Dec. 5, 1961 B. E. MONCK 3,011,377

PRODUCTION OF BLANKS FOR ENVELOPES, BAGS AND THE LIKE

Filed April 4, 1956 4 Sheets-Sheet 1

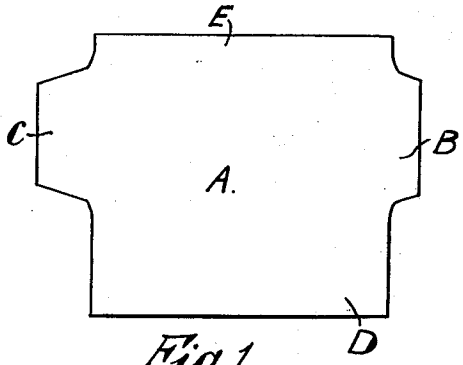


Fig. 1.

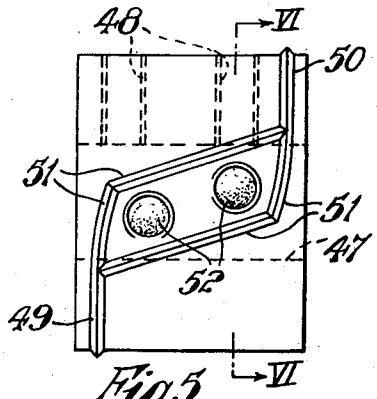


Fig. 5.

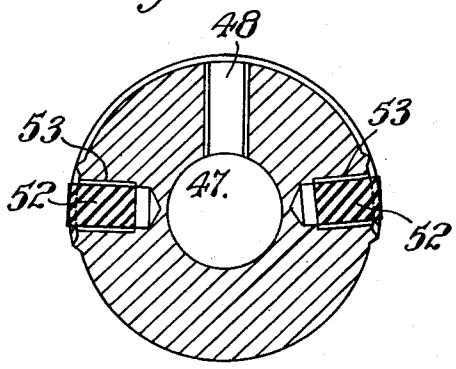


Fig. 6.

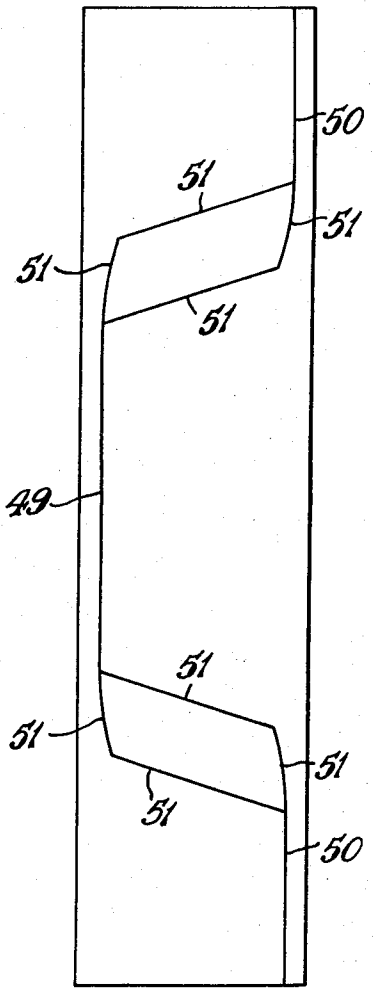


Fig. 7.

INVENTOR
Bosworth Edwin MONCK
by [illegible]
Attorney

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PRODUCTION OF BLANKS FOR ENVELOPES, BAGS AND THE LIKE

Filed April 4, 1956 4 Sheets-Sheet 2

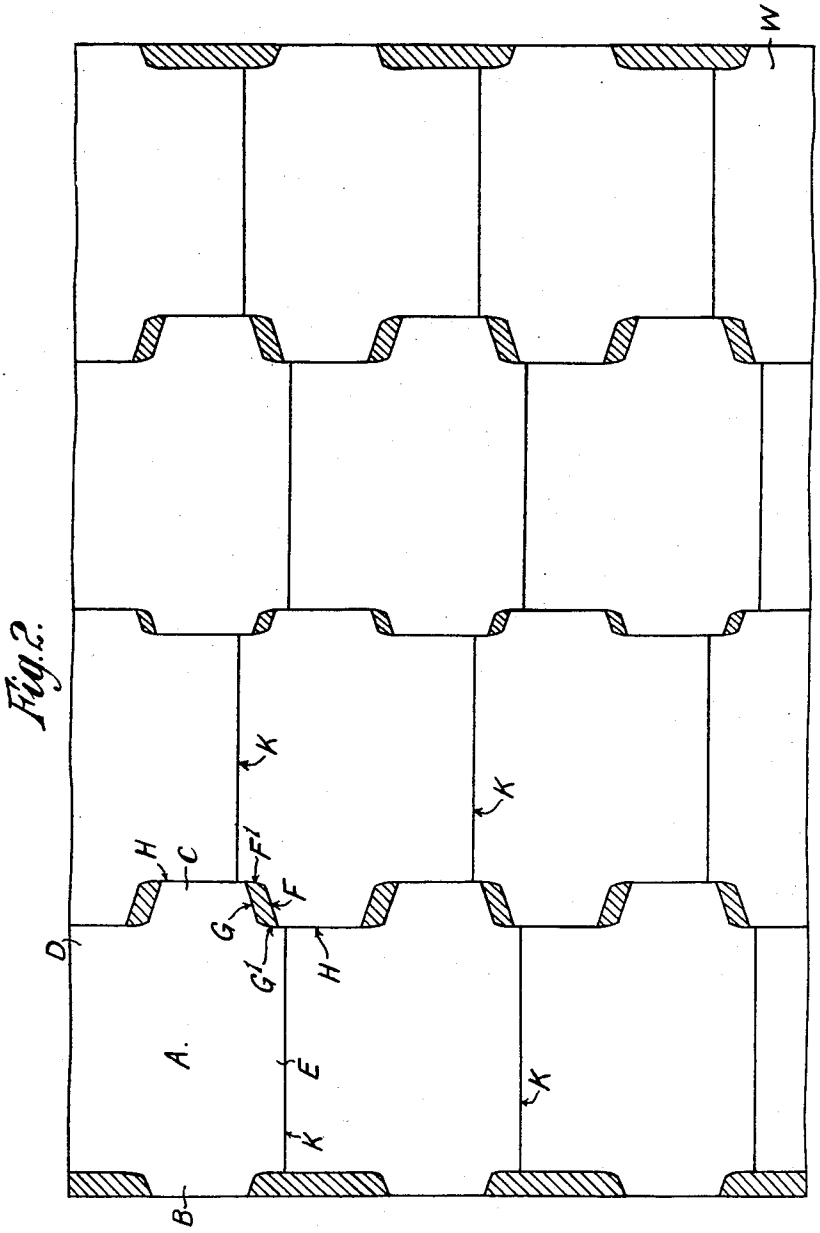


Fig. 2.

INVENTOR
Bosworth Edwin MONCK
by [illegible]
Attorney

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PRODUCTION OF BLANKS FOR ENVELOPES, BAGS AND THE LIKE

Filed April 4, 1956 4 Sheets-Sheet 3

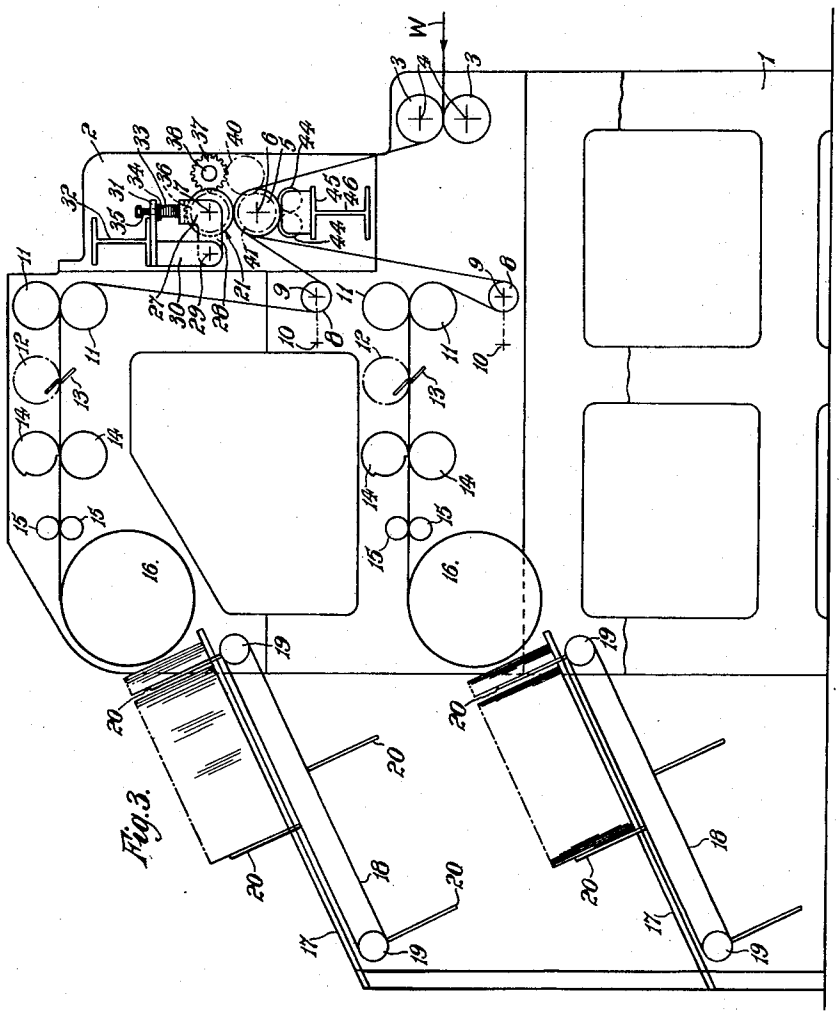


Fig. 3.

INVENTOR
Bosworth Edwin MONCK
by [signature]
Attorney

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PRODUCTION OF BLANKS FOR ENVELOPES, BAGS AND THE LIKE

Filed April 4, 1956 4 Sheets-Sheet 4

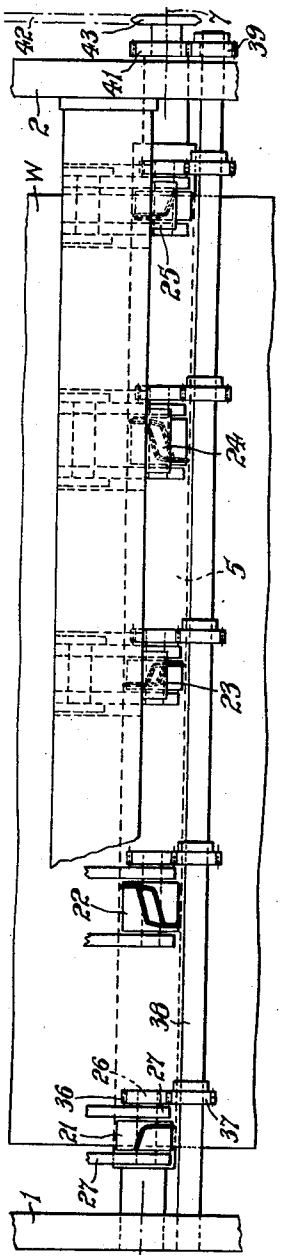


Fig. 4.

INVENTOR
Bosworth Edwin MONCK
by J. A. Finch Jr.
Attorney

United States Patent Office

3,011,377

Patented Dec. 5, 1961

3,011,377

PRODUCTION OF BLANKS FOR ENVELOPES, BAGS AND THE LIKE

Bosworth Edwin Monck, London, England, assignor to Spicers Limited, London, England

Filed Apr. 4, 1956, Ser. No. 576,170
Claims priority, application Great Britain Apr. 7, 1955
4 Claims. (Cl. 83—303)

This invention relates to the production of blanks for envelopes, bags and the like by longitudinally cutting continuous strips, from a travelling web of paper or the like material, the edges of said strips being continuously shaped with a repetitive contour so that when the strips are cut transversely at equal distances indentical blanks are obtained.

In the following description whilst reference is principally made to the use of the arrangement for producing envelope blanks, it is to be understood that the invention is not confined to the production of such blanks and can be used for the production of other shaped blanks.

Envelope blanks are commonly cut from a stack of large sheets of paper the size of each sheet being a multiple of that of the desired blank. An annular, shaped cutter, the cutting edge of which corresponds to the outline of the desired blank is then pressed with great force into the stack near one edge thereof, and a wad of blanks is cut therefrom. The cutter is then moved to another portion of the stacked sheets and the procedure repeated until the entire stack has been cut into blank wads. This method, by which the great majority of envelope blanks are produced, has several drawbacks. Although the stack is obviously cut so as to obtain the maximum number of wads, a relatively high percentage of paper waste is unavoidable. This is mainly due to the fact that as the cutter cannot be applied to the extreme edge of the stack a narrow edge strip around the entire outline of the stack must be wasted. Moreover a narrow strip of paper is wasted between any two adjacent edges of adjacent blank wads. The percentage of waste obviously depends on the particular shape of the desired blanks and the skill of the operator who cuts the blank wads, but an average waste of between 15 and 20% is usual.

A further drawback of this method consists in that the cutting tool, due to the very great stresses exerted thereon during cutting, cannot be constructed with parallel sides but is tapered towards the cutting edge. As a result of this from the uppermost sheets of the stack there are cut blanks of larger area than from the lowermost sheets, i.e. the area of the blanks gradually decreases from top to bottom of the stack. Although the difference in the size of the top and bottom blank is relatively small, it is nevertheless sufficient to result in faulty operation of the machines used for the subsequent working up, i.e. folding and gumming, of the blanks. In practice, therefore, the cut blanks are separated into three "cuts," i.e. top, middle and bottom "cuts" which are worked up separately with a view to avoiding frequent adjustment of or alternatively, faulty performance of the folding and gumming machines.

With a view to overcoming the drawback of this customary method, it has been proposed to cut longitudinally from a travelling web one continuous strip the edges of which are continuously shaped with a repetitive contour in such manner that when the strip is cut transversely at equal distances, identical blanks for envelopes, bags and the like are obtained which are thereafter folded and gummed. While blanks of uniform size are produced in this manner, the percentage of paper waste is still very high. Moreover, in order to avoid excessive paper wastage the width of the paper web should be substantially that of the strip to be produced.

In further development of the last mentioned arrangement a cutting device has been proposed for longitudinally cutting a travelling web into a plurality of juxtaposed, shaped strips, wherein a plurality of cutting tools with point shaped cutters are arranged across the web and pressed against it whilst the outline of the cuts is shaped by vertical and lateral movement of said cutters. This cutting device, however, is only applicable to non-fibrous materials, because if employed for the cutting of fibrous materials such as paper, the latter would tear. A further drawback of this last-mentioned device consists in the fact that only linear or single cuts can be obtained, so that the juxtaposed edges of two adjacent strips are always complementarily shaped. This, of course, limits the applicability of the device.

The present invention aims at still further improving the principle underlying the last mentioned device and is based on the following observations and facts. If a sheet of paper of any given size is to be subdivided into identical portions each of which corresponds to an envelope blank for common types of envelopes such as e.g. pocket shaped envelopes or bankers envelopes, it is apparent that, owing to the particular shape of envelope blanks of this type, it is not possible to arrange a layout or pattern in which the entire sheet is utilized, but a small percentage of waste must necessarily occur. However, the percentage of waste can be kept to a minimum if the individual blanks to be produced, are arranged in longitudinally extending, continuous rows the shaped edges of which, i.e. the sealing and bottom flaps of the blanks, internest with the juxtaposed row or rows so that substantially the entire sheet is utilized and only very small areas of paper lying between the internesting edge portions of the rows and along the two edges of the web between successive flaps, are waste.

It is an object of the present invention to provide improvements generally in the production of blanks for envelopes, bags and the like.

A further object of the present invention is to provide an improved method for the production of blanks for envelopes, bags and the like by means of which material wastage is substantially reduced so that production is more economical than heretofore.

A still further object of the present invention is to provide an improved apparatus for carrying out the method of producing blanks for envelopes, bags and the like.

A still further object of the present invention is to provide, for the production of envelopes, bags and the like, continuous strips of envelope-forming material comprising at least two longitudinal rows of blanks.

The present invention consists in a method for the production of envelope blanks which comprises feeding a web of paper past cutter means to form from said web at least two longitudinal rows of blanks arranged side by side, each blank having end flap forming portions extending laterally at opposite sides of the row, the flap forming portions at the adjacent sides of adjacent rows being interspaced with one another, in such manner that the opposing lateral edges of adjacent flap forming portions are spaced from one another whilst the longitudinal edge of a flap forming portion is coincident with an opposing longitudinal edge portion of the adjacent row of blanks.

The invention also provides apparatus for the production of envelope blanks by the above method which comprises means for feeding a web of material and rotary cutter means located in the path of movement of the web for forming from the web at least two longitudinal rows of blanks arranged side by side.

In order that the invention may clearly be understood and carried into effect an embodiment of the same will

now be described by aid of the accompanying drawings in which:

FIGURE 1 shows an envelope blank produced by the method and apparatus of the invention.

FIGURE 2 shows a portion of a web having four rows of blanks of the kind shown in FIG. 1, arranged side by side.

FIGURE 3 is a diagrammatic side view of the machine, part of the machine frame being broken away for the sake of clarity.

FIGURE 4 is a plan view to an enlarged scale showing the layout of one suitable construction of cutters constituting the cutter means.

FIGURE 5 is an elevation also to an enlarged scale of one of the cutters shown in the cutter layout of FIG. 4.

FIGURE 6 is a section on the line VI—VI of FIG. 5 and

FIGURE 7 is a view showing the development of the cutting edge of the cutter shown in FIGS. 5 and 6.

Referring to the drawings, the blank shown in FIG. 1 is suitable for the manufacture of pocket shaped envelopes. The blank A is provided with a bottom flap forming portion B and a top sealing flap forming portion C both of which are arranged in relation to the general outline of the blank to provide portions D and E which are subsequently folded over in overlapping engagement and secured by gumming to form the rear face of the envelope, the bottom of which is closed by folding over the bottom flap forming portion B which is also secured by gumming.

As shown in FIGURE 2 the blanks are produced in rows arranged side by side by cutting a web of material into strips each strip constituting a row of blanks. To obtain the maximum paper economy, the number of strips should always be even and the sealing flaps C of the outermost blanks to be produced, should point towards the centre of the web. In this manner the smaller bottom flaps B of the outer strips are always situated at the edges of the web and it thus follows that smaller pieces of paper are cut to waste.

In the particular arrangement shown in FIGURE 2, it will be seen that the blanks are arranged in rows, the flap forming portions B and C of the blanks A in adjacent rows interspaced with one another, the opposing lateral edges F and G of adjacent flap forming portions being spaced from one another and connected by short edge portions F′ and G′, these edges forming together an area substantially in the form of a parallelogram. When cutting the material of the web to produce the rows of blanks the web material bounded by the lateral edges F and G and the edges F′ and G′ which constitutes waste material, is removed the web material also being cut along the line H which produces a longitudinal edge of a flap forming portion coincident with an opposing longitudinal edge portion of the adjacent row of blanks. Thus cutting of the web in this manner will produce four strips each consisting of a row of blanks, the strips being separated from one another by the apertures formed by the areas of parallelogram shape and the cut along the lines H.

Finally to produce individual blanks, the material is cut transversely along the lines K to separate the blanks in a row from one another.

In the machine shown diagrammatically in FIGURE 3 of the drawings, a web of material W is fed in at the feed end of the machine, and is fed past rotary cutter means for producing the rows of blanks arranged as shown in FIGURE 2, the blanks in each row being separated from one another, and delivered to stacking means at the discharge end of the machine for producing stacks of individual blanks.

As shown, the machine consists of two spaced side frame members **1** and **2**, the upper portion of side frame member **1** being broken away for the purpose of exposing the cutter means and other component parts of the machine.

The web of blank forming material W, is fed into the machine between a pair of draw rollers **3** from a reel of material not shown, located adjacent the feed end of the machine. The draw rollers **3** are mounted so as to be rotatable about parallel axes **4** extending transversely between the frame members **1** and **2**.

From the draw rollers **3**, the web W is fed to the cutter means wherein the web run passes between an anvil roller **5** and rotary cutters hereinafter more fully described, the anvil roller **5** and rotary cutters being mounted so as to be rotatable about parallel axes **6** and **7** respectively extending transversely between the frame members **1** and **2**.

In the machine shown in the drawing after cutting, the adjacent rows of blanks are separated from one another and the feeding of the separated adjacent rows of blanks is continued along different paths.

As shown in FIGURE 2 the flaps of the rows obtained point alternately in opposite directions and accordingly they are separated into two "runs," each run consisting of two alternate rows of blanks so that in one all the flaps face in one direction and in the other "run" all the flaps face in a direction opposite to that of the first mentioned run. When the blanks are stacked corresponding flaps will be located over one another.

The different paths along which the runs are directed are located one above the other so that the web W when cut is divided into upper and lower runs, each run consisting of rows of blanks.

Separation is effected by passing each run as it leaves the cutter means, around one of a pair of register rollers **8** located one above the other each roller **8** being mounted so as to be rotatable about an axis **9** extending transversely between the frame members **1** and **2**. The register rollers control the synchronous movement of the runs and each said roller is displaceable automatically in accordance with any variations in the tension of the runs. For this purpose the axes **9** about which each register roller **8** rotates extends between arms (not shown) which are in turn pivotally mounted about one end on pivots represented by the centres **10**.

From the register rollers **8**, each run of rows of blanks is directed between a pair of draw rollers **11**, and guided along a horizontal path to a transverse cutting means consisting of a rotary top knife **12** which co-operates with a lower fixed knife **13**, the cutting means operating to sever the blanks of a row from one another by cutting the material along the lines K shown in FIGURE 2.

Continued movement of the blanks feeds them between a pair of feed rollers **14** which engage each individual blank and thrust the same towards a pair of forwarding rollers **15**. Each blank is delivered by the forwarding rollers **15** to a suction cylinder **16** at the discharge end of the machine, the blanks as they are delivered by the suction cylinder being turned from a horizontal position to a substantially vertical position in readiness for stacking. The separated blanks are supported by supporting means (not shown) during their passage between the cutting means **12**, feed rollers **14** and forwarding rollers **15**.

For stacking the blanks as they are discharged from the machine, stacking means is provided to which the blanks are delivered by the suction cylinders.

The stacking means shown in FIGURE 3 is constructed so that it is unnecessary to "knock-up" the blanks when stacked and for this purpose the said means includes sloping support rails **17** beneath which is disposed an endless conveyor band **18** the run of which passes around end pulleys **19**. The conveyor band is provided with a plurality of outwardly projecting slats **20**. The support rails **17** are spaced apart from one another so that as each blank is delivered for stacking the rails **17** engage in the corners provided by the flap

forming portions of the blank, the blanks being held edge on in a substantially vertical position by the slats **20**.

The support rails are vibrated by means not shown, for the purpose of aligning the blanks with one another and the conveyor band **18** is driven at slow speed to facilitate delivery of the blanks onto the sloping rails. The stacks of blanks between adjacent slats **20** can be removed at will by an operator.

Driving means, not shown, are provided for effecting in synchronism with the formation of the blanks, driving of the transverse cutting means **12**, feed rollers **14**, forwarding rollers **15** and suction cylinder **16**. It will be appreciated that as each "run" consists of two rows of blanks side by side the transverse cutting means, feed rollers and suction cylinders are duplicated for each said run, the stacking means also being duplicated.

To produce the formation of rows of blanks shown in FIGURE 2 from a single web of blank forming material the rotary cutter means is arranged and constructed as shown particularly in FIGURES 4, 5, 6 and 7.

For this purpose five separate rotary cutters are used which in the drawing are designated **21**, **22**, **23**, **24** and **25**. The cutters are independently mounted but are arranged axially in alignment with one another about the common transverse axis **7** previously referred to.

As the independent mounting of each rotary cutter is identical only one such mounting will be described, the same reference numerals being used in the following description to identify corresponding parts of the mountings for the remaining rotary cutters.

Referring to the rotary cutter **21**, the same is mounted on a stub axle **26** supported between the arms **27** of a pair of bell crank levers each of which is pivotally mounted about the free end of its other arm **28** on a pivot pin **29**. The pivot pin **29** is in turn supported between the arms **30** of a bracket **31** secured to so as to project downwardly from the underside of the bottom flange of an I section beam **32** which extends transversely between the frame members **1** and **2** and secured thereto at its opposite ends.

The rotary cutter is spring loaded so as to be urged into contact with the web W as it passes over the anvil roller **5**, by means of a compression spring **33**. The loading of the spring **33** is adjustable to permit variation of the pressure of the rotary cutter on the web W, and for this purpose the spring is compressed between the arms **27** and a flange **34** on the lower end of a threaded bolt **35** screwed into a tapped hole in the bracket **31**. Thus rotation of the bolt in the appropriate direction results in an increase or a decrease of the pressure exerted by the rotary cutter.

Each rotary cutter is driven by providing a toothed pinion **36** on each stub axle **26**, each said toothed pinion meshing with an associated driving pinion **37**. The driving pinions **37** are mounted on a common driving shaft **38** supported at its opposite ends in bearings mounted respectively in the machine frame members **1** and **2**. The end of the driving shaft **38** extends beyond the frame member **2** the projecting end carrying a gear **39** the teeth of which mesh with the teeth of an idler gear **40** carried by a spindle mounted in bearings carried by the machine frame **2**.

The idler gear in turn, meshes with the teeth of a driving gear **41** mounted co-axially with the anvil roller **5**, the anvil roller and consequently the rotary cutters being positively driven by for example an electric motor not shown, through a chain drive which includes a chain **42** and chain wheel **43** also mounted co-axially with the anvil roller **5**.

The above described manner of individual mounting of the rotary cutters **21** to **25** is advantageous as it overcomes the considerable deflection which would occur if the rotary cutters were mounted on a common shaft and which would result from the heavy loading occurring during operation and to the distance between the respective cutting tools. The described manner of mounting does not eliminate deflection and both the anvil roller and the bridge structure undergo some degree of bending, depending on how heavily they are constructed, but the amount of bending can in this manner be held within reasonable limits so that it does not affect the performance of the independently mounted cutting tools. The bending of the anvil roller **5** can be reduced still further by providing bolster rolls **44** or half-bearings mounted on a cross member constituted by the upper flange **45** of an I section beam **46** fixed to the machine frame below the anvil roller.

The cutters **21** to **25** are provided with cutting edges formed on the periphery of each said cutter.

While the cutting edges of the rotary cutters **21** and **25** for cutting the edges of the web i.e. the outer strips are linear and intermittent, the outline of the cutting edges of the rotary cutters **22**, **23** and **24** for cutting the remainder of the web will be continuous and partly linear and partly formed with a view to cutting out the apertures in the web which constitute waste material. Therefore, the development of these latter cutting edges will correspond to the outlines of the complete lateral edges of two envelope blanks, which outlines will partly coincide for both edges and partly will be formed by opposite sides of the apertures.

FIGURES 5 and 6 show in detail the construction of the rotary cutters particularly the cutters **22** and **24**. The cutter shown in these figures consists of a cylindrical body having a bore **47** for mounting the cutter on its stub axle, the cutter being secured on the stub axle by a grub screw inserted in a tapped hole **48** extending radially through the body. The periphery of the cylindrical body is formed to provide a cutting edge which consists of two spaced arcuate portions **49** and **50** interconnected by the cutting edges **51** which define substantially a parallelogram extending across the periphery at an angle to the axis of rotation of the cutter. The arcuate portions **49** and **50** are utilised to cut the material of the web along the lines H shown in FIGURE 2 whilst the cutting edges **51** cut the material of the web to produce the apertures defined by the edges F, F', G, G' constituting waste material. This waste material as it is cut is displaced from the web W by ejecting means consisting simply of rubber plugs **52** located in drillings **53** in the cylindrical body. Two plugs are provided within the area bounded by the cutting edges **51** the outer ends of the plugs extending slightly beyond the periphery of the cutting edges. FIGURE 7 shows a development of the cutting edges **49**, **50** and **51**.

The rotary cutter **23** is of similar construction to the rotary cutters **22** and **24** with the exception that the cutting edges defining the parallelogram are of shorter length to produce an aperture of smaller area resulting from the difference in depth of the bottom and sealing flap portions.

Means not shown are preferably provided for removing the paper waste or dross which is cut out of the web. This is preferably done by arranging suction holes adjacent the web, preferably in the anvil roller **5** or in the rotary cutters, and the dross is sucked towards these holes. Moreover, it is possible operatively to connect the suction system to a blowing means in such manner that at a pre-determined point in the revolution of the anvil roller **5** of rotary cutters, the waste pieces are blown off its surface. If desired, means may also be provided for eliminating static electricity which may cause the sticking of the dross to the machine members. The dross is removed through ducts or channels which are fitted at suitable places around the underside of the anvil roller.

Further if desired a printing arrangement, preferably an aniline printing arrangement is incorporated into the machine immediately after the longitudinal cutting of the web for printing the blanks. Moreover, a seal flap gumming and drying device may also be incorporated between the cutting and blank delivery means so that the

thus gummed blanks can be further worked up in a folding and gumming machine but without the necessity of incorporating a flap drier.

It will be realised that by using the arrangement of the invention the web is crush cut, i.e. the cutting edges effect a bursting of the fibres in the web there being no relative movement between the web and cutters.

Considerable savings in paper are obtained by using the arrangement of the invention. In the manufacture of blanks for 9" x 4" pocket shaped envelopes from a web which for example is cut into four juxtaposed strips, the paper waste is reduced to about 4%.

With the rotary cutting arrangement described in the above embodiment it will be appreciated that the cutting of the web material to produce the apertures constituting the waste material is effected in alternating sequence with cutting of the web material to produce the longitudinal edges of the flap forming portions, i.e. cutting along the lines H.

I claim:

1. A cutter assembly for cutting a web of material into continuous strips having laterally reversed alternate rows of individual envelope-forming blanks, comprising at least three spaced-apart rotary cutting means, at least an inner one of the cutting means having a cylindrical body driven for rotation about an axis extending across said web, a pair of spaced-apart axially and circumferentially, substantially arcuate cutting-edge portions each lying substantially in a radial plane on the periphery of each of said bodies, at least two pairs of spaced-apart supplemental cutting-edge portions on each body interconnecting said pairs of arcuate cutting-edge portions so as to form on each body two substantially parallelogrammatic cutting-edge formations extending transversely between the ends of said arcuate cutting-edge portions, said parallelogrammatic formations being reversely oriented on each body with respect to each other, the continuous development of each of said cutting-edge portions defining the lines along which the opposed end-flap forming portions of said envelope-forming blanks are cut, while the waste areas between adjoining blanks of each of said continuous strips of laterally reversed rows of blanks are cut out by said parallelogrammatic cutting-edge formations.

2. A cutter assembly according to claim 1 in which there are five spaced-apart rotary cutting means and three of said inner cutting means have said cylindrical body.

3. A cutter assembly according to claim 1 wherein said one end-flap forming portion is the bottom-flap forming portion while said other end-flap forming portion is the top-flap forming portion of said banks, said bottom-flap forming portion being narrower than said top-flap forming portion and yielding only minimum waste areas within and between said parallelogrammatic cutting-edge formations along the outer edges of said web.

4. A cutter assembly according to claim 1 comprising an odd number of rotary cutting means higher than three, the two outermost and every other intermediary rotary cutting means being adapted to cut out the bottom-flap forming portions of said blanks in said reversed rows while the remaining ones of the rotary cutting means are adapted to cut out the top-flap forming portions of said blanks, said bottom-flap forming portions being narrower than said top-flap forming portions and yielding smaller waste areas within and between said parallelogrammatic cutting-edge formations.

References Cited in the file of this patent

UNITED STATES PATENTS

302,690	Stocking	July 29, 1884
623,862	Armstrong	Apr. 25, 1899
1,010,833	West	Dec. 5, 1911
1,404,526	Husted	Jan. 24, 1922
1,826,889	Koch	Oct. 13, 1931
2,006,417	Topping	July 2, 1935
2,706,000	Landis	Apr. 12, 1955

FOREIGN PATENTS

1,091,495	France	Oct. 27, 1954
274,251	Switzerland	June 16, 1951

UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,011,377 December 5, 1961

Bosworth Edwin Monck

It is hereby certified that error appears in the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 8, line 12, for "banks" read -- blanks --.

Signed and sealed this 1st day of May 1962.

(SEAL)
Attest:

ERNEST W. SWIDER
Attesting Officer

DAVID L. LADD
Commissioner of Patents