United States Patent [19]

Orrick et al.

[11] **3,797,350**

[45] **Mar. 19, 1974**

[54] **ENVELOPE OPENING APPARATUS**

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[73] Assignee: **United States Envelope Company,** Springfield, Mass.

[22] Filed: **July 27, 1973**

[21] Appl. No.: **383,278**

Related U.S. Application Data

[63] Continuation of Ser. No. 57,045, July 22, 1970, abandoned.

[52] **U.S. Cl.** **83/418,** 83/422, 83/425, 83/912

[51] **Int. Cl.** **B26d 1/20,** B26d 7/06

[58] **Field of Search** 83/49, 355, 418, 422, 912, 83/425

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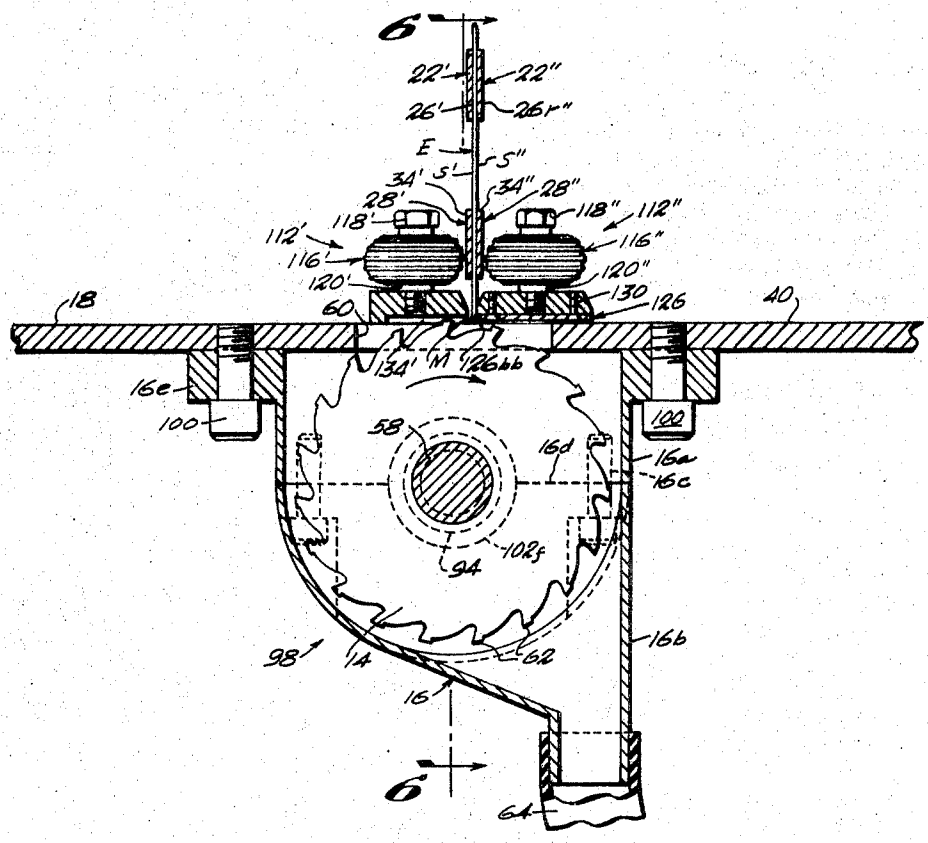
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[57] **ABSTRACT**

Apparatus for opening letter envelope work items or the like, each having a folded edge margin. A supply of envelope work items are clampingly conveyed in successive order by mating belt means and conveyed transversely across the cutting periphery of a circular cutting element which removes the folded edge margin of each envelope item for permitting access to the envelope contents.

6 Claims, 7 Drawing Figures



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SHEET 1 OF 3

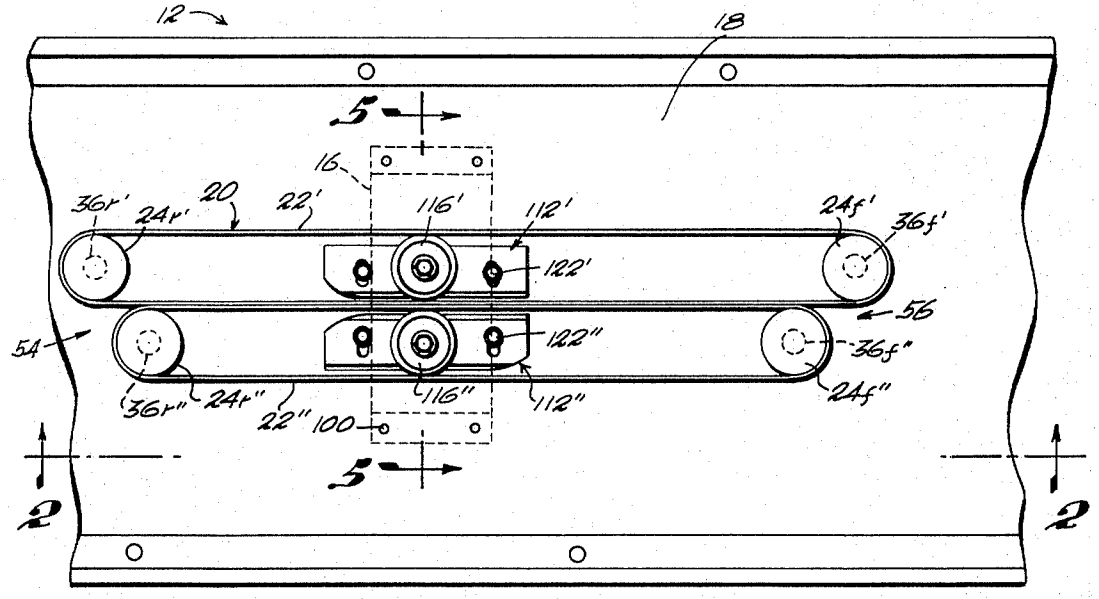


Fig. 1

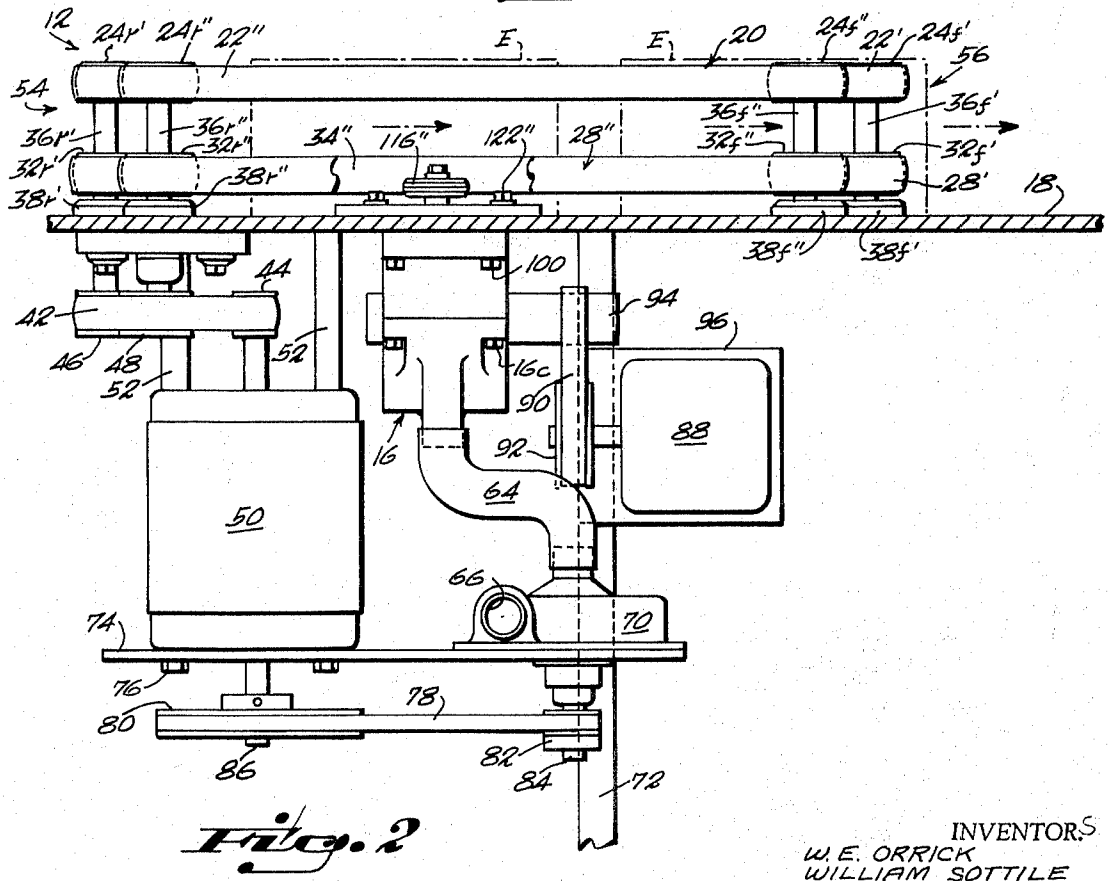


Fig. 2

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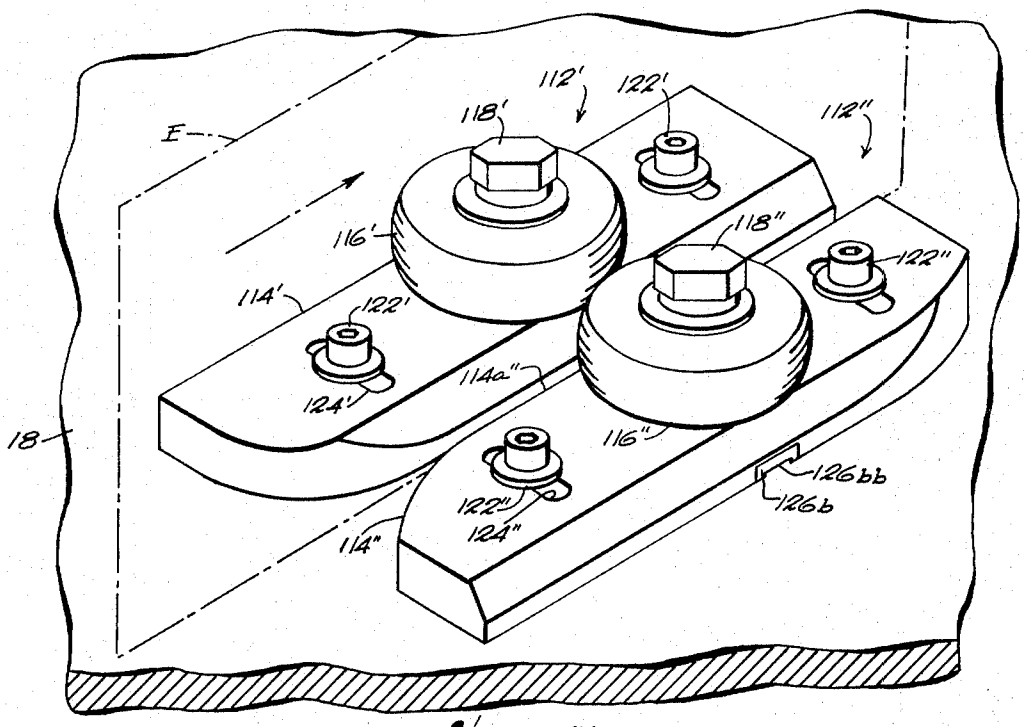


Fig. 3

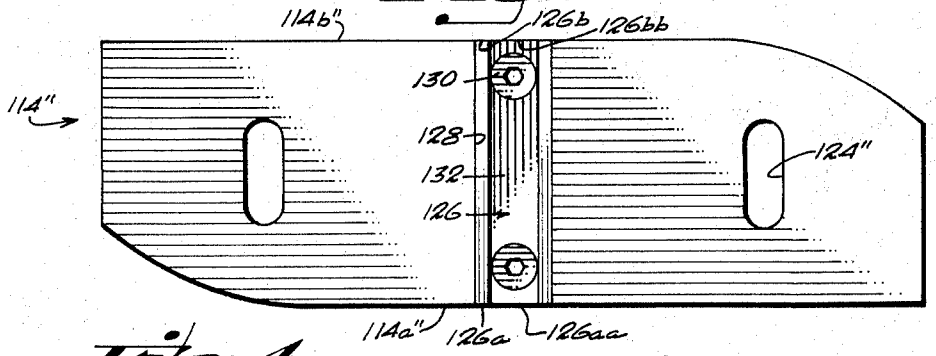


Fig. 4

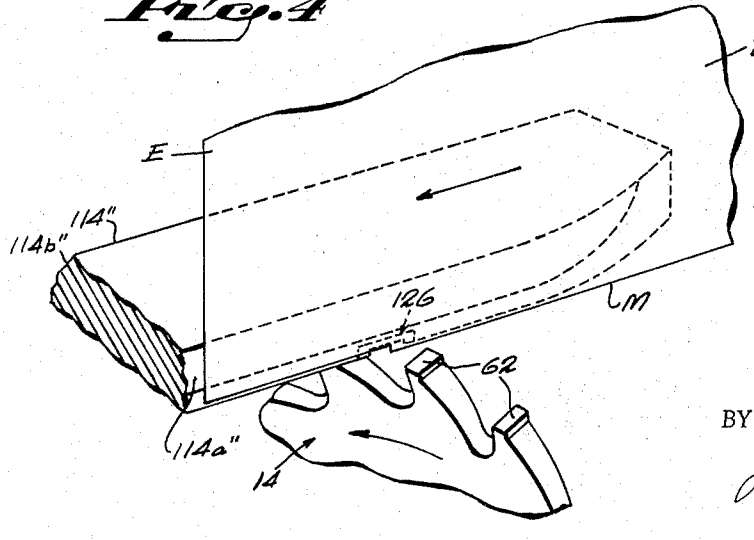


Fig. 7

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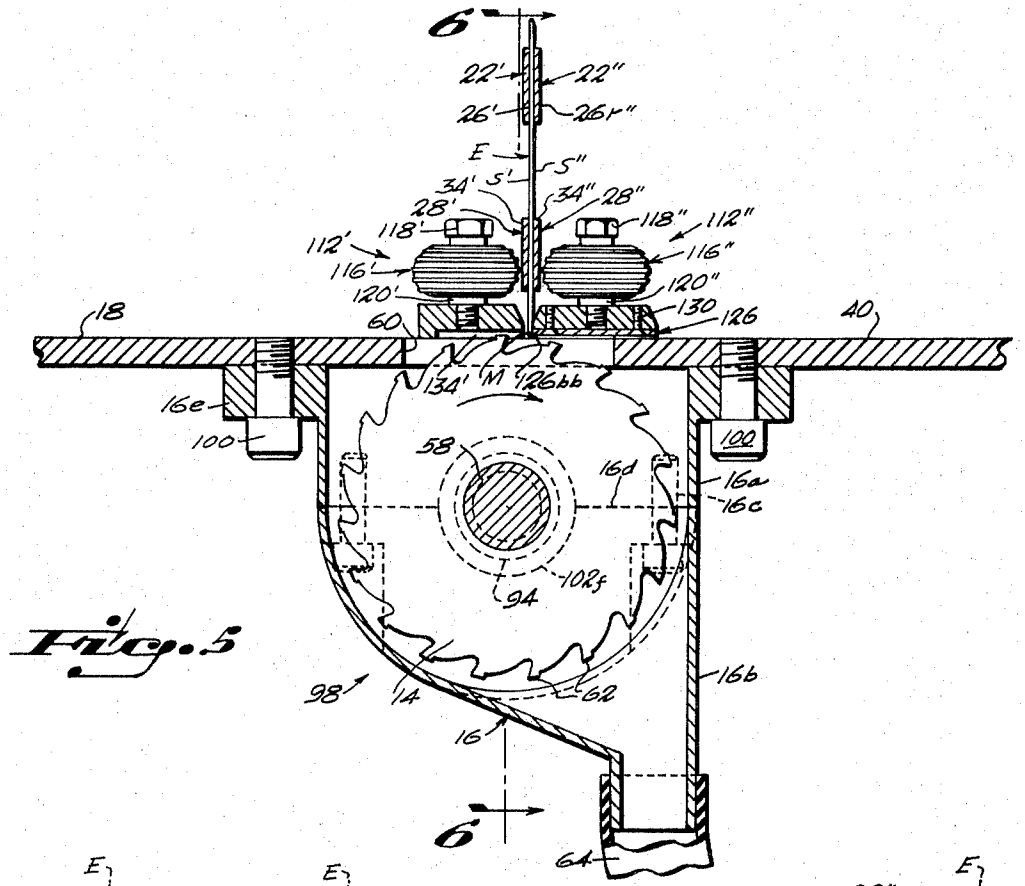


Fig. 5

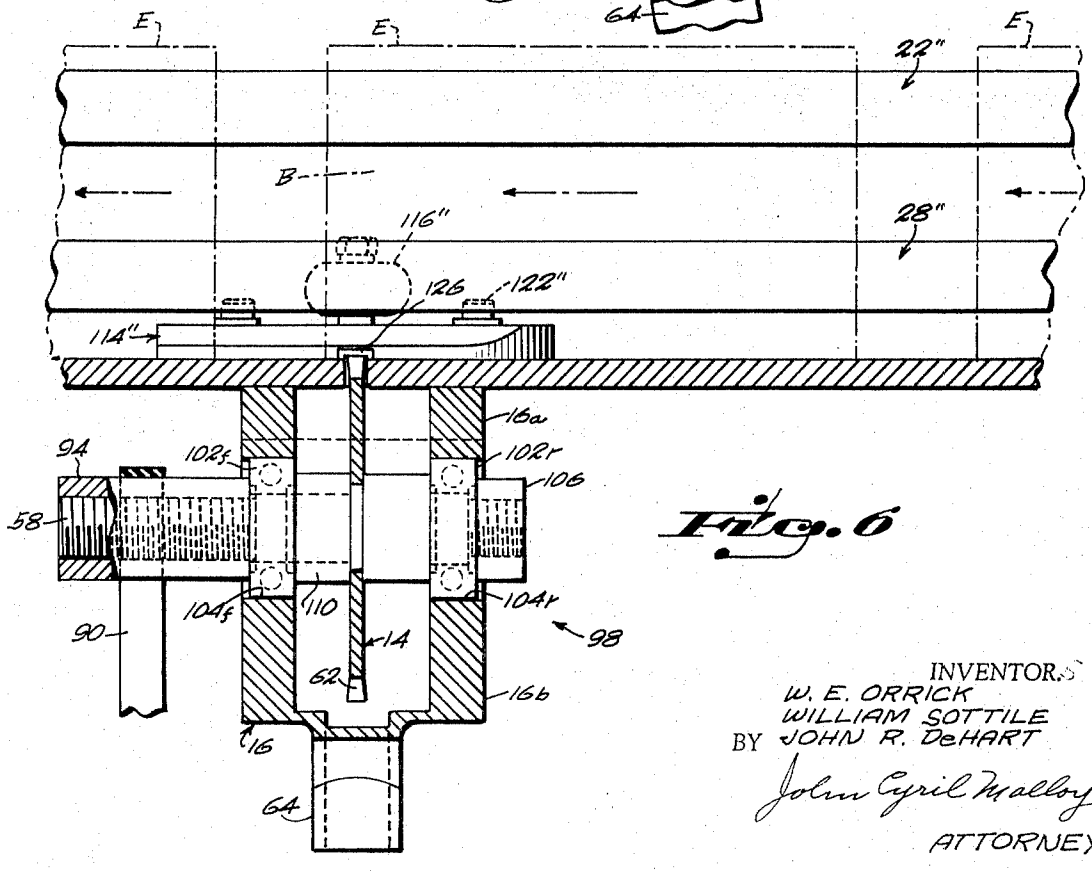


Fig. 6

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ENVELOPE OPENING APPARATUS

This is a continuation of application Ser. No. 57,045, filed July 22, 1970, and now abandoned.

This invention relates to envelope opening apparatus generally and particularly relates to such apparatus operative for successively opening a supply of envelopes by edging or removing a fold edge margin of each envelope.

Apparatus for rapidly successively opening letter envelopes or the like have been developed and marketed in the past, however, various disadvantages are noted in the design and operation of the prior art machines: The typical letter opening apparatus is of substantially complex design and operation and may include complicated electronic components or the like subject to malfunction. In the operation of the prior art letter opening apparatus, an envelope work item may be mishandled in the envelope-opening process and jam the apparatus, resulting in work stoppage or downtime for clearing the apparatus. Moreover, the envelope work item jamming the machine and the succeeding work items may be mutilated or damaged along with the envelope contents. Such occurrences may necessitate additional time and effort in repairing or replacing the envelope or envelope contents with the resulting additional expense involved. The complicated design and electronic circuitry of certain prior art apparatus also requires the services of experienced, highly skilled personnel in the operation and maintenance of such apparatus resulting in substantially high operating cost for such apparatus.

A principal object of the instant invention is to provide an envelope opening apparatus which is uniformly consistently operative in successively opening a supply of envelopes.

A further object is to provide envelope opening apparatus of substantially simple mechanical design, and such apparatus which does not include complicated electronic components or the like subject to malfunction.

A further object is to provide envelope opening apparatus which is easy to operate and which may be attended by an operator of negligible skill or practice.

A further object is to provide rapidly operative direct acting letter opening apparatus which substantially obviates mishandled envelope work items and resulting work stoppage or downtime resulting from such occurrences.

A further object is to provide such apparatus which substantially obviates damage or mutilation to the envelope work items during the envelope opening process.

A further object is to provide envelope opening apparatus of mechanically simple durable design and construction, admitting of economical manufacture and marketing.

In the drawings:

FIG. 1 is a top plan view of the envelope opening apparatus of the instant invention;

FIG. 2 is a longitudinal sectional view of the apparatus taken as on the line 2—2 of FIG. 1;

FIG. 3 is a perspective view of the envelope guide and crowder means of the apparatus;

FIG. 4 is a bottom view of an envelope guide element of the apparatus;

FIG. 5 is an enlarged transverse sectional view, taken as on the line 5—5 of FIG. 1, and illustrating the circular saw means of the invention and the envelope carrier belts and guide means;

FIG. 6 is a longitudinal sectional view taken as on the line 6—6 of FIG. 5; and

FIG. 7 is a perspective fragmentary view of the envelope edging means of the invention and illustrating an envelope work item in a partially edged or opened configuration.

The envelope opening apparatus is designated by numeral 12 and primarily includes a circular saw element 14, saw housing structure 16 dependingly supported on the underside of horizontal planar support structure 18, and includes envelope carriage means 20 adapted for guidingly conducting in edgewise successive order a series of envelope work items E and guidingly conducting the lower folded edge margin M of each envelope E across the cutting periphery of the circular saw element 14 (see FIGS. 5, 6 and 7).

The envelope carriage means 20 preferably includes an upper pair of flat belts 22′, 22″ drivingly supported on pulley means 24*f*′, 24*r*′; 24*f*″, 24*r*″ and defining confronting belt reach portions 26′, 26″. The carriage means 20 includes also a lower pair of flat belts 28′, 28″ drivingly supported respectively on pulleys 32*f*′, 32*r*′; 32*f*″, 32*r*″ and defining respectively mating belt reach portions 34′, 34″. The upper and lower pairs of flat carrier belts 22′, 22″; 28′, 28″ are runningly supported on the respective pulley means, fixedly secured in turn on respective vertical shaft means 36*f*′, 36*f*″; 36*r*′, 36*r*″. The forward pulley means 24*f*′, 24*f*″; 32*f*′, 32*f*″ are idly journalled respectively to the vertical shaft means 36*f*′, 36*f*″, fixedly secured respectively in pedestal structure 38*f*′, 38*f*″ fixedly secured in turn on the upper surface 40 of the horizontal support structure 18. The rearward shaft means 36*r*′, 36*r*″ provide the drive shaft structure for the belt pairs 22′, 22″; 28′, 28″, and are turnably supported respectively in bearing pedestals 38*r*′, 38*r*″ fixedly supported on the upper surface 40 of the horizontal support structure. Drive belt and pulley means 42; 44, 46, 48, driven by electric motor means 50, simultaneously rotate the vertical shaft structure 36*r*′, 36*r*″ and correspondingly drives the upper and lower belt pairs 22′, 22″; 28′, 28″. The electric motor 50 is dependingly supported to the underside of the horizontal support structure 18 by vertical truss rods 52, 52.

Although the drive belt and pulley means 42, 44, 46, 48, driving the vertical shaft means 36*r*′, 36*r*″ is not specifically shown in the drawings, it will be understood that the particular configuration of the belt and pulley means 42, 44, 46, 48 are arranged for providing contra-directional rotation respectively of the vertical shaft means 36*r*′, 36*r*″ and respectively counterclockwise and clockwise simultaneous rotation rspectively of the flat belt means 22′, 28′; 22″, 28″, as viewed in FIGS. 1 and 2. The configuration permits the reach portions 26′, 26″; 34′, 34″ respectively of the upper and lower belt pairs 22′, 22″; 28′, 28″ to simultaneously move forwardly along a vertical plane of movement and to clampingly convey a series of envelope work items E from the infeed side 54 to the outfeed side 56 of the apparatus. The belt reach portions 26′, 28′; 26″, 28″ respectively of the belts 22′, 28′; 22″, 28″ simultaneously engage respectively opposite envelope side surfaces S′, S″ and operatively successively convey a se-

ries of envelopes intermittently across the cutting periphery of the circular saw element **14** (see FIGS. 1 and **5**).

The circular saw element **14** is supported on shaft structure **58** transversely arranged of the carrier belts **22', 22''; 28', 28''**; the saw element **14** is arranged with its upper periphery received in a slot opening **60** formed in the planar support structure **18** and in a disposition whereat the extreme cutting periphery of the teeth **62** of the saw element project slightly above the upper surface **40** of the planar support structure. Each envelope work item is edgewise conveyed and with its lower folded edge margin M runningly engaging the upper surface **40** of the horizontal support structure. As each work item intersects the upper extremity of the cutting periphery of the saw element **14,** saw teeth **62** sever the fold edge M of the envelope body B (see FIGS. **6** and **7**).

The envelope sawdust or waste material from the cutting element **14** is conducted through the housing **16,** and a conduit **64,** and through the discharge opening **66** of a centrifugal fan unit **70.** Vertical and horizontal support structure **72, 74,** fixedly supported respectively on the horizontal planar support structure **18** and the housing of electric motor **50,** stationarily mount the centrifugal fan **70** on a vertical axis. The horizontal support member **74** is of elongate plate configuration and is fixedly secured to the motor housing by nut means **76, 76** threadedly engaging the lower end portions of truss rods **52, 52.** Drive belt and pulley means **78, 80, 82,** drivingly connect the impeller shaft **84** of the fan **70** to the output shaft **86** of the motor **50.** An electric motor **88** drives the circular cutting element **14** through belt and pulley means **90; 92, 94.** The motor **88** is fixedly supported on a horizontal axis by a mounting plate **96** fixedly secured to the vertical support **72.**

The circular saw assembly, as indicated by numeral **98,** preferably is of the form illustrated in the drawings; the saw housing **16** preferably is of two part configuration, including an upper and a lower housing section **16***a*, **16***b*, fixedly secured together by cap screws **16***c* along a horizontal plane of intersection **16***d* (see FIG. **5**). A plurality of screw elements **100** extend respectively upwardly through external flange structure **16***e* of housing section **16***a* and threadedly engage the planar support structure **18.** The saw assembly **98** is dependingly supported on the underside of the planar support structure with the upper periphery of the saw received in the slot opening **60** formed in the support structure. The saw shaft **58** preferably is journalled in radial ball bearing means **102***f*, **102***r* friction-fitted respectively in apertures **104***f*, **104***r* defined by mating semi-circular bearing recesses formed in the upper and lower saw housing portions **16***a*, **16***b*. A nut **106** is threaded on the rearward end of the saw shaft **58** and clampingly secures the bearing **102***r* against a shoulder portion **108** of the shaft. The pulley **94** is of threaded nut form and is threadedly fixed on the forward end portion of the saw shaft **58.** The pulley **94** clampingly secures the bearing **102***f* against a spacer member **110,** which in turn clampingly secures the saw element **14** against the shoulder portion **108** of the saw shaft.

The letter opening apparatus preferably includes a left envelope guide and crowder assembly **112'** and a right envelope guide and crowder assembly **112''**. The left and right envelope guide and crowder assemblies **112', 112''** are arranged in corresponding relation and superjacently transversely symmetrically of the circular cutting element **14.** The left and right assemblies **112', 112''** include respectively guide plate elements **114', 114''** having respectively inner and outer edge portions **114***a'*, **114***b'*; **114***a''*, **114***b''*, and respectively crowder roller elements **116', 116''** turnably mounted respectively to the guide plate elements **114', 114''** by vertical bearing pin means **118', 118''** threadedly engaging the respective guide plates; the threaded shoulder portions **120', 120''** of the bearing pins **118', 118''** fixedly secure respectively the bearing pins to the guide plates **114', 114''** and journal respectively the crowder rollers **116', 116''** in horizontal generally coplanar relation.

The crowder rollers **116', 116''** preferably are provided respectively with resilient circular tread structure for resiliently engaging mating reach portions **34', 34''** respectively of the lower pair of carrier belt members **28', 28''**. The left and right guide and crowder assemblies **112', 112''** are adjustably mounted respectively by cap screw elements **122', 122''** threadedly fitted in the planar support structure **18;** the cap screw elements **122', 122''** are received respectively in slotted apertures **124', 124''** formed respectively in the guide plates **114', 114''**. Turnably manipulating the cap screws **122', 122''** permits lateral adjustment respectively of the guide and crowder assemblies **112', 112''** and corresponding adjustment of the assemblies relative to the carrier belt means and the path of the envelope work items.

The guide and crowder assemblies **112', 122''** are of somewhat different design particularly in that the guide plate **114''** of assembly **112''** functions as fender or fence means in guiding the envelopes E and in receiving the tangential cutting thrust of the saw element **14.** As may well be appreciated, the inner edge **114***a''* of the guide plate **114''** receives substantially the total cutting thrust of the saw element **14,** and with extended operation of the apparatus, the inner edge **114***a''* may be worn away by friction of the passing envelope work items: the guide plate **114''** preferably is of symmetrical form longitudinally and laterally thereof for permitting adjustment manipulation of the guide plate and for changing positions of the inner and outer edge portions **114***a''*, **114***b''*. By removal and reinsertion of the cap screws **122''**, the right envelope guide and crowder assembly **112''** may be turned end for end, for arranging an unused outer edge **114***b''* of the guide plate on the inner side thereof when the inner edge **114***a''* is worn away in use.

The right envelope guide and crowder assembly **112''** also preferably includes anvil means **126** transversely fitted in the underside of the guide plate **114''** and defines shear edge means adapted for shearing cooperation with the circular series of cutting teeth **62** of the saw element **14.** The anvil member **126** is generally of bar-like inverted U transverse section, and is snugly fitted in a grooveway **128** formed transversely in the underside of the guide plate **114''** by a pair of flush head screws **130.** The anvil member **126** extends coextensive with the width of the guide plate **114''** and the opposite end surfaces respectively of the anvil define opposite vertical face surfaces **126***a*, **126***b* arranged generally flush respectively with the inner and outer vertical surfaces **114***a''*, *b''* of the guide plate. The recessed horizontal undersurface **132** of the anvil **126** intersects at opposite end portions thereof the vertical

face surfaces 126*a*, 126*b* and defines the horizontal shearing edges 126*aa*, 126*bb*, each being selectively positionable for coaction with the circular saw teeth 62. As may well be appreciated, when the right guide and crowder assembly 112'' is turned end for end, as for example, when arranging the guide edge 114*b* contiguous to the carrier belt reach 34'', the shear edge 126*bb* of the anvil will likewise be turned to a disposition contiguous to the carrier belt reach and to a disposition for shear-cutting action with the teeth 62 of the circular saw.

Also, the location of the guide plate 114'' is such that the active one of the vertical surfaces 114*a*'' and 114*b*'', that is, the one facing the other guide plate 114', is located in a vertical plane parallel to and spaced from the vertical plane containing the axis of rotation of the cutter 14, as seen in FIG. 5. Therefore, by adjusting the guide plate 114'' laterally, toward or away from the other guide plate 114', as permitted by the cap screws 122'' and slots 124'' and as previously described, the spacing between the cutter teeth 62 and the active horizontal shearing edge 126*aa* or 126*bb* may be adjusted to provide that spacing which yields optimum shearing action on the envelope work items. Further, the offset of the vertical guide surface 114*a*'' or 114*b*'' from the plane containing the axis of cutter rotation causes the shearing of the work items to take place at a point on the cutter periphery at which the cutter teeth have a component of downward movement, as evidenced from FIG. 7. As a result the shearing action exerts a downwardly directed force on each work item tending to hold it in place on the upper surface of the support 18, thereby inhibiting tipping of the work item and assuring cutting of its edge margin to the desired depth.

The left envelope guide and crowder assembly 112', or particularly the guide plate structure 114' thereof, is of asymmetrical form and is not intended to be turned end for end for presenting a new wear surface as does the right guide and crowder assembly 112''. During operation of the envelope opener apparatus, there is negligible wear on the inner edge 114*a*' of the guide plate 114' and thus the left guide and crowder assembly 112' may be maintained at an optimum setting indefinitely. The guide plate 114' is provided with a transverse recessed undersurface 134' for permitting free passage of the cutting periphery of the circular saw element.

In operation, a series of envelope work items E are individually successively introduced simultaneously between the belt reach portions 26', 26'', 28', 28'' and on the infeed side 54 of the apparatus. The envelopes are clampingly conveyed between the belt reach portions and with the lower folded edge margin M of each envelope being slidably conveyed along the upper surface 40 of the horizontal support structure 18. The cutting periphery of the circular saw protrudes slightly above the planar surface 40 of the support structure and as each envelope passes across the cutting periphery of the saw, the lower fold margins M of the series of envelopes are removed, providing access to the envelope contents.

While the instant invention is shown and described in an embodiment presently conceived as being a preferred embodiment, various changes and modification in the structure may be made without departing from the spirit and scope of the invention.

What is claimed is:

1. Apparatus for opening in successive order a supply of sealed envelope work items or the like, each having a folded edge margin, the apparatus comprising a circular cutter driven on a horizontal axis so that said cutter rotates in a vertical plane, said cutter having a circular series of unidirectionally oriented cutting teeth on its outer periphery, envelope carriage means adapted for guidingly conducting in edgewise successive order a supply of envelopes along a generally horizontal path lying generally crosswise of the plane of rotation of said circular sawing element, said carriage means including means for guidingly conducting said folded edge margin of each work item longitudinally of itself and in a path crosswise intersecting the cutting periphery of said cutter to a depth radially of said cutter sufficient substantially only for removing said folded edge margin of each work item, and an anvil means for cooperation with said cutting teeth of said cutter, said anvil means providing a generally horizontal shearing edge and a generally vertical surface extending upwardly from said shearing edge, said shearing edge and said generally vertical surface of said anvil means being located in a vertical plane spaced from the vertical plane containing said axis of cutter rotation with said generally vertical surface facing said vertical plane containing said axis of cutter rotation whereby said cutting teeth of said cutter as they pass said shearing edge of said anvil means have a downwardly directed component of movement.

2. The apparatus as set forth in claim 1 further characterized by means for adjustably positioning said anvil means in a horizontal plane toward and away from said vertical plane containing said axis of cutter rotation to adjustably vary the spacing between said shearing edge of said anvil means and said teeth of said cutter.

3. The apparatus as set forth in claim 1 further characterized by said carriage means including a stationary horizontal guide plate having a first planar vertical edge surface facing said vertical plane containing said axis of cutter rotation and arranged adjacent said path of said work items so as to engage the lower margin of each work item conducted along said path, said anvil means being part of said guide plate and said shearing edge of said anvil means being located in the plane of said first vertical edge surface of said guide plate.

4. The apparatus as set forth in claim 3 further characterized by said guide plate having a second planar vertical edge parallel to said first planar vertical edge, said anvil means providing a second shearing edge located in the plane of said second vertical edge, and means for alternatively fixing said guide plate to the remainder of said apparatus with either said first vertical surface thereof or said second vertical surface thereof adjacent said path of said work items.

5. The apparatus as set forth in claim 3 further characterized by said anvil means comprising an anvil member separate from the remainder of said guide plate, said anvil member being of inverted U-shape in transverse section, and said remainder of said guide plate having a downwardly facing grooveway receiving said anvil member.

6. The apparatus as set forth in claim 3 further characterized by said anvil means comprising an anvil member separate from the remainder of said guide plate, said anvil member extending transversely of said guide plate from said first to said second planar vertical edges thereof and defining both of said two shearing edges.

* * * * *

UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,797,350 Dated March 19, 1974

Inventor(s) W.E. Orrick, William Sottle and John R. DeHart

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

Col. 2, line 56, "rspectively" should read --respectively--

Col. 4, line 65, "114a" ,]b" " should read --114a" , 114b" --

Col. 6, line 48, after each occurrence of "edge" insert --surface--

line 50, after "edge" insert --surface--

line 52, after "vertical" insert --edge--

line 53, after "vertical" insert --edge--

line 62, "claim 3" should read --claim 4--

line 66, cancel "edges" and substitute --edge surfaces--

Signed and sealed this 17th day of September 1974.

(SEAL)
Attest:

McCOY M. GIBSON JR.
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents

FORM PO-1050 (10-69)

USCOMM-DC 60376-P69
* U.S. GOVERNMENT PRINTING OFFICE : 1969 O—366-334.