

July 31, 1962

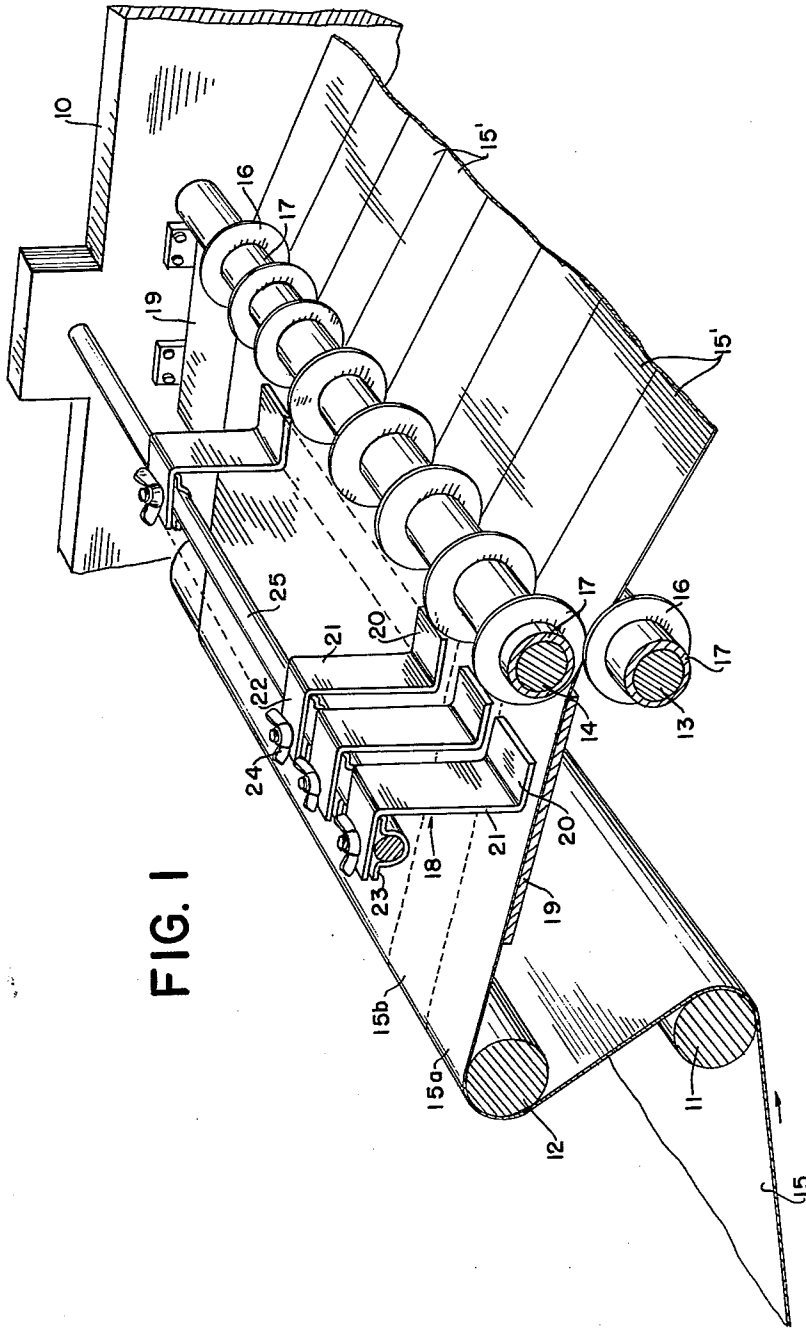
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TENSIONING DEVICE FOR A WEB IN A SLITTING APPARATUS

Filed Oct. 4, 1957

2 Sheets-Sheet 1



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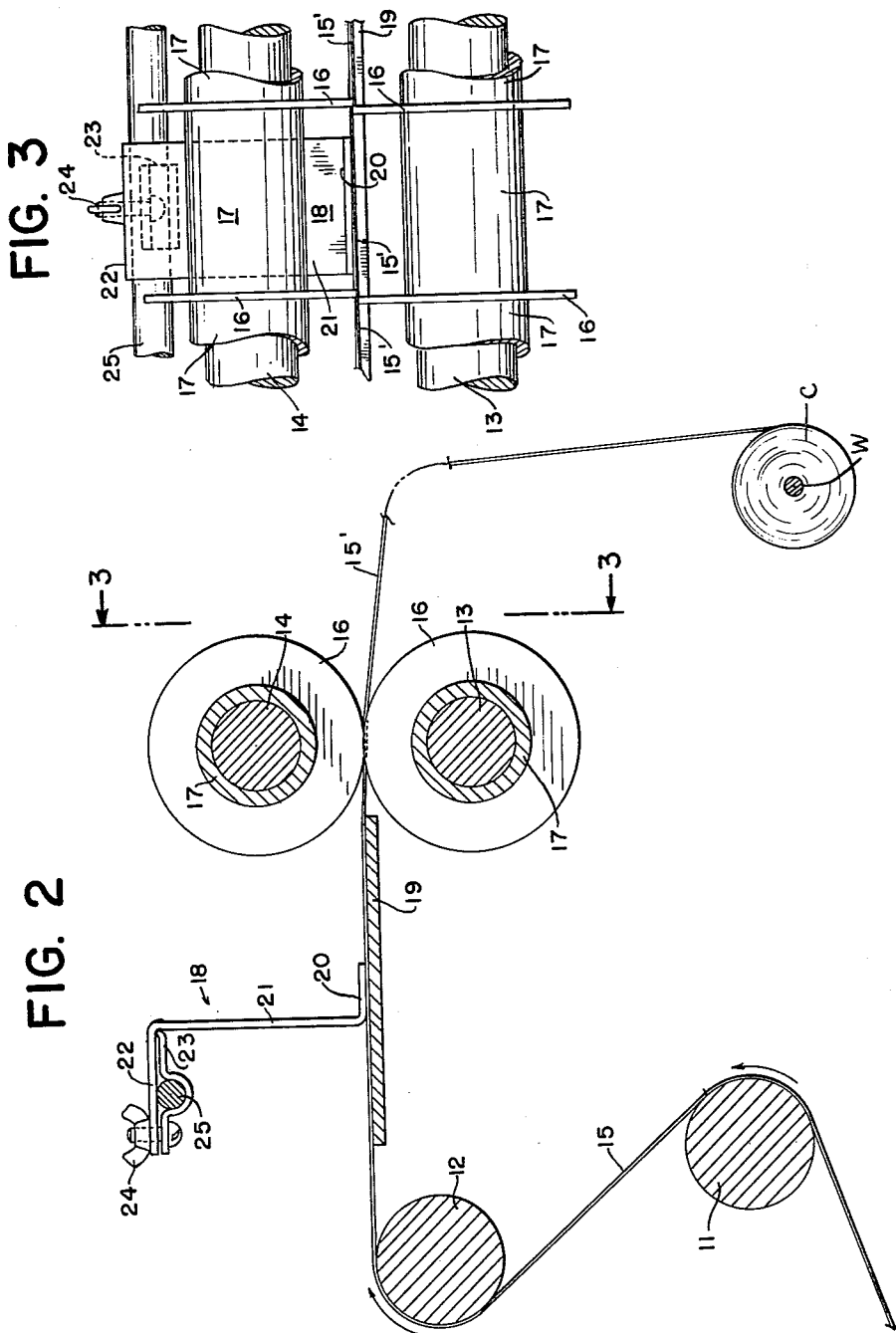
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TENSIONING DEVICE FOR A WEB IN A SLITTING APPARATUS

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Filed Oct. 4, 1957, Ser. No. 688,215

1 Claim. (Cl. 83-175)

The present invention relates to web slitting apparatus, and more particularly to specific improvements in apparatus for continuously slitting elongated webs of flexible material, such as paper, for example.

In the processing of certain web materials, such as paper, it is often expedient to pass an elongated web section longitudinally through a slitting device, whereby the web is severed continuously into a plurality of elongated strips. A conventional apparatus for this purpose is a Fales type slitter, for example, which comprises one or more cooperating pairs of slitting knives arranged in overlapping relation and adapted to rotate about axes disposed transversely of a web, on opposite sides thereof. As the web is drawn longitudinally between the pairs of rotating knives, the knives continuously shear the web into longitudinal strips.

In many slitting operations, it is desirable or expedient to slit a relatively wide web of material to form a large number of narrow strips. In such cases, the slitting apparatus comprises a relatively large plurality of pairs of slitting knives mounted on shafts disposed on opposite sides of the web. While these conventional arrangements are suitable for many operations, it has been found, in connection with the slitting of material such as paper, that it is difficult if not impossible to maintain substantial accuracy in the width of the cut strips. Thus, it has been observed that as the web of material approaches and passes between the cooperating sets of slitting knives, the eccentric shearing forces applied to the web cause the web to wrinkle between the sets of cutters and the width of the cut strips is found to be slightly greater than the spacing between axially adjacent sets of slitting knives. The discrepancy in width may be of considerable importance where the overall width of the strips is relatively small, and the behavior of the web is often such that the width varies from point to point, providing an unsatisfactory end product.

In accordance with the invention, a slitting device of an otherwise conventional design is provided with an improved arrangement for handling the web immediately prior to the passing thereof between the sets of slitting knives, whereby the web is maintained in a substantially flat condition throughout, and the cut strips are of uniform, accurately predetermined width throughout. More specifically, the invention provides a novel and simplified arrangement whereby as the web approaches the slitting knives it is pressed flat upon a supporting plate at predetermined points, and placed under a slightly increased tension at such points. The arrangement is such that the tendency of the web to wrinkle or form waves between the pairs of slitting knives is substantially or wholly eliminated, and the several longitudinal elements of the web, which eventually form the cut strips, are maintained in a flat condition as they pass between the respective sets of slitting knives.

In a preferred form of the invention, a slitting device of otherwise conventional design is provided with a plurality of pressure members which press the web downwardly onto a supporting plate, immediately adjacent the entry side of the slitting knives, a pressure member being provided for each of the theoretical longitudinal elements of the web which is eventually formed into a

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cut strip. By this means, each longitudinal element of the web is pressed flat and placed under a slightly increased tension over an area within, but not extending to the lateral limits of the element. Each element is to be maintained in a flat, taut condition as it passes through the slitting knives, so that slit strips are accurately formed to the desired widths.

For a better understanding of the invention, reference should be made to the description and the accompanying drawings, in which:

FIG. 1 is a fragmentary perspective view, partly in section, of a slitting apparatus incorporating the improved features of the invention;

FIG. 2 is a fragmentary cross-sectional view of the apparatus of FIG. 1; and

FIG. 3 is a fragmentary elevation, as taken along the line 3-3 of FIG. 2.

Referring now to the drawing, the numeral 10 designates generally the frame of a slitting apparatus, the frame mounting a pair of guide rollers 11, 12 and a pair of slitter shafts 13, 14. A web 15 of material, coming from a suitable source thereof (not shown) is passed around the guide rollers 11, 12, in that order, and is then passed between the slitter shafts 13, 14, after which it is taken to suitable wind-up means W (FIG. 2) which take up the strips in coil form as indicated at C.

In accordance with usual practice, the slitter shafts 13, 14 are disposed transversely of the web 15, in parallel relation thereto, and are journaled in the frame 10 for rotation. The shafts 13, 14 are adapted to receive a plurality of slitting knives 16 and spacing collars 17, the collars 17 being inserted between adjacent slitting knives to space the knives a predetermined fixed distance apart. As shown in FIG. 3, the knives and collars 16, 17, on the respective shafts 13, 14, are so arranged that the corresponding knives on the respective shafts are placed immediately adjacent each other, in overlapping relation, so that pairs of slitting knives are in shearing relation. Accordingly, when the web 15 is passed between the slitting shafts 13, 14, the cooperating pairs of slitting knives 16 are effective to sever the web longitudinally in a continuous manner. As a general rule, the slitting shafts 13, 14 are power driven to facilitate the cutting action of the overlapping knives.

As shown in FIG. 1, as the web 15 passes between the slitting shafts 13, 14, the web is severed into a plurality of separate strips 15', depending upon the number and position of the pairs of slitting knives. Ideally, the width of the slit strips 15' should be exactly equal to the spacing between the sets of slitting knives. However, under normal conditions it has been found that the web tends to buckle or wrinkle between and rearwardly of the sets of the slitting knives and the width of the cut strip 15' is thus somewhat greater than the spacing between slitting knives. That is, the longitudinal elements of the web 15, which eventually become the separate slit strips 15', tend to buckle transversely of the web prior to passing through the slitters, so that the width of such longitudinal element, as it is cut, is greater than is desired.

In accordance with the present invention, buckling of the longitudinal elements of the web is avoided by providing a plurality of pressure members, generally designated by the numeral 18, which act upon the longitudinal elements of the web and press the elements against a supporting plate 19 mounted on the frame 10. Advantageously, the pressure members 18 are positioned adjacent the entry side of the slitting knives 16 and are aligned with individual slit strips 15', a pressure member being provided for each of the slit strips. In the illustrated apparatus, the active surface portions of the pressure members are of slightly less width than that of the strips 15' and

are substantially centered with respect to the lateral edges of the slit strips, whereby the pressure members act upon longitudinal elements of the web, such as indicated at 15a, 15b, over a central portion thereof.

In the illustrated form of the invention, the pressure members 18 may be more or less Z-shaped metal members, each having a pressure foot 20 extending substantially at right angles to a vertical support 21, the support 21 depending from a generally horizontal clamping arm 22. Each pressure member 18 is provided with a generally U-shaped clamp 23, which is secured to the clamping arm 22 by suitable means, such as wing nuts 24. As shown best in FIGS. 1 and 2, the clamping arms 22 are adapted to be received over the top of a horizontal supporting bar 25 positioned over and disposed transversely of the web 15. The clamps 23 extend around the bottom of the supporting bar 25, and the respective pressure members 18 may be individually clamped to the bar 25. The arrangement is such that the pressure members 18 may be adjusted individually along the supporting bar 25, as well as rotated into desired positions with respect to the supporting plate 19, whereby proper alignment with and pressure upon the longitudinal elements 15a, 15b, etc. of the web may be obtained.

As shown in FIG. 3, the individual pressure members 18 are advantageously so adjusted as to be centrally aligned between adjacent cooperating pairs of slitting knives 16. It will also be observed in FIG. 3 that the width of the pressure foot 20 of each pressure member is slightly less than the spacing between the adjacent sets of knives. By way of example, and not of limitation, the pressure feet 20 may have a width of approximately 2½ inches, where the spacing between adjacent sets of slitting knives is approximately 3 inches.

When the pressure members 18 are properly adjusted, each member will be substantially centrally positioned with respect to one of the theoretical longitudinal elements 15a, 15b, etc., of the web, and the pressure feet 20 of the members 18 will press lightly upon the web, urging it into flat relation to the plate 19. As will be noted in FIG. 2, the pressure feet 20 act upon the web 15 slightly in advance of the slitting shafts 13 and 14. By way of example, the pressure feet 20 may be located in the order of 5 inches in advance of the shafts 13, 14.

With the pressure members 18 thus properly adjusted, the web 15 may be passed through the slitting device and severed into a plurality of separate strips 15' of relatively narrow width, with the width of the slit strips accurately reflecting the predetermined spacing between axially adjacent pairs of slitting knives.

The apparatus of the invention is particularly advantageous in connection with the slitting of a relatively wide paper web into a plurality of strips of relatively narrow width. Heretofore it has been difficult, if not impossible, to accurately regulate the width of the slit strips due to the tendency of the web to buckle and form waves while passing between the slitting knives. Moreover, such variations in width were not always consistent and predictable in that the buckling of the web elements may vary in magnitude from point to point along the web.

The improved form of slitting apparatus is realized by providing a generally simplified and economically manufactured attachment for an otherwise conventional slitting device. The attachment is readily adjustable to accommodate most commercial slitting operations, regardless of the number or size of the slit strips, since the pressure members 18 may be of various sizes, and are individually adjustable on the supporting bar 25.

It should be understood, however, that the specific apparatus herein shown and described is intended to be representative only, as certain changes may be made therein without departing from the clear teaching of the invention. Accordingly, reference should be made to the following appended claim in determining the full scope of the invention.

I claim:

In combination with a web slitting device for slitting paper webs, said slitter being of the type having a plurality of pairs of cooperating disc-type slitting knives arranged in pairs in overlapping relation for continuously severing a paper web drawn longitudinally past the knives into a plurality of separate strips, a rigid and fixed continuous web supporting plate disposed horizontally positioned adjacent the entry side of said slitting knives for continuously supporting the web across its entire width as the web moves toward the knives, a rigid and fixed supporting rod positioned over said plate and extending across the width of said web, a Z-shaped pressure member for each of said separate strips, each of said pressure members having a depending portion and a cantilever-supported pressure foot extending horizontally forward from said depending portion, each of said pressure members further having a clamping arm extending rearward toward and adjustably mounted on said supporting rod for adjustably securing the pressure member to the rod, each of said pressure members being formed of strip like material for accommodation of flexing of the pressure foot thereof in accordance with adjustments of the pressure member on said rod, said pressure members being slidably and rotatably adjustable on said rod, freely accessible means on the clamping arm of each pressure member for independently releasably securing each of the pressure members in predetermined adjusted position on said rod, said pressure members being positioned adjacent the entry side of said slitting knives with their pressure feet slidably engaging portions of the web passing forwardly over said plate and pressing said portions of the web against the fixed plate to longitudinally tension the web, said pressure members being of a width slightly less than the spacing between adjacent sets of slitting knives and being arranged such that a pressure member is positioned in alignment between each set of two pairs of slitting knives, each of said pressure members being further arranged with its pressure foot pressing upon a separate area of said web to individually tension a separate longitudinal strip area of the web, which ultimately becomes a separate slit strip, and wind-up means on the exit side of the slitting knives for drawing the web past the knives.

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