

April 14, 1936.

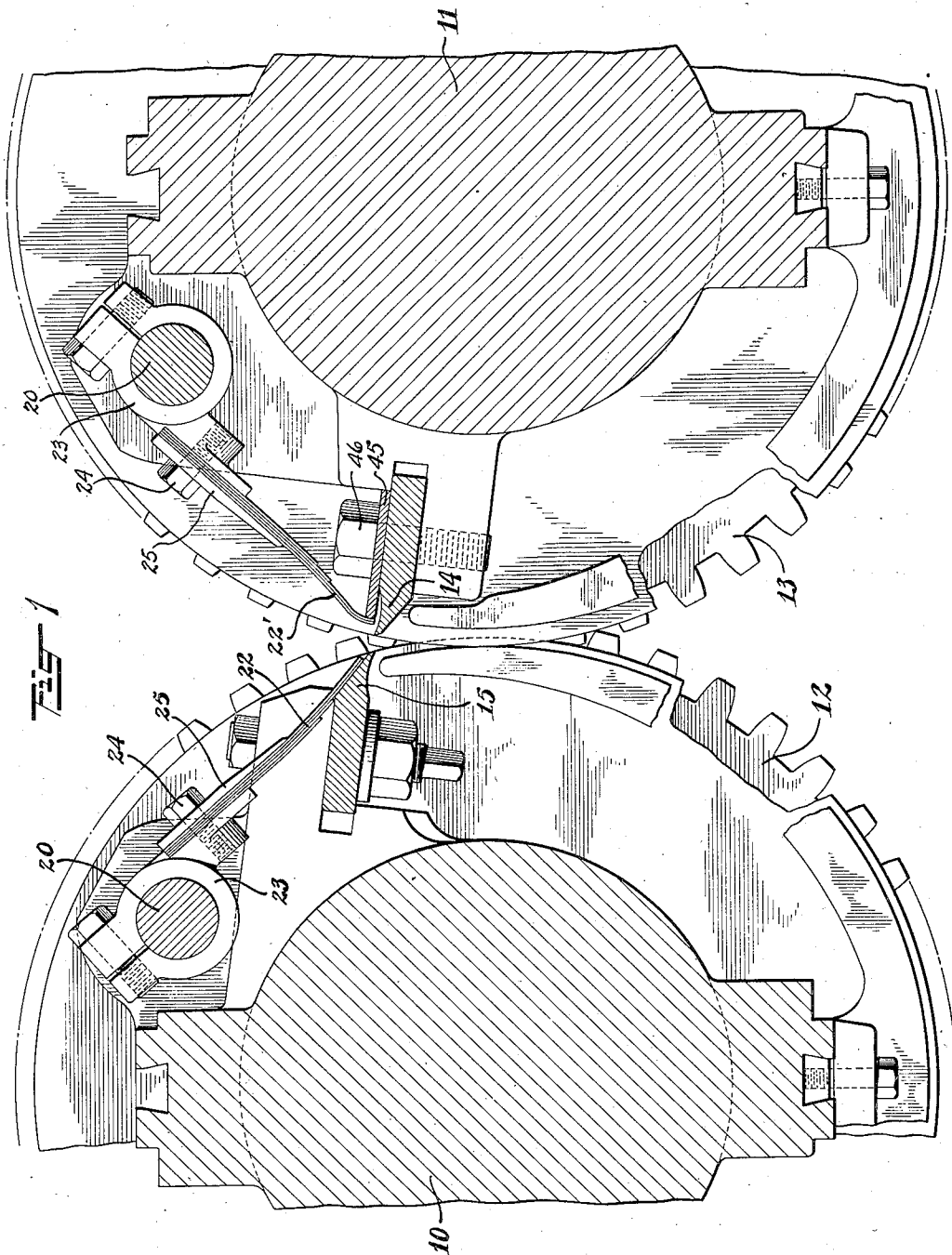
C. A. HARLESS

2,037,469

FOLDING MACHINE

Filed March 20, 1934

3 Sheets-Sheet 1



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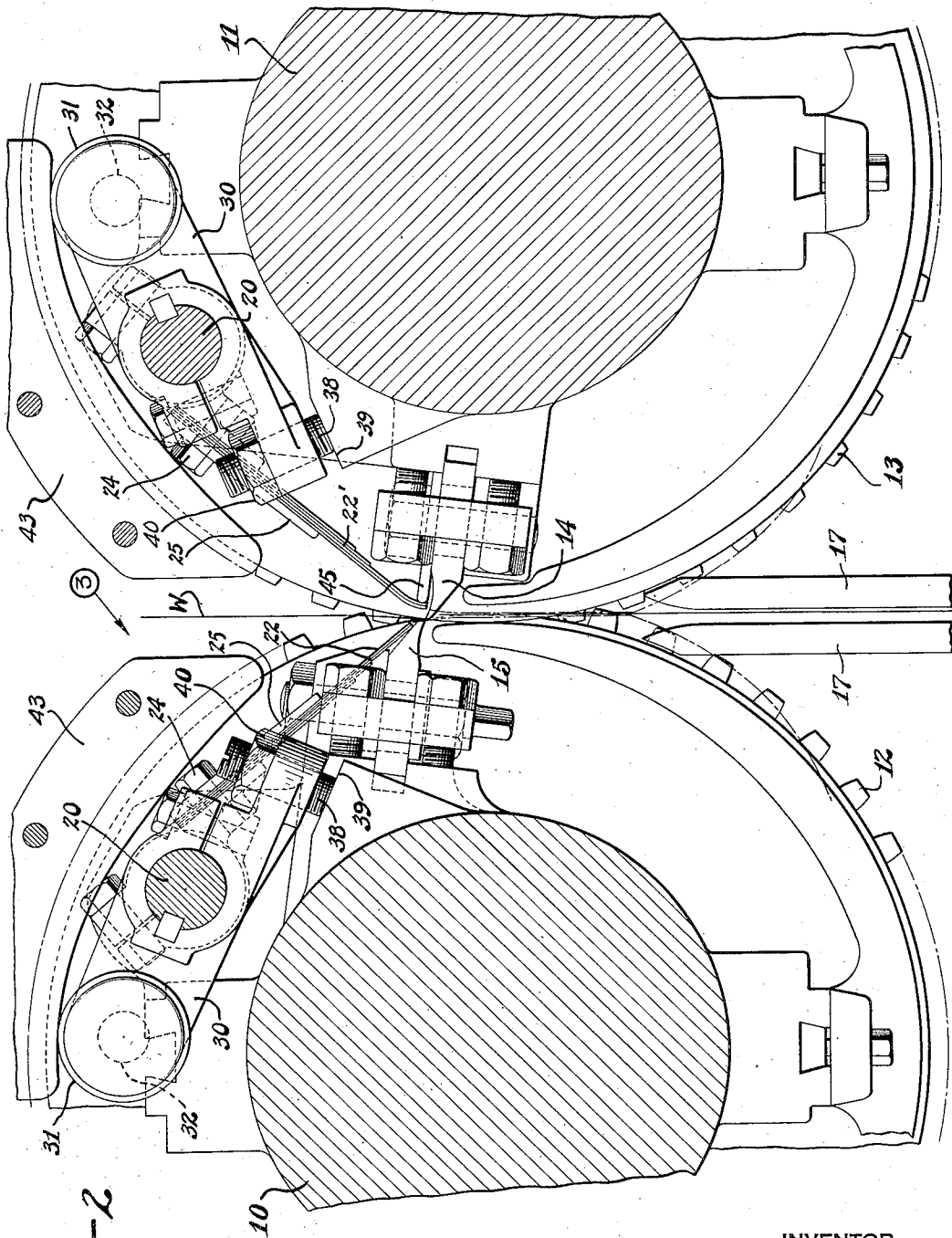
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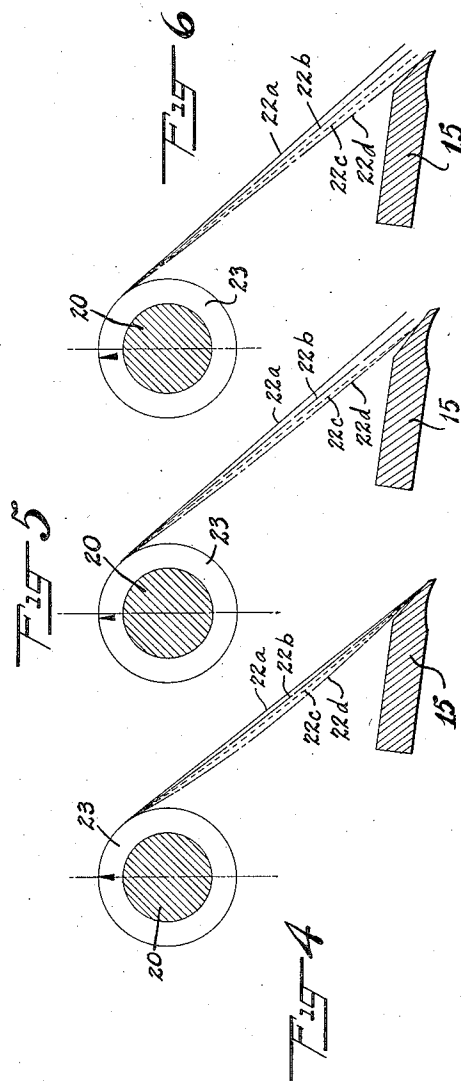
3 Sheets-Sheet 2



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3 Sheets-Sheet 3



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2,037,469

FOLDING MACHINE

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Application March 20, 1934, Serial No. 716,496

22 Claims. (Cl. 164—66)

The present invention relates to rotary folding machines and more particularly to a novel and improved mechanism for guiding a web between the cutting cylinder and a rotary folding cylinder.

Objects and advantages of the invention will be set forth in part hereinafter and in part will be obvious herefrom, or may be learned by practice with the invention, the same being realized and attained by means of the instrumentalities and combinations pointed out in the appended claims.

The invention consists in the novel parts, construction, arrangements, combinations and improvements herein shown and described.

The accompanying drawings, referred to herein and constituting a part hereof, illustrate one embodiment of the invention, and together with the description, serve to explain the principles of the invention.

Of the drawings:

Figure 1 is a fragmentary vertical section taken on the line 1—1 of Figure 3;

Figure 2 is a similar section taken on the line 2—2 of Figure 3;

Figure 3 is a plan view, with certain parts being shown in section, and looking in the direction of the arrow as indicated on Figure 2; and

Figures 4, 5, and 6 are fragmentary diagrammatic sectional views showing successive stages in the operation of one of the parts.

The present invention has for its object the provision of a novel and improved mechanism for guiding the cut or leading edge of a web into a guideway immediately after cutting. Another object is the provision of such a mechanism which is particularly adapted for use in connection with high speed rotary folding mechanisms operating in combination with shear-cutting cylinders. Still another object of the invention is the provision of a web-cutting mechanism having web lead guiding fingers which operate in timed relation with the rotation of the cutting cylinders.

The present illustrative embodiment of the invention later to be described is particularly adapted for use in conjunction with the cutting and folding mechanism shown and described in the copending application of Curtis S. Crafts, Ser. No. 676,411, filed June 19, 1933, although the present invention may be used with many other types of folding and cutting mechanisms.

The illustrative embodiment of the present invention comprises a pair of cutting cylinders each provided with one or more shear-cutter blades,

adapted to cut a web of paper into sheets which are later to be folded by means of a folding couple which may be positioned below the cutting cylinders. A guideway, extending from a point near the point of cutting to the folding couple guides the lead end of the web into proper position so that it may be gripped by the gripping means on the folding cylinder. In accordance with the present invention, means are provided for directing the lead end of the web immediately after cutting into the mouth of the guideway, and these means are preferably positioned immediately behind the shear cutter blades and serve to prevent the lead end of the web from being deflected to one side or the other of the guideway due to the air currents set up by the high speed rotation of the cylinders. As embodied, these web lead guiding means comprise a plurality of relatively long, light and resilient fingers mounted on shafts which are oscillatable in the cutting cylinders, and are so positioned that the free ends of the fingers lie immediately against the rear face of the shear cutting blades. When used in connection with more or less helical shear cutting blades, such as those shown in the Crafts application referred to, the fingers are not alined on their supporting shaft, but are set so that in retracted position they are flexed to different extents, those fingers at the end of the cylinders where the cutting operation begins being flexed to a lesser extent than the fingers at the end of the cut. Means are also provided for oscillating the finger-supporting shafts in timed relation to the rotation of the cutting cylinders, so that the fingers on each cylinder are progressively moved towards the fingers on the other cylinder during the cutting operation, the fingers on the two cylinders being moved to press against the web and each other at the instant of cutting and maintaining this pressure by being progressively moved outwardly with respect to their respective cylinders until the freshly cut lead end of the web has been positioned in the mouth of the guideway. Thereafter, the fingers are progressively withdrawn to their original flexed position and retain this position until the next cutting operation takes place. That is, the web is moved downwardly between the cutting cylinders and as the cutting progresses from one edge to the other, the fingers on both sides of the web are moved into contact with the web and maintain this relation to the web until the cut edge of the web is in the mouth of the guideway, at which time the fingers are withdrawn and moved inwardly on their respective cylinders.

It will be understood that the foregoing general description and the following detailed description as well are exemplary and explanatory of the invention but are not restrictive thereof.

Referring now in detail to the present preferred and illustrative embodiment of the inventions as shown in the accompanying drawings, the web lead guiding means are shown as applied to shear-cutting cylinders of the type shown and described in the Crafts application referred to. As embodied, the cutting mechanism comprises a pair of cutting cylinders 10 and 11 driven together through gears 12 and 13 so that they rotate at the same speed. The shear cutter blades are helically disposed on their respective cylinders, the leading blade 14 being mounted on cylinder 11 while the following blade 15 is mounted on cylinder 10. As is usual with shear cutters, the axes of the cylinders 10 and 11 are parallel to each other but are set at a slight angle to the horizontal or to a line extending transversely of the vertically-fed web, this angle being such that, taking into consideration the speed of the web, the development of the edge of either helical blade on the web is a line extending at right angles to the edge of the web.

As is usual in the operation of shear-cutting cylinders, the cutting of the web starts at that edge corresponding to the leading part of the helically-disposed cutting blades, and progresses transversely across the web towards the trailing ends of the blades, which are at the low ends of the cylinders.

As shown in Figure 2 of the drawings, the web of paper to be cut is led downwardly substantially tangential to both of the cutting cylinders and is passed between the two cylinders. The leading end of the web is passed to the mouth of a guideway formed between the guides 17 which are positioned on both sides of the web and serve to guide the web from the cutting cylinder to the folding couple positioned below the guides. The web of paper is cut by the shear cutter blades 14 and 15 immediately above the mouth of the guideway, and that portion of it between the guides 17 becomes a sheet which continues its downward motion through the guideway as it is fed on to one of the folding cylinders. Guides 17 preferably extend parallel to the line of web feed, and each of these guides 17 may be formed as a plurality of narrow ribs spaced from each other across the web.

Means are also provided for engaging the lead end of the web as it is formed by the cutting of the sheet from the web and for engaging the lead end of the web and guiding it to the mouth of the guideway. As embodied, a shaft 20 is rotatably mounted in the body of the cylinder 10, and is positioned slightly within the periphery of the cylinder and to the rear of blade 15 and extends parallel to the axis of the cylinder 10. A plurality of fingers 22 are individually mounted on shaft 20 by means of split collars 23 which may be variably angularly positioned on the shaft, and each of these fingers 22 comprises a plurality of thin, light and highly resilient leaf springs clamped together and secured to their respective collars 23 by means of screws 24 and clamping plates 25. The laminated fingers 22 are preferably of slightly different lengths and may be provided with forked ends 26. These fingers 22 are long enough to extend nearly to the outer edge of the blade 15 and lie against its beveled rear

face, the cylinder body 28 being cut away where necessary to accommodate these fingers.

Means are provided for oscillating the finger mounting shaft 20 as the cylinder 10 is rotated and for this purpose an arm 30 is clamped to the shaft 20 near one end and is provided with a cam roller 31 which is rotatably mounted in a stub shaft 32. Spring means are provided for retracting the laminated fingers 22, and these means provide a spring 34 coiled about the shaft 20, one end of the spring 34 being secured in a socket 35 encircling the shaft and held rigid with respect to the body of the cylinder while the other end of the spring 34 is secured to a spring socket 36 which is fast on shaft 20. Means are also provided for limiting the amount of flexing in the fingers 22 caused by the spring 34, and for this purpose a screw stop 38 is threaded in one end of the cam roller supporting arm 30 and is adapted to bear against a flat surface 39 formed as part of the cylinder body. A lock nut 40 is provided on the stop screw 38 for securing the stop in any desired position.

Means are also provided for moving the cam roller supporting arm 30 and the finger shaft 20 and for this purpose a cam track 43 is provided and is mounted rigidly on the frame in which the cutting cylinders are journaled. This track comprises a relatively short member having a concave inner surface which is substantially concentric with the axis of the cylinder 10, and is positioned to engage the cam roller 31. The curvature of the track 43 is such that the fingers 22 are projected from their normal position outwardly of the cylinder and into contact with the leading portion of the web immediately after cutting, and are maintained in contact with the web with more or less pressure until the leading end of the web has been introduced into the mouth of the guideway between guides 17, at which time the cam roller 31 runs off the end of track 43 and the spring 34 withdraws the fingers, returning them to their normal position.

For causing the fingers to engage the leading end of the web first at one edge thereof and for causing the remaining fingers to be successively brought into engagement with the web as the cut progresses across the web, the fingers are bent more or less by spring 34 so that they are released in succession and not simultaneously. To accomplish this, the finger mounting collars 23 are positioned at slightly different angles with respect to the cam roller supporting arm 30, the finger supporting collars 23 near the low end of the cylinder 10 are so positioned as to flex their fingers 22 to a considerably greater extent than the fingers at the high end of the cylinder are flexed and this flexing of the fingers is progressively increased towards the lower end of the cylinder. When properly adjusted, the engagement of the ends of the fingers 22 with the web is substantially coincidental with the cutting of the web at the point just below the fingers.

The web lead guiding means on the right-hand cylinder 11 are substantial duplicates of those on the left-hand cylinder just described and for that reason need not be again described in detail. However, the web guiding fingers 22 on the right cylinder have their free ends bent slightly as shown in the drawings, and when in retracted position bear against a rail 45 which is positioned immediately behind the blade 14 and is secured to the blade by means of the blade holding screws 46.

Figures 4, 5, and 6 of the drawings illustrate

successive positions of several of the fingers 22, as these fingers are moved to contact with the lead end of the web. As shown in Figure 4, finger 22a is not flexed and is the finger nearest the high end of the cylinder, finger 22b is slightly flexed, 22c is flexed slightly more and finger 22d is flexed the most of these four and is the closest to the low end of the cylinder. In Figure 5, the fingers have been moved towards the web lead end and only finger 22d is under tension, while in Figure 6, none of the fingers are under tension. As will be seen, finger 22a first contacts with the web end, then 22b, 22c, and finally finger 22d, and by properly determining the angular relation of these fingers to each other the fingers may be made to contact with the web lead end at the moment the corresponding portion of the web is cut.

Figure 2 of the drawings shows the path of the web engaging ends of the fingers 22 and 22', these paths being indicated by the dot-dash lines extending downwardly from the tips of the fingers 22 and 22'. The finger ends engage with the lead end of the web, travel straight downwardly until the lead end of the web has been positioned between the guides 17, whereupon the fingers 22 and 22' are retracted and return to their original position (Figure 1) under the action of springs 34. Due to the resilience of the spring fingers, the lead end of the web can be firmly held and it is not necessary to provide other means to cause them to move in a straight line while engaging the web end.

The invention in its broader aspects is not limited to the specific mechanisms shown and described but departures may be made therefrom within the scope of the accompanying claims without departing from the principles of the invention and without sacrificing its chief advantages.

What I claim is:—

1. Web cutting and handling mechanism including in combination a pair of cutting cylinders having helically disposed blades which form a shear cutter, a guideway through which the cut sheets are led, fingers mounted in each cylinder to engage with the leading end of the web, the fingers on each cylinder being angularly disposed with reference to each other and means for pressing said fingers against the web progressively across the web as the web is cut.

2. Web cutting and handling mechanism including in combination a pair of cutting cylinders having helically disposed blades which form a shear cutter, a guideway through which the cut sheets are led, resilient fingers mounted in each cylinder to engage with the leading end of the web and cam means operated by rotation of the cylinders for pressing said fingers against the web progressively across the web as the web is cut.

3. Web cutting and handling mechanism including in combination a pair of cutting cylinders having helically disposed blades which form a shear cutter, a guideway through which the cut sheets are led, fingers mounted in each cylinder to engage with the leading end of the web and cam means operated by rotation of the cylinders for pressing said fingers against the web progressively across the web the fingers on each cylinder being progressively angularly displaced across the cylinder whereby they are engaged with the web as the web is cut.

4. Web cutting and handling mechanism including in combination a pair of shear cutting cylinders having their axes inclined to a horizontal and having helically-disposed blades, a

guideway to which the cut sheets are led after being cut by said blades, resilient fingers mounted in each cylinder to engage with the leading edge of the web and means for progressively engaging said fingers with the web as the point of cutting moves across the web.

5. Web cutting and handling mechanism including in combination a pair of shear cutting cylinders having their axes inclined to a horizontal and having helically-disposed blades, a guideway to which the cut sheets are led after being cut by said blades, web engaging means mounted in each cylinder to engage with the leading edge of the web, a shaft on each cylinder parallel to the cylinder axis by which said means are oscillatably mounted, and means for progressively engaging said web engaging means with the web as the point of cutting moves across the web.

6. Web cutting and handling mechanism including in combination a pair of shear cutting cylinders having their axes inclined to a horizontal and having helically-disposed blades, a guideway to which the cut sheets are led after being cut by said blades, resilient fingers mounted in each cylinder to engage with the leading edge of the web and cam operated means for progressively engaging said fingers with the web as the point of cutting moves across the web.

7. Web cutting and handling mechanism including in combination a pair of cutting cylinders, resilient web lead guiding fingers for guiding the cut end of the web and a cam for operating said fingers by rotation of the cylinders.

8. In combination, a pair of cutting cylinders, cooperating cutting devices mounted on said cylinders, a guideway with its entrance near the cutting locus, pairs of fingers mounted in spaced apart relation along the cylinders, and means for moving said fingers outwardly to grip the web lead, the fingers on each cylinder being progressively angularly displaced across the cylinder whereby they are engaged with the web at the instant of cutting and progressively outwardly until the web lead has been led into the guide entrance.

9. In combination, a pair of cutting cylinders, cooperating cutting devices mounted on said cylinders, a guideway with its entrance near the cutting locus, pairs of opposed resilient fingers mounted in spaced apart relation along the cylinders, and means for causing said fingers to resiliently grip the web lead on both sides at the instant of cutting and for releasing their resilient grip on the web lead as it enters the guideway.

10. In combination, a pair of cutting cylinders, cooperating cutting devices mounted on said cylinders, a guideway with its entrance near the cutting locus, pairs of opposed laminated spring fingers mounted in spaced-apart relation along the cylinders, and means for causing said fingers to resiliently grip the web lead on both sides at the instant of cutting and for releasing their resilient grip on the web lead as it enters the guideway.

11. In combination, a pair of cutting cylinders, cooperating cutting devices mounted on said cylinders, a guideway with its entrance near the cutting locus, pairs of opposed resilient fingers mounted in spaced relation along the cylinders, the fingers on at least one of said cylinders being resilient, and means for causing said fingers to resiliently grip the web lead on both sides at the instant of cutting and for releasing their re-

silient grip on the web lead as it enters the guideway.

12. In combination, a pair of cutting cylinders, cooperating cutting devices mounted on said cylinders, a guideway with its entrance near the cutting locus, pairs of opposed resilient fingers mounted in spaced relation along the cylinders, at least one finger of each of said pairs of fingers being resilient, and means for causing said fingers to resiliently grip the web lead on both sides at the instant of cutting and for releasing their resilient grip on the web lead as it enters the guideway.

13. In combination, a pair of cutting cylinders, cooperating shearing cutters mounted on said cylinders, a guideway with its entrance near the cutting locus, pairs of opposed resilient fingers mounted in spaced-apart relation along the cylinders, and means for causing said pairs of fingers to successively resiliently grip the web lead on both sides as the shear cut progresses and for releasing their resilient grip on the web lead as it enters the guideway.

14. In combination, a pair of cutting cylinders, cooperating shearing cutters mounted on said cylinders, a guideway with its entrance near the cutting locus, pairs of opposed resilient fingers mounted in spaced relation along the cylinders, at least one finger of each of said pairs of fingers being resilient, and means for causing said fingers to successively resiliently grip the web lead on both sides as the shear cut progresses and for releasing their resilient grip on the web lead as it enters the guideway.

15. In combination, a pair of cutting cylinders, a guideway with its entrance near the cutting locus, and guiding means for the web end mounted on said cylinders and including resilient fingers and means for placing said fingers under tension and means for releasing said tension to cause the fingers to resiliently engage the web lead to direct it into said guideway.

16. In combination, a pair of cutting cylinders, a guideway with its entrance near the cutting locus, and guiding means for the web end mounted on said cylinder and including pairs of opposed resilient fingers, and means for placing said fingers under tension to hold them apart and means for releasing said tension to cause the fingers to resiliently engage both sides of the web lead to direct it into said guideway.

17. In combination, a pair of cutting cylinders, a guideway with its entrance near the cutting locus, and guiding means for the web and mounted on said cylinders and including a shaft mount-

ed on a cylinder, a plurality of resilient web-engaging fingers mounted on said shaft, and means for rotating said shaft to place said fingers under tension and to release the tension on said fingers.

18. In combination, a pair of cutting cylinders, cooperating shearing cutters mounted on said cylinders, a guideway with its entrance near the cutting locus, and guiding means for the web end mounted on said cylinders and including a shaft mounted on a cylinder, a plurality of resilient web engaging fingers mounted on said shaft, and means for rotating said shaft to place said fingers successively under tension as the cut progresses and to release the tension on said fingers.

19. In combination, a pair of cutting cylinders, cooperating shearing cutters mounted on said cylinders, a guideway with its entrance near the cutting locus, and guiding means for the web end mounted on said cylinders and including a shaft mounted on a cylinder, a plurality of spaced-apart, resilient web engaging fingers positioned at slightly different angles upon said shaft, and means for rotating said shaft to progressively change the tension on said fingers as the cut progresses.

20. In combination, a pair of cutting cylinders, a guideway with its entrance near the cutting locus, and guiding means for the web including a shaft mounted on a cylinder, a plurality of web engaging fingers mounted on said shaft, spring means acting to rotate said shaft, the fingers on each cylinder being angularly disposed with reference to each other, and a cam mechanism for governing the rotation of the shaft.

21. In combination, a pair of cutting cylinders, a guideway with its entrance near the cutting locus, and guiding means for the web including a shaft mounted on a cylinder, a plurality of resilient web engaging fingers mounted on said shaft, spring means acting to rotate said shaft and to flex said fingers under tension, and a cam mechanism for governing the rotation of the shaft.

22. In combination, a pair of cutting cylinders, a guideway with its entrance near the cutting locus, and guiding means for the web including a shaft mounted on a cylinder, a plurality of resilient web engaging fingers mounted on said shaft, spring means acting to rotate said shaft and to flex said fingers under tension in retracted position, and a cam mechanism for governing the rotation of the shaft to cause said fingers to resiliently engage the web end.

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