E. A. BIRCHER.

MACHINE FOR OPENING ENVELOPS.

APPLICATION FILED FEB. 2, 1912.

1,273,318.

Patented July 23, 1918.

3 SHEETS—SHEET 1.

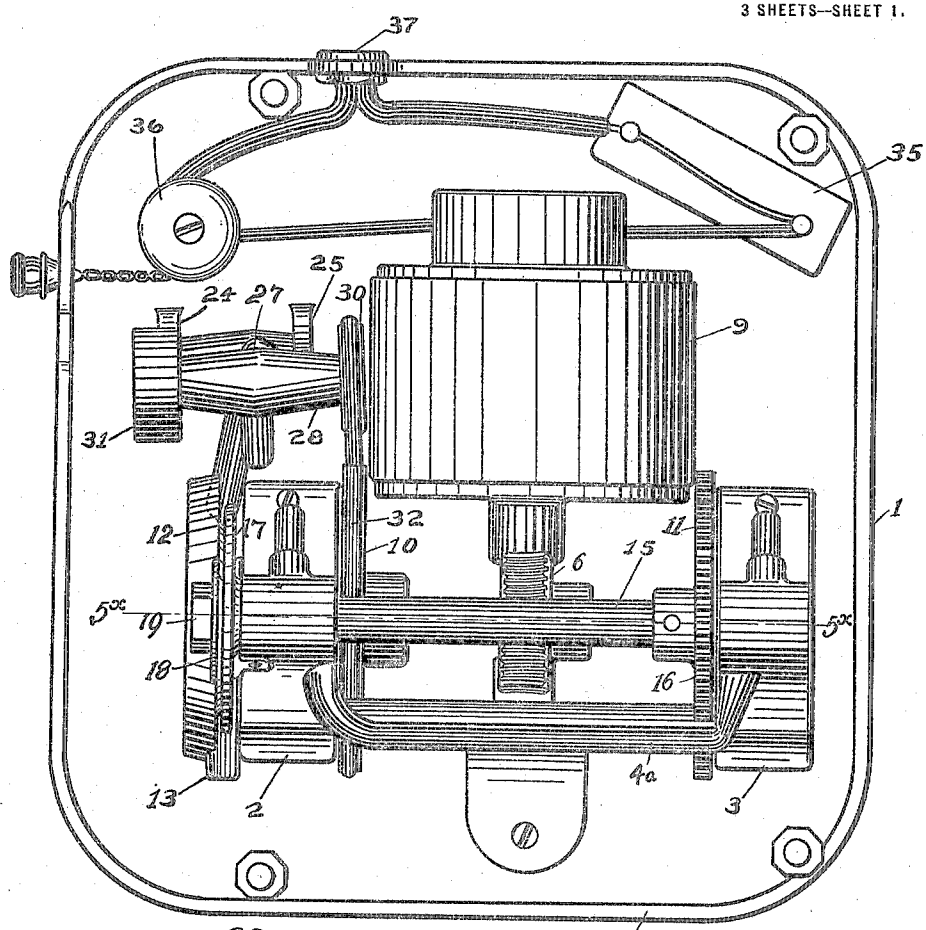


Fig. 1

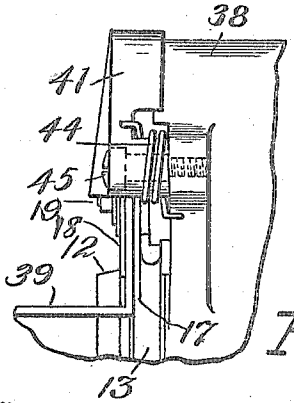


Fig. 6.

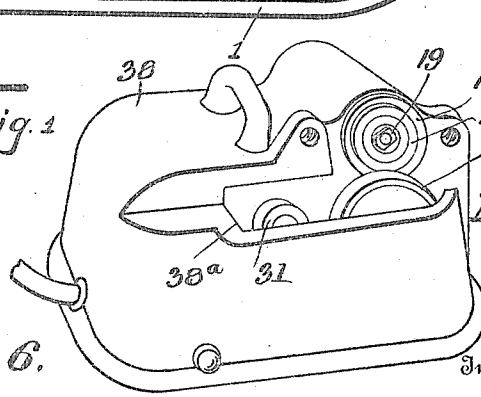


Fig. 7.

Witnesses

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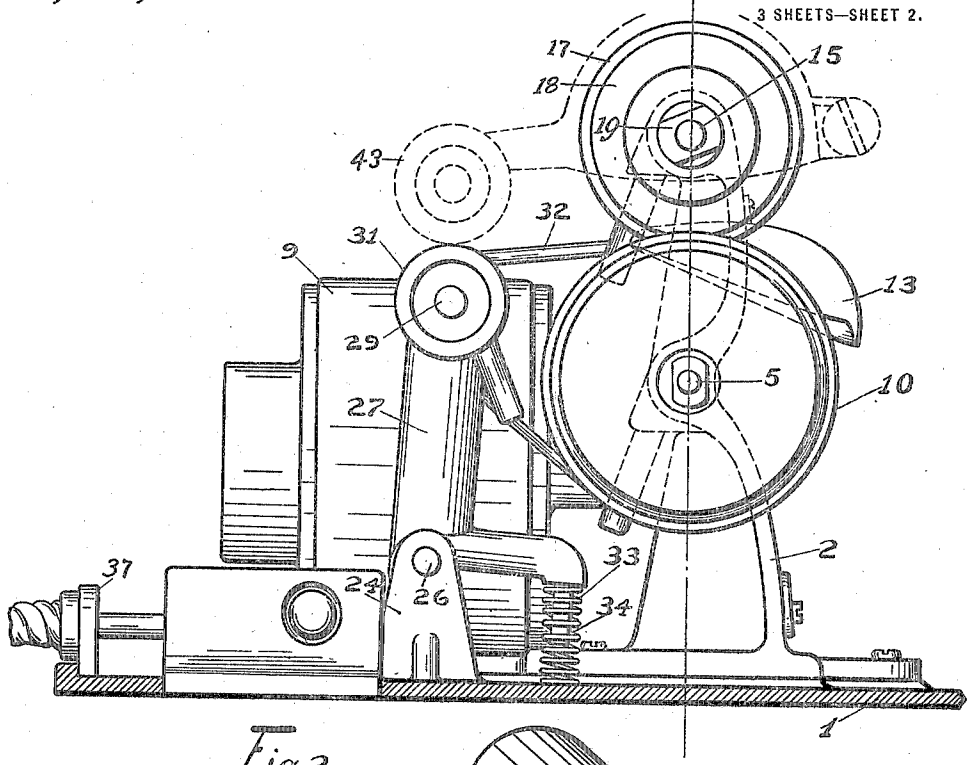


Fig. 2

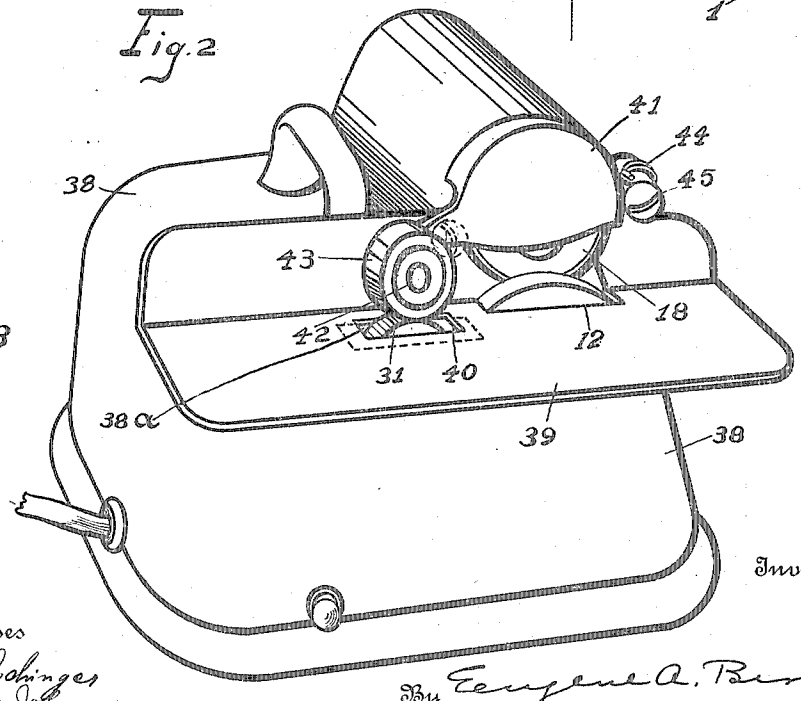


Fig. 3

Witnesses

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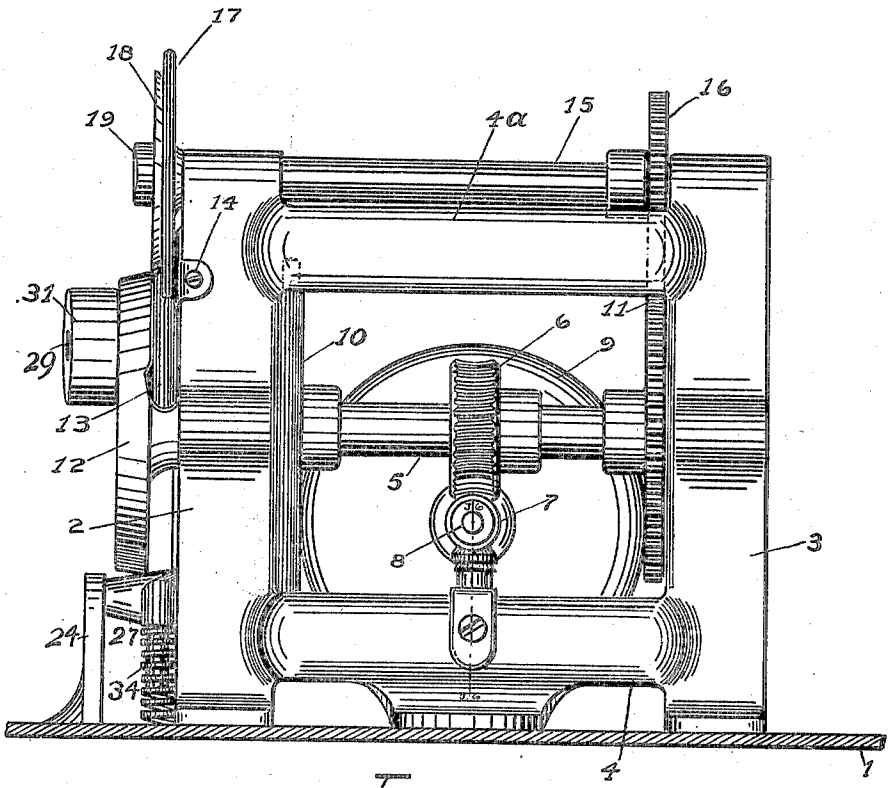


Fig. 4

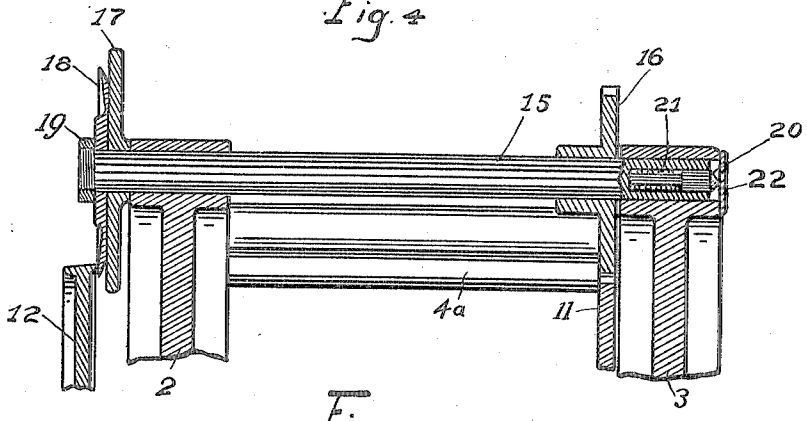


Fig. 5

Witnesses

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UNITED STATES PATENT OFFICE.

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MACHINE FOR OPENING ENVELOPS.

1,273,318. Specification of Letters Patent. Patented July 23, 1918.

Application filed February 2, 1912. Serial No. 675,011.

To all whom it may concern:

Be it known that I, EUGENE A. BIRCHER, a citizen of the United States, residing at Rochester, in the county of Monroe and State of New York, have invented certain new and useful Improvements in Machines for Opening Envelops, of which the following is a specification.

The object of this invention is to provide a machine for opening envelops such as are ordinarily used in mailing letters, the machine being constructed to open the envelop by cutting off a small portion therefrom along any edge of the envelop.

Another object of my invention is to provide the machine with a pair of feed rolls which are used to feed the envelop, one of which feed rolls is positively driven.

Another object of my invention is to provide a rotary cutter with which the envelops are cut.

Another object of my invention is to adjust the feeding mechanism so that the edge on which the cut is intended to be made will be held in line with the cutting mechanism of the machine as the envelop passes through the machine.

Another object of my invention is to so construct the machine that it may be power driven, and the machine is preferably so designed as to contain therein an electric motor by which it may be driven.

These and other objects of my invention will be fully illustrated in the drawings, described in the specification and pointed out in the claims at the end thereof.

In the accompanying drawings, Figure 1 is a top plan view of the machine with the cover or casing therefor removed.

Fig. 2 is an elevation of the side of the machine that is at the left in Fig. 1.

Fig. 3 is a perspective view of the machine complete with its casing.

Fig. 4 is an end elevation of the machine looking at it from the bottom of Fig. 1.

Fig. 5 is a section on the line 5^x—5^x of Fig. 1.

Fig. 6 is an end elevation of the table, guide flange, casing and arm viewed from the right of Fig. 3, the table and casing being partly broken away.

Fig. 7 is a perspective view of the machine and casing with the table, guide flange and upper roller and mountings therefor removed.

In the several drawings, like reference characters indicate like parts.

My improved machine is built preferably upon a base 1, upon which are mounted the uprights or brackets 2 and 3, which preferably are formed in a single casting, as illustrated in Fig. 4, they being connected together by the cross brace 4 at the bottom and the cross brace 4^a at the top.

Mounted to rotate in these brackets is the shaft 5 having the worm gear 6 thereon which is driven by a worm 7 carried on the shaft 8 of the electric motor 9 or equivalent power device by which the operating mechanism is driven. Keyed to this shaft within the bracket at one end is the grooved belt driving pulley 10 and at the other end the gear wheel 11. On the outside of the bracket at the left, as shown in Fig. 4, is the lower cutting wheel 12 which forms the ledger blade of the cutting device. Between this wheel and the upright bracket 2 is mounted the trough 13 which receives the cuttings from the envelops and passes them out of the machine. This trough is fastened to the upright 2 by the screw 14 and is readily removable therefrom.

Mounted in the top of the uprights 2 and 3 is the shaft 15 having the gear 16 thereon which meshes with the gear 11 and is positively driven thereby.

Keyed to the shaft 15 outside of the support 2 is the disk 17. Mounted on the shaft outside of this disk is the disk cutter 18. This disk cutter is clamped to the shaft 15 by the nut 19, the end of the shaft being threaded to receive it.

The right hand end of the shaft 15 is bored out as shown in Fig. 5, to receive a pressure pin 20, which pin is pressed out by the compression spring 21 against the end plate 22. The spring presses against the shaft 15 in the other direction and moves it to the left and holds the cutter 18 firmly against the lower cutting wheel 12. The gears 11 and 16 compel the cutting blade 18 and cutting wheel 12 to rotate together. The gearing is proportioned so as to drive the cutting blade 18 with a peripheral velocity slightly greater than that of the cutting wheel 12.

The cutting blade 18 is provided with a beveled edge which bears against the edge of the lower cutting wheel 12, both of the wheels 18 and 12 being undercut as shown in cross section in Fig. 5, so that they will grind against each other and be self sharpening. The spring 21 holds them yieldingly in contact so as to maintain good uniform cutting and sharpening effect.

Also provided on the base plate 1 are the lugs 24 and 25, between which is supported the shaft 26 on which is mounted the bell crank 27. This bell crank at its upper end is provided with a bearing 28 integral therewith, through which passes the shaft 29. This shaft has the grooved belt pulley 30 keyed to one end thereof and the soft friction roller 31 keyed to the other end thereof. A belt 32 is used to drive the pulley 30 from the pulley 10. The shaft 29 is placed at a slight angle to the shafts 5 and 15, as will appear in Fig. 1. The lower arm of the bell crank 27 is provided with a reduced end 33 which is surrounded by the compression spring 34 which bears against the plate 1 at the other end, tending to rotate the bell crank to the left at the top, and keeping the belt 32 taut, as shown in Fig. 2.

Mounted on the base are the fuse block 35, the switch 36 and the insulating bushing 37, through which the electrical connections are made to the motor 9.

I provide the machine with the cover 38 which is fastened to the base in any suitable manner. This cover is provided with the opening 38ª which is closed by the table 39. In this table is the opening 40 through which the roller 31 projects. Pivotally mounted on the cover is the arm 41 which carries at its end the pin 42 on which is mounted to rotate the roller 43, which roller normally rests against the roller 31, being held in contact therewith by the torsion of the spring 44 bearing on the arm 41. The arm 41 is so shaped as to act as a guard or housing for the knife 18 which rotates inside of it. By increasing the weight of this guard the frictional effect of the wheel 43 is increased. The rollers 31 and 43 are made of a wooden core, with a rim of rubber thereon. See Figs. 2 and 3.

The table 39 is mounted on the cover 38 so that the crease in the angle of the table comes slightly out of line with the cutting edges but parallel thereto, being substantially in line with the left hand side of the disk 17 as it appears in Figs. 4 and 5. This difference in alinement between the crease of the cutting table and the cutting edges of the cutters determines with certain limits the depth of the cut which the cutters make along the edge of the envelop. The table 39 is clamped to the cover 38 by the screw 45 which appears in dotted lines under the arm 41 in Fig. 3. The crease of the table can be adjusted toward and away from the line of the cutters in any suitable manner, as by placing a washer around the screw 45 and between the table 39 and the cover 38. The adjustment can also be made by inserting a washer of suitable thickness between the cutter 18 and the disk 17, in which case the table will remain stationary and the position of the cutter will be changed with reference thereto.

It is apparent from the foregoing that when the upper cutter is adjustable outwardly, the lower cutter must be adjusted outwardly as well. On the right of the lower cutter 12 is shown a shoulder or collar on the shaft 5. Against this shoulder the lower cutter is clamped by a nut (see Fig. 2), the end of the shaft being threaded to receive this nut. In this respect the lower cutter shaft is like the upper one. When the upper cutter is adjusted outwardly by putting the washer behind it, the nut that clamps the lower cutter on the shaft must be loosened up and possibly a washer should be inserted between the lower cutter and the shoulder on the shaft.

It is apparent from the foregoing that when the upper cutter is adjustable outwardly, the lower cutter must be adjusted outwardly as well. On the right of the lower cutter 12 is shown a shoulder or collar on the shaft 5. Against this shoulder the lower cutter is clamped by a nut (see Fig. 2), the end of the shaft being threaded to receive this nut. In this respect the lower cutter shaft is like the upper one. When the upper cutter is adjusted outwardly by putting the washer behind it, the nut that clamps the lower cutter on the shaft must be loosened up and possibly a washer should be inserted between the lower cutter and the shoulder on the shaft.

The pin or shaft 29 which supports the roller 31 is slightly out of parallel with the shafts 15 and 5, as has been above mentioned, and the pin 42 which supports the roller 43 is still more out of parallel, so that the rollers between which the envelops are fed not only tend to drive the envelops forward but also to move them sidewise against the upright flange of the table 39, so that the envelops will be fed forward parallel to and in line with the cutting edges, so that the cutting edges will cut a thin shaving of about a thirty-second of an inch from the edge of the envelop that passes between them.

It will be noticed that the upper roller 43 which revolves idly and is out of parallel with the roller 31 and is driven by frictional engagement therewith or with the envelop passing through the rollers will not revolve with the same peripheral speed as does the lower rollers. This will cause the envelop to drag between the two rollers. That is, the envelop will move slower than the under

roller and faster than the upper roller and will advance more slowly than the cutters themselves would advance if the rollers were absent. Between the rotating cutters tending to pull the envelop forward at one end and the rollers 31 and 43 tending to retard the envelop at the other end, the portion of the envelop between the rollers and cutters is kept in a state of slight tension.

It will be also noted that both of the feed rolls are narrow compared to the width of the envelops driven thereby and that they are placed close to the guide flange and almost in line with the cutters.

The feed rolls 31 and 43 not only perform the function of alining the envelops with the guide flange and feeding them through the machine to the cutters, but also in connection with the guide flange perform the function of separating the edge of the envelop from the contents so that the inner edge of the envelop or the edge of the envelop against the guide flange will be presented to the cutters free of the contents. This result is accomplished as follows:

The lower roll 31 extends above the feed table and lifts the envelop slightly above the table. The two feed rolls not only push the envelop sidewise against the guide flange but in conjunction with the guide flange, cause both the bottom and top of that part of the envelop that is between the rollers and the guide flange to bulge or become distorted due to the side thrust of the rollers on the envelop and the flexibility of the envelop. This side thrust is but imperfectly communicated to the contents of the envelop due to the fact that the envelop acts as a washer between the rollers and the contents. The immunity of the contents from this distortion is further assisted by the lack of adhesion between the envelop and its contents and the stiffness of the contents, the effect being greatest where the envelop is flexible and the contents are stiff. This budging effect of the rollers and guide flange on the envelop is produced on both the bottom and the top of the envelop because both the upper and lower rollers are set at an angle to the line of feed as determined by the guide flange. As the part of the envelop that has been bulged by the rollers leaves the rollers it tends to resume its normal shape and flatten out somewhat tending to draw the contents back away from the cutters.

The edge of the envelop, as it reaches the open space in the guide flange occupied by the cutters, moves sidewise due to the further expansion of the envelop insuring or increasing the engagement of the envelop with the edges of the cutters as the envelop moves forward. After the engagement of the envelop and cutters has taken place the draft of the cutters tends to pull the edge of the envelop further into the cutters increasing the width of the strip cut thereby and further flattening out the envelop, the contents of the envelop being at all times kept free from the cutters.

It will also be noticed from an inspection of Fig. 3 that the meeting edges of the feeding rollers 31 and 43 are slightly above the table and the meeting edges of the cutters 12 and 18 are considerably above the table so that by the lower cutter the inner edge of the envelop is flared upwardly somewhat and some additional room is thus given in which the bulged portion of the envelop can expand permitting the sides to come together and resume their normal condition independently of the contents of the envelop. This flaring of the envelop is believed to contribute slightly to the beneficial result of separating the edge of the envelop from its contents and cutting the one without cutting the other, which result is secured primarily, first by the distortion of the envelop by the rollers, the edge of the envelop being subsequently forced forward into the cutters by its own elasticity, the contents being restrained from this forward movement or actually moved back away from the cutters.

The theory of operation by which this result is secured has been explained as it is now understood. The explanation may be imperfect, incomplete or even erroneous, but of the effect of the machine in separating the edge of the envelop from its contents and the cutting of the one and not the other, there can be no doubt as this has been repeatedly demonstrated by the operation of the machine.

The width of the strip cut from the side of the envelop varies approximately from .01 to .05 of an inch in width, depending on the setting of the guide flange with reference to the cutters and the character of the envelop to be cut and its contents, so that the movement of the contents back from the cutters and the movement of the envelop into the cutters is comparatively small but is sufficient to protect the one and insure the sole cutting of the other. In this way the contents of the envelop are protected against being cut while the edge alone is exposed to the cutters.

It has been noticed that when envelops are passed through the machine the contents of the envelops are moved back from the edge of the envelops more or less, sometimes evenly and sometimes considerably more at one end than at the other end whether the cutters are present or have been removed. In the one case the edge of each of the envelops will be cut and in the other case it will not be cut. While the contents of the envelop may, at the start, have been close against the inner edge of the envolep, after they have been passed through the machine the contents will have been moved back from

the inner edge of the envelop, sometimes retaining their parallel alinement with the edge of the envelop and sometimes being moved back much more at one end than at the other.

It will be understood that the contents of the envelop are always held back from the guide flange by the edge of the envelop a distance equal to the thickness of the paper on the edge of the envelop plus whatever resistance the stock of the envelop creased at the edge of the envelop may offer to the contents of the envelop approaching the edge thereof. The bulging of the envelop and the subsequent flattening thereof or the subsequent flaring or bringing of the sides of the envelop together still further separates the edge of the envelop from the contents and gives the cutters ample room to cut on the edge of the envelop without cutting the contents.

The operation of my machine is as follows: The motor is started, causing the cutting edges to rotate, the upper cutting edge rotating slightly faster than the lower one, with the feed roller 31 rotating at a peripheral velocity substantially the same as the peripheral velocity of the cutting wheel 12. The envelops are placed upon the table 39 near the flanged side of it and are passed between the rollers 31 and 43 which immediately press the envelops against the flanged side of the table and draw them forward against the cutters, which in turn draw the envelop forward, cutting off the edge of the envelop therefrom.

By means of the feed rollers and the cutters which rotate at a considerable velocity, envelops are passed through the machine and cut open with great rapidity, the capacity of the machine being about four hundred six-inch envelops per minute.

Having thus described my invention, what I claim as new and patentable is as follows:

1. In a machine for cutting envelops, the combination of a feed table having a flange thereon, a pair of circular cutting knives rotating against each other through said table, a disk placed back of one of said cutting knives and substantially in line with the flange on the table.

2. In a machine for cutting envelops, the combination of a feed table having a flange thereon, a pair of circular cutting knives rotating against each other through said table, a disk placed back of one of said cutting knives and substantially in line with the flange on the table, said cutting knife being adjustable toward and away from said disk.

3. In a machine for opening envelops, the combination of a pair of cutting disks mounted to rotate against each other, means for yieldingly pressing one of said disks laterally against the other, gearing to positively drive one of said cutters from the other with unequal peripheral velocity, a table having a guide flange placed parallel to and out of line with said cutters, a roller having its axis mounted at an angle to the axes of said cutters and working in connection with said table and guide flange to feed an edge of the envelop forward to said cutters.

4. In a cutting machine, the combination of a table, a pair of disk cutters working against each other through said table, a pair of rollers mounted at different angles to the axes of said cutters and normally bearing against each other to move the material sidewise and forward to said cutters.

5. In a machine for opening envelops, the combination of a table having a guide flange thereon, a roller mounted on the swinging axis movable toward and away from said table, the axis of said roller being substantially parallel to the plane of the table and being placed at an acute angle to the flange on the table.

6. In a machine for cutting envelops, the combination, with cutting-mechanism adapted to feed an envelop during the cutting operation, of a guide for controlling the envelop during the cutting operation, and means for producing a dragging action on the envelop at one side of the cutting-line in order to hold the envelop against the guide.

7. In a machine for opening envelops, the combination, with cutting-mechanism adapted to feed an envelop during the cutting operation, of a guide for controlling the envelop during the cutting operation, and means for producing a dragging action on the envelop at one side of the cutting-line in order to hold the envelop against the guide.

8. In a machine for opening envelops, the combination, with a pair of rotary cutters adapted to feed an envelop during the cutting operation, one of which has a greater peripheral speed than the other, said cutters rotating in the direction of feed of an envelop through the machine, of a guide for controlling the envelop during the cutting operation, and means for producing a dragging action on the envelop at one side of the cutting-line in order to hold the envelop against the guide.

9. In a machine for opening envelops, the combination, with cutting-mechanism operating in a direction to feed an envelop through the machine, of a guide for controlling the envelop during the cutting operation, and a roller frictionally engaging and rotatable by the envelop and operating in a plane at an angle to, and at one side of, the cutting-line of the cutting-mechanism, so as to produce a dragging action

upon the envelop in order to hold the envelop against the guide.

10. In a machine for opening envelops, the combination, with cutting-mechanism comprising a pair of rotary shearing-cutters adapted to feed an envelop during the cutting operation, and means for rotating the cutters in such a direction that their effective cutting portions move in the direction of the line of feed through the machine, of a guide for controlling an envelop during the cutting operation, and a roller frictionally engaging and rotatable by the envelop, the roller being located in a position to engage the envelop at one side of the cutting-line, and being journaled in a plane at an acute angle to the cutting-line so as to produce a dragging action on the envelop.

11. In an envelop-opening machine, the combination, with cutting-mechanism tending to move an envelop in the direction of feed through the machine, of a guide for controlling the envelop during the cutting operation, and means adapted to advance the envelop into engagement with the cutting-mechanism and thereafter to produce a dragging action on the envelop at one side of the cutting-line, in order to hold the envelop against the guide.

12. In an envelop-opening machine, the combination, with cutting-mechanism tending to feed an envelop through the machine, of a guide for controlling the envelop during the cutting operation, feeding mechanism comprising a roller adapted to be driven positively and a device engaging the envelop oppositely thereto, the latter producing a dragging action upon the envelop at one side of the cutting-line, in order to hold the envelop against the guide, and means for rotating the feed-roller in a direction to advance the envelop toward the cutting-mechanism.

13. In a machine for opening envelops, the combination, with cutting-mechanism tending to feed an envelop through the machine and embodying a pair of rotary shearing-cutters, and means for rotating the cutters in the direction in which their effective cutting portions move in the direction of feed of an envelop through the machine, of a guide for controlling an envelop during the cutting operation, feeding mechanism comprising a member adapted to be driven positively and frictionally engaging the envelop, and a device engaging the envelop oppositely thereto, the latter producing a dragging effect on the envelop at one side of the cutting-line, in order to hold the envelop against the guide, and means for actuating the feed-member, in the general direction of feed, at the same linear speed as the speed of the effective portion of one of the rotary cutters.

14. In a machine for opening envelops, the combination, with cutting-mechanism operating in a direction to feed an envelop through the machine, of a guide for controlling the envelop during the cutting operation, a roller having its axis mounted at an angle to the axis of said cutters, adapted to feed the envelop to said cutters, means for rotating said roller, and a freely rotatable roller journaled to rotate in a plane at an angle to and at one side of the cutting-mechanism.

15. In a machine for opening envelops, the combination of a table having a guide flange thereon, revolving means operating in connection with said table for feeding envelops along said table and laterally against said flange, cutters operating in connection with said feeding mechanism, said cutters operating to draw an envelop forward faster than said feeding mechanism operates to feed it.

16. In a machine for opening envelops, the combination of a table having a guide flange thereon, rotary cutters working through said table and adjacent to said guide flange, narrow rollers arranged above and below said table in a pair and placed adjacent to said guide flange and nearly in line with said cutters, said rollers operating to feed envelops forward to said cutters and sidewise against the guide flange, said cutters operating to feed an envelop forward when engaged therewith, said rollers operating to retard the forward movement of the envelop due to the cutters.

17. In a machine for opening envelops, the combination of a table having a guide flange thereon, rotating cutters arranged in a pair, one above and the other below the table, said cutters working through said table and adjacent to said guide flange, a positively driven rotating feeding device for feeding envelops along said table, comprising a positively driven member having substantially the same peripheral speed as one of the cutters and less peripheral speed than the other cutter, and an idly driven rotating roller coöperating with the first-mentioned member to feed the envelops forward along the table and sidewise against the guide flange.

18. In a machine for cutting envelops, the combination of a feed table having a flange thereon, a pair of circular cutting knives rotating against each other through said table, said flange serving to hold envelops in line with said knives, a positively driven roller placed in said table with its axis at an angle to the axis of said cutters and a second roller yieldingly mounted and making contact with said first named roller, said second roller also having its axis at an angle to the axes of said cutters, said rollers being adapted to feed the envelops between them.

19. In a machine for opening envelops, the combination of a base, a pair of uprights mounted thereon, a pair of shafts mounted to rotate in said uprights, a rotary cutter mounted on the end of each of said shafts, means for pressing one of said shafts longitudinally so as to cause one of said cutters to bear against the other, a cover for said machine, said cover having the top and sides cut away to form an opening with an angular seat in said cover surrounding said opening, a table with a guide flange thereon, adapted to close said opening, said table being adjustable laterally on said seat.

20. In a machine for opening envelops, the combination of a base, a pair of uprights mounted thereon, a pair of shafts mounted to rotate in said uprights, a rotary cutter mounted on the end of each of said shafts, means for pressing one of said shafts longitudinally so as to cause one of said cutters to bear against the other, a cover for said machine, said cover having the top and sides cut away to form an opening with an angular seat in said cover surrounding said opening, said cutters projecting into said opening, a table with a guide flange thereon, adapted to close said opening, and having openings therein to receive said cutters, said flange being normally parallel to the edges of said cutters, said table being adjustable on said seat laterally of said cutters.

21. In a machine for opening envelops, the combination with a cutting mechanism embodying a pair of rotary cutters having their effective cutting portions traveling in the direction of the line of feed through the machine, of a guide for controlling the envelops during the cutting operations, and a freely rotating roller arranged to coöperate with the envelops to one side of the cutting line and operating in a plane at an acute angle to the cutting line in order to produce a dragging action on the envelop.

22. In a machine for opening envelops, the combination with a cutting mechanism embodying a pair of rotary cutters having their effective cutting portions traveling in the direction of the line of feed through the machine, of a guide for controlling the envelops during the cutting operation, means for producing a dragging action on the envelops to one side of the cutting line in order to hold the envelops against the guide, and a rotary feed member coöperating with the drag producing means to carry the envelops to the cutting mechanism, said feed member having its effective portion traveling at the same speed as the effective portion of one of the cutters of the cutting mechanism.

23. The method of opening envelops which consists in gripping the same at its upper and lower surfaces, applying pressure to the edge sufficient to bulge the envelop and slide the contents laterally within the same, releasing the edge pressure and allowing the edge to expand away from the contents and finally cutting a narrow strip from the edge of the envelop thus separated from its inclosure.

24. An envelop opening machine comprising a cutting device, an edge gage arranged slightly beyond the cutting plane, means for gripping and feeding the envelop longitudinally and laterally against the gage with sufficient pressure to bulge the envelop while permitting the contents to slip laterally, the feeding devices being so located as to permit expansion of the envelop before it reaches the cutter.

25. An envelop opening machine comprising a cutting device, an edge gage arranged slightly beyond the cutting plane, a pair of feeding rolls having axes inclined to the line of feed and gripping the upper and lower surfaces of the envelop with such pressure as to bulge the edge of the envelop at its contact with the gage while permitting the contents to slip within the envelop, said feed rolls being so located as to permit the lateral pressure to be released before the envelop reaches the cutter, so that it may spring away from the contents and present an edge for trimming without danger of injuring the inclosure.

26. In an envelop opening machine, the combination with a guide, of feeding and deflecting mechanism which acts on the envelops to move them laterally toward the guide and also along the latter, said mechanism pinching the outside wrappers to cause them to bulge on their contents, means permitting the bulged portion to spread out at a certain point in the travel of the envelop free from the contents, and a cutting mechanism for operating on the edge of the envelop after it has been thus spread or flattened.

27. A machine for opening envelops comprising a cutting mechanism, mechanism for feeding the envelops to the cutting mechanism and for bulging the envelops along one of their edges on their contents and means for causing portions of the bulged portions to be presented to the cutting mechanism free from the contents of the envelops.

In testimony whereof I affix my signature in presence of two witnesses.

EUGENE A. BIRCHER.

Witnesses:
LENA M. ASH,
ALICE M. JOHANNA.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."