May 9, 1939. E. J. DUMMER ET AL 2,157,232

ENVELOPE OPENING MACHINE

Original Filed Dec. 24, 1936 2 Sheets-Sheet 1

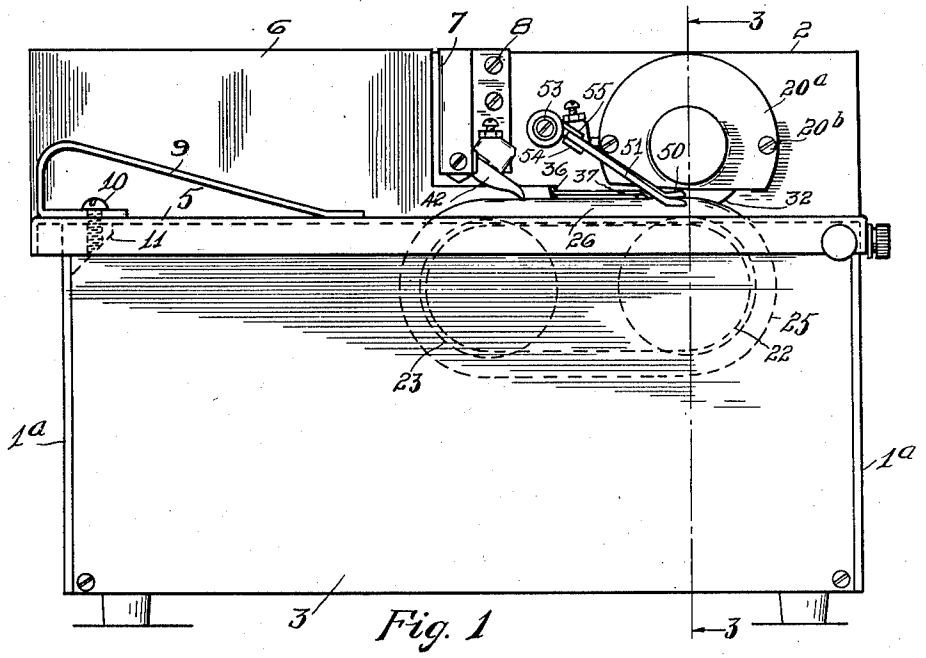

Fig. 1

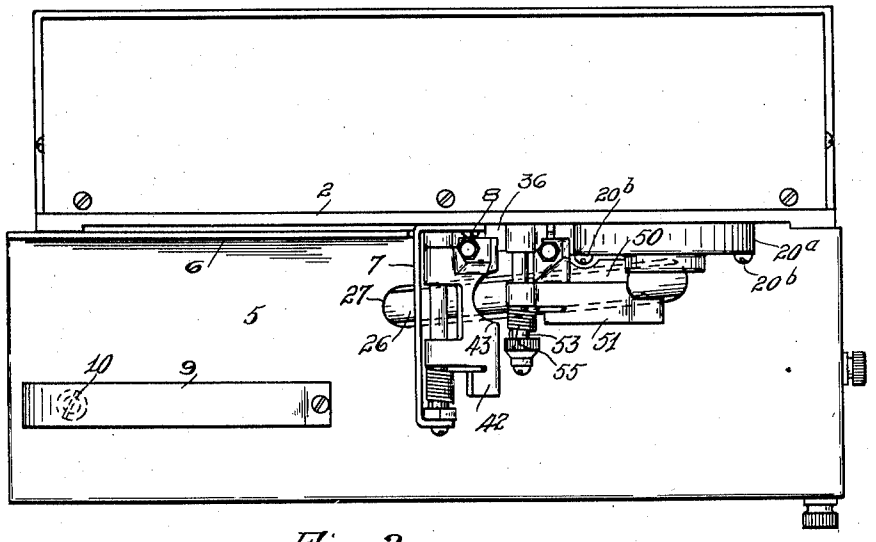

Fig. 2

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Fig. 3

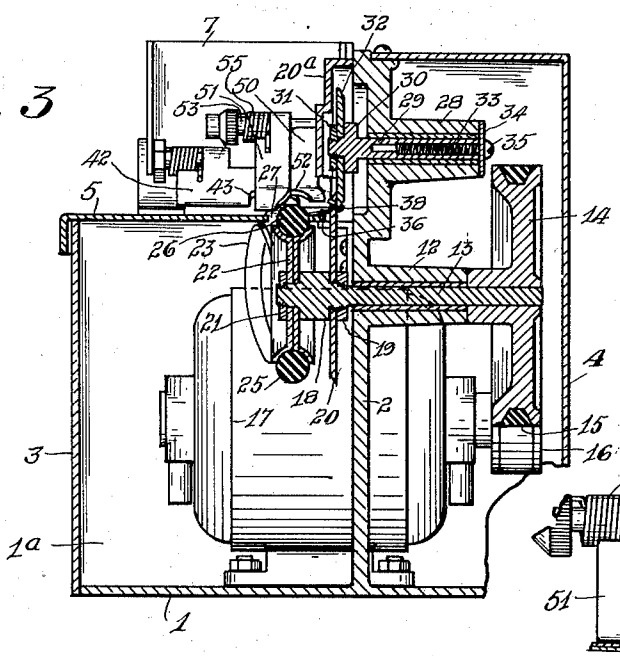
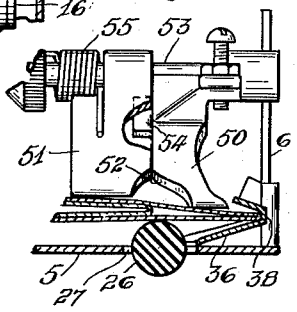


Fig. 5



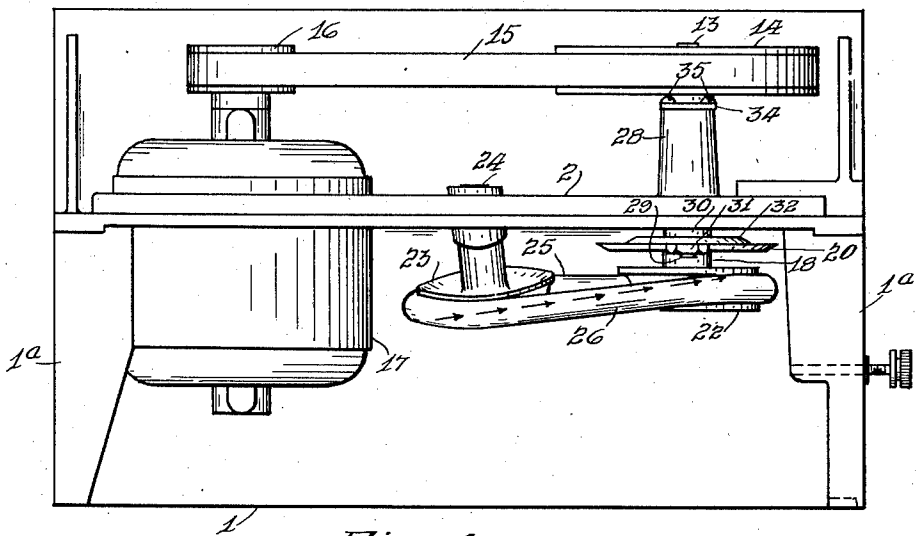


Fig. 4

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UNITED STATES PATENT OFFICE

2,157,232

ENVELOPE OPENING MACHINE

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Original application December 24, 1936, Serial No. 117,486. Divided and this application January 22, 1938, Serial No. 186,357

2 Claims. (Cl. 164—61)

Our present invention relates to paper feeding and cutting machines and more particularly to envelope or mail opening machines of the type in which the letters either piled or singly may be run rapidly through and one of their marginal edges neatly slit to just remove the fold without injuring the contents, and it has for its object to provide a simple, efficient and improved machine of this character that may be conveniently operated at high speed and capacity and yet with surety of accurate performance.

This application is a division of our prior application, Serial No. 117,486, filed December 24, 1936, in which other features of the machine are disclosed and claimed, but the improvements herein concerned are restricted to the feeding mechanism whereby the envelopes are rapidly passed in succession past the cutting means and ejected from the machine. They relate to the provision of means adapted to withstand the wearing effects of the envelopes that will function to hold the envelope securely against its guide at the cutting point so that the cut or shear will be uniform at all times and each envelope will be completely opened along the full extent of one edge but with such a nicety that the contents will not be threatened with damage.

To these and other ends, the invention resides in certain improvements and combinations of parts, all as will be hereinafter more fully described, the novel features being pointed out in the claims at the end of the specification.

In the drawings:

Fig. 1 is a front elevation of a letter opening machine constructed in accordance with and illustrating one embodiment of our invention;

Fig. 2 is a top plan view thereof;

Fig. 3 is a vertical section taken substantially on the line 3—3 of Fig. 1 and viewed in the direction of the arrows;

Fig. 4 is a top plan view similar to Fig. 2 but with the bed plate and casing shell removed to disclose interior parts, particularly in the mounting of the feed belt; and

Fig. 5 is an enlarged detail sectional end view of the presser feet illustrative of their action on a passing envelope.

Similar reference numerals throughout the several views indicate the same parts.

Referring more particularly to the drawings, 1 indicates a preferably cast base having end walls 1a and a partition-like central framework 2 rising therefrom. At the front is suitably secured a cover plate 3 and at the rear a cover plate 4 together constituting a casing within which the interior mechanism is housed. At the front a shelf-like plate 5 constitutes the bed along which the envelopes are fed and operated upon. Rising from the rear wall of this bed plate at the left end thereof in Fig. 1 is a flange 6 constituting a general rear guide wall. A transversely extending vertical plate 7 has a flange by which it is secured to the frame 2 at 8 and constitutes a gate beneath which the envelopes are fed. They are stacked on this left hand or feed end of the bed plate 5 in an inclined pile, the regularity of which is established by the guide wall 6 and the said gate 7. The downward inclination of the feed of the lower envelope is established by a shed 9 secured to the table by a screw 10 passing therethrough and into a lug 11 on the adjacent base end 1a.

At the right hand end of the table, the frame 2 is provided with a bearing 12 in which turns a shaft 13 having at its rear end a driven pulley 14 and belt 15 by which it is turned from the driving pulley 16 of a motor 17 mounted on the base. The shaft 13 extends through the frame partition 2 and at its forward end is a hub 18 against the rear side of which is clamped securely by a nut 19 a slitting knife 20. A housing 20a open sufficiently at the bottom only to admit a guiding means and the envelopes, covers and protects this knife, the same being held to the frame wall 2 by screws 20b. Against the front side of the hub is similarly secured by a nut 21 a grooved pulley 22. Another grooved idler pulley 23 is mounted on a stud 24 on the frame partition 2 and over the two pulleys passes an endless feed belt 25. This feed belt is preferably of rubber and circular in cross section. Its upper reach 26 travels in slot 27 on the bed plate 5 and projects just partially above the same so as to take sure frictional contact with an envelope on the bed while the latter is still maintained in a substantially flat condition.

Above the bearing 12 is a similar bearing 28 on the frame 2 containing a stud shaft 29. On the outer or forward end of this stud is a hub 30 against which there is clamped by a nut 31 an upper companion slitting knife 32 cooperating in the overlapping manner best shown in Figs. 3 and 5 with the driven knife 20. The stud 29 is hollow and contains a spring 33 that reacts against a plate 34 secured to the end of the bearing box by two screws 35. The knife 32 is thus urged forwardly continuously by the spring against the driven knife 20 to itself be frictionally driven by the latter.

As best shown in detail in Fig. 5, an extension 36 on the end of the back plate or guide 6 of the bed plate 5 projects toward the knives and has a tapered end 37 that enters between them at their intersection running as closely as possible to the bite or cutting point of the blades. This extension is V-shaped in cross section, but the bottom at the inside apex is definitely flat, as indicated at 38 in Fig. 5, lies in the plane of the guide wall 6 and this plane is sufficiently back of the cutting plane defined by the contacting surfaces of the knives to cut off the fold of the envelope edge back the desired distance.

As so far described, in operation, the under most letter of a pile squared against the back wall 6 and the gate 7 touches or is urged by the operator against the belt 25. It is carried under the gate and the frictional hold of the belt thereon causes it to overcome the retarding influence of a spring finger 42 on the far side of the gate having a notch 43 therein (Fig. 2) to accommodate the belt. The finger has a rounded lower edge which, however, arrests the envelope next above until the first one, whose frictional contact might otherwise carry it with it, has passed on. This adjacent one in turn contacts the superior friction of the feed belt and is next fed forward. The latter carries each envelope along the edge guide through the knives which slit the fold thereof and then it passes out at the right end of the machine in opened condition.

At the cutting point, the envelope is held to the knives in one construction by compressor feet 50 and 51, best shown in Figs. 1, 3 and 5. These are jointly notched at 52 to span the feed belt and are pivoted upon a stud 53 projecting from the vertical frame piece 2. The inner foot 50 is provided with a lug 54 engaging beneath the foot 51. The latter is pressed downwardly by a spring 55 coiled about the stud so that through the lug it also presses down companion foot 50 although the latter may rise independently.

It is, of course, important that as the envelope enters the knives its edge should be firmly and evenly pressed against the wall 38 of the edge guide so that the fold thereof will be uniformly and evenly sheared off to exactly the desired extent. This, in the practice of our present invention, is insured by the following provisions: In the first place, the direction of travel of the upper reach 26 of the belt is not strictly longitudinally of the bed but converges inwardly from pulley 23 to pulley 22. In addition to this, the axis of pulley 23 is cocked in two planes intersecting the plane of the axis of pulley 22, as clearly appears in Fig. 4, that is, the stud is tilted downwardly and also laterally bringing the pulleys out of line on two angles. The result is that the reach 26 of the belt twists or rotates on its own geometrical axis toward the knives as it passes from the one pulley to the other in the feeding direction, as indicated by the arrows in Fig. 4. Its frictional effect on the envelope is, therefore, both to convey it in a straight path and to urge it laterally toward the knives and against the edge guides 36.

This latter function develops operatively from the fact that the upper reach 26 of the belt extends along and contacts uninterruptedly the entire length of a small envelope and the greater portion of the length of a large envelope. Hence, its frictional effect thereon is uniform and, without tendency to twist in its horizontal plane, the envelope is urged in parallelism to and straight against its cutting guide, the frictional force thereafter maintaining it under some pressure against the guide and just within the cutting plane of the knives.

This cocking of the rear or idle pulley performs another function in constantly and uniformly rotating the belt on the geometric axis of its upper reach. Paper is surprisingly abrasive, especially with respect to rubber. If the belt did not thus rotate and the envelopes travelled constantly on one of its tangetial lines, they would soon wear a flat face thereon, rapidly reducing the necessary degree of projection of the upper reach of the belt above the surface of the bed plate. But with this bodily rotation, such wear is distributed evenly throughout the whole circumferential surface so that the reduction in thickness falls slightly upon all diameters instead of being concentrated upon one.

A belt feed constructed in accordance with our invention will, therefore, be found to increase the life of the belt as well as performing the desired guiding function with respect to the envelope at the cutters.

We claim as our invention:

1. In an envelope opening machine, the combination with a bed, a knife arranged laterally thereof and an edge guide for the envelopes associated with the knife to direct the edge of an envelope in the cutting plane thereof, of an endless conveyor belt having a reach thereof extending along and partially above the surface of the bed, said belt being cylindrical in cross section, a mounting for the belt embodying two pulleys, one of which has an axis cocked in two planes relatively to the cutting plane to give the belt a pronounced rotation on its longitudinal axis while travelling between the pulleys and continuously urge an envelope toward the edge guide, and means for driving the pulleys.

2. In an envelope opening machine, the combination with a bed, a knife arranged laterally thereof and an edge guide for the envelopes associated with the knife to direct the edge of an envelope in the cutting plane thereof, of an endless conveyor belt having a reach thereof extending along and partially above the surface of the bed, said belt being cylindrical in cross section, a mounting for the belt embodying two pulleys, one of which has an axis cocked in two planes relatively to the cutting plane, means for driving the pulleys, a yielding presser foot adapted to engage the edge portion of the envelope at the cutting point, and a companion presser foot adapted to yieldingly engage the body of the envelope so that the envelope is bent around the rotating belt.

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