tapered rollers **70** and sever the envelope along perforated line **20***d* as the tear strip is drawn downward. The opened envelope, such as **10***c*, together with contents **46***c* are carried away by conveyor **54**.

While this invention has been described in conjunction with preferred embodiments thereof, it is obvious that modifications and changes therein may be made by those skilled in the art without departing from the spirit and

scope of this invention as defined by the claims appended hereto.

What is claimed is:

1. Apparatus for opening an envelope having front and back panels with common longitudinal and side edges, and means forming lines of weak tear strength across said panels extending between said side edges and displaced from one of said longitudinal edges to form a tear strip along said one longitudinal edge, said apparatus comprising: conveyor means movable along a fixed path, holding means on said conveyor for grasping said panels firmly in an area outside of said tear strip, a stripping member adapted to grasp said panels at a portion of said tear strip, carrier means for moving said stripping member into said fixed path and then away therefrom, and actuating means for operating said stripping member during movement thereof to grasp said tear strip and separate it from said panels.

2. The apparatus defined by claim 1 wherein said conveyor means moves along a lineal path and wherein said carrier means includes a rotating member carrying said stripping member along a circular path, a tangent of which is parallel to said lineal path.

3. The apparatus defined by claim 1 wherein said conveyor means moves along a lineal path and wherein said carrier means includes a rotating member carrying said stripping member along a circular path, a tangent of which is parallel to said lineal path, and wherein said actuating means comprises an arcuate cam member disposed along said circular path and engageable with said stripping member for forcing said stripping member to grasp said panels approximately when it reaches said tangent.

4. Apparatus for opening an envelope having front and back panels with common longitudinal and side edges, and means forming lines of weak tear strength across said panels extending between said side edges and displaced from one of said longitudinal edges to form a tear strip along said one longitudinal edge, said apparatus comprising: conveyor means movable along a fixed path, holding means on said conveyor means for grasping said panels firmly in an area outside of said tear strip, a pair of flexible discs mounted for rotation in spaced relationship on opposite sides of the fixed path and adapted to grasp said panels along the tear strip between adjacent circumferential margins of the discs, and actuating means for operating said flexible discs during movement thereof to grasp said tear strip and separate it from the panels.

5. The apparatus defined by claim 5 wherein said actuating means includes rollers cooperable with the adjacent circumferential margins of said discs for constraining such margins to define a predetermined path, such a path having a portion thereof wherein respective circumferential portions of said discs are brought into abutting engagement in order to grip a portion of the tear strip.

References Cited

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THERON E. CONDON, Primary Examiner

N. ABRAMS, Assistant Examiner

U.S. Cl. X.R.

53—381; 83—912; 225—100; 229—85

PO-1050
(5/69)

UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,529,756 Dated September 22, 1970

Inventor(s) W. W. SMITH

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Column 6, line 15, after "claim" change "5" to -- 4 --.

Signed and sealed this 21st day of September 1971.

(SEAL)
Attest:

EDWARD M.FLETCHER,JR.
Attesting Officer

ROBERT GOTTSCHALK
Acting Commissioner of Patents