

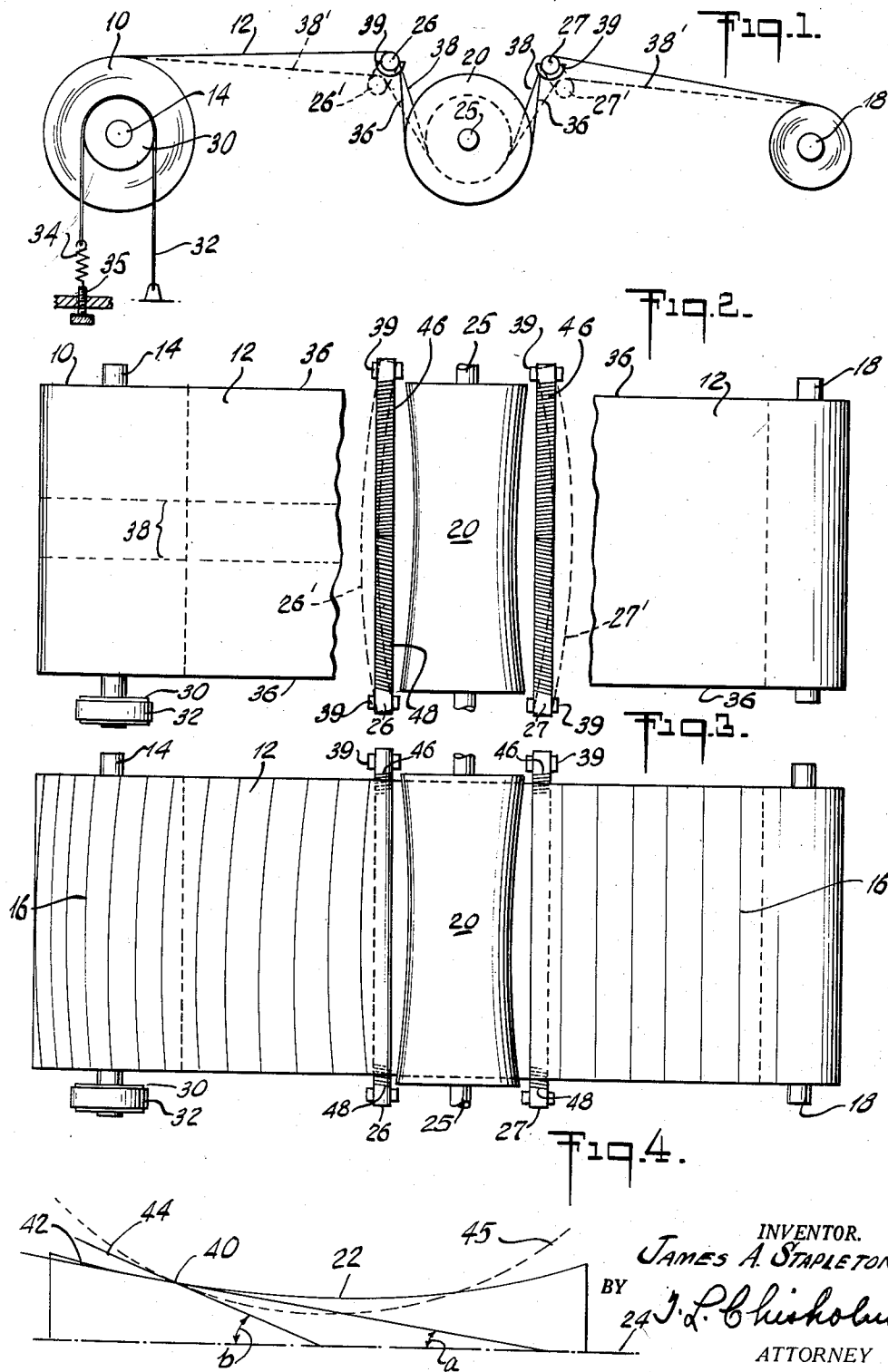
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J. A. STAPLETON

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APPARATUS FOR STRAIGHTENING FABRIC

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INVENTOR.
JAMES A. STAPLETON.
BY *J. L. Chisholm*
ATTORNEY

UNITED STATES PATENT OFFICE

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APPARATUS FOR STRAIGHTENING FABRIC

James A. Stapleton, Cornelia, Ga., assignor, by
mesne assignments, to Chicopee Manufacturing
Corporation, Chicopee Falls, Mass., a corpora-
tion of Massachusetts

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This invention relates to devices for straightening bowed weft of woven fabric. It is particularly, but not exclusively, adapted to straightening bow in fabrics woven of plastic monofilaments such as nylon, saran, polyethylene and the like, and for example only will be described as applied to such fabrics. These filaments are frequently stiff, wiry, elastic and have a very slippery surface, and these properties create unusual problems in handling and processing the fabric.

In the weaving of fabrics it is common to encounter bowed weft, that is the weft strands or yarns are bent or bowed from one edge or selvage to the other. This bow is frequently, if not usually, convex toward the end of the fabric first woven by the loom. While this bow may readily be removed from certain textiles such as cotton gauze by simple sidewise stretching, as in a tenter, this is impractical with certain other fabrics, particularly heavy weight, closely woven fabrics made of the plastic monofilaments referred to, which may have a diameter of about fifteen thousandths of an inch.

My invention provides a simple and economical apparatus for positively straightening bow in such plastic monofilament fabrics, which apparatus at the same time effectively prevents wrinkling, stretching and shrinking of the fabric in the direction of its width, and eliminates other disadvantages of previously proposed weft straightening devices.

In the accompanying drawings:

Fig. 1 is a diagrammatic end elevation of an apparatus embodying one form of my invention;

Fig. 2 is a diagrammatic plan of the apparatus shown in Fig. 1, the fabric being partly broken away to show parts beneath;

Fig. 3 is a plan like Fig. 2 but with the fabric complete;

Fig. 4 is a geometric diagram showing how the surface of the straightening roll is derived.

Referring especially to Figs. 1 and 2, 10 represents a roll of fabric 12. The end first woven by the loom has been wound on a take-off roll or core 14, which in the present apparatus is supported for rotation in any suitable bearings, not shown. The weft strands are indicated by 16, and as shown in the left portion of Fig. 3, they are convex toward the initial end of the fabric. The fabric is unwound from the roll 14 and is wound onto the roll or core 18 which is rotated by any suitable means, not shown. The core 18 constitutes means for moving the fabric in the direction of its length over a straightening roll.

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The straightening roll 20 has a concave surface, by which is meant that the surface is generated by revolving a curved generatrix 22 about an axis 24, the generatrix being convex toward the axis of revolution. This provides a roll having a minimum diameter at the longitudinal center and gradually increasing the diameter toward the ends. The roll thus has a straight line axis of symmetry, and it is suitably mounted for rotation about this axis, as by a spindle 25.

The invention includes means for guiding the fabric over a substantial circumferential portion on the surface of the roll. This includes, for example, one or preferably two guide bars 26 and 27 placed parallel to the spindle 25, the fabric being threaded over the guide bars and around the roll. Suitable means is provided for applying continuous tension to the fabric in the direction of its length. This may be a brake drum 30 keyed to the roll 14 and having a brake band 32 loaded by a spring 34 adjusted by a screw 35 for regulating the tension in the fabric. As the fabric is wound on the drum 14 under the tension of the brake, it is held firmly against the surface of the roll 20 throughout the width of the fabric. This causes the edges 36 of the fabric to travel over longer path (around the large diameters of the ends of the roll) than the center of the fabric, which travels over the smaller diameter of the roll. Therefore by the time a particular weft strand has reached the guide bar 27, the portion in a zone 38 has tended to catch up with the ends, and thus the weft strand has tended to become straight. The amount by which a strand is straightened depends upon the amount of initial bow, and upon the difference of the lengths of the paths of each increment of the weft strand. The differences of the lengths of the paths are determined initially by the differences of diameter along the roll 20.

The invention includes means for changing these differences and thus accurately straightens bows of different curvatures. To this end the guide bars 26 and 27 are flexible and each end of each bar is supported in a rigid fulcrum support 39 which permits the bar to bend. The difference in the diameter of the center and the ends of the roll 20 is sufficient to straighten the minimum curvature expected, by drawing the fabric over the bars 26 and 27 and roll 20 under a tension which is not great enough to bend the bars appreciably. To straighten curvature greater than this, the tension in the fabric is increased. This causes the flexible bars to bend

and to take positions indicated by the dotted lines 26' and 27' in Figs. 1 and 2. When so bent, the positions of the portions of the bars which support the selvages does not change appreciably, but the centers move downwardly and outwardly as seen in Fig. 2 so that the portion of the fabric near the center now travels a path 38' which is shorter than the path 38. Since this path is now shorter than before, and the paths of the ends have remained the same length, the difference in the lengths of the paths has increased. Consequently the center can catch up a greater distance and bows of greater curvature can be corrected.

The tension of the fabric tends to slide the fabric toward the small diameter of the roll 20 and thus tends to wrinkle the fabric if motion along the axis were permitted. Such motion is positively prevented, and the roll 20 together with bars 26 and 27 constitute means for positively moving the warp strands, each substantially in a single plane. The surface of the roll is so generated that at any given point of contact between fabric and roll, such as 40 in Fig. 4, the tangent 42 to the generatrix 22 makes an angle (α) with the axis 24 which is less than the angle of repose of the fabric on the roll. The angle of repose is that angle (β) between the axis and the tangent 44 to a generatrix 45 having such a slope that the fabric just begins to slip down the slope, that is, along the surface in the direction of the axis of the roll. The angle of repose is a well known friction phenomenon, and depends upon the character of the surfaces in contact. Therefore for slippery fabrics such as nylon or saran, it is preferred to make the roll slightly rough, as by turning it from wood with a slightly dull tool. Alternatively, or in addition, the guide bars 26 and 27 may be provided with oppositely pitched shoulders 46 and 48 extending from the longitudinal center of the fabric to its edges. As the fabric is dragged over the bars, the shoulders (which may be lands or may be the edges of grooves) tend to move the warp strands outwardly toward the ends of the bars, but the warp strands are positively held against such movement by the tension of the weft strands. Thus each longitudinal half of the fabric is urged outwardly against the other half and the entire surface of the fabric is kept smooth and free of wrinkles.

I claim as my invention:

1. Apparatus for straightening bowed weft strands of a woven fabric having warp strands and weft strands, comprising in combination means for moving the fabric in the direction of its length, a roller having a straight line axis of symmetry, means for supporting the roller for rotation about its axis, the surface of the roller being generated by rotating about the axis a curved line which is convex toward the axis, means for guiding the fabric about a substantial circumferential portion of the surface of the roller as the fabric is moved in the direction of its length, and means for applying tension to the fabric in the direction of its length, the angle with respect to the axis of the tangent to the generatrix of the surface at any point of contact between the surface and the fabric being less than the angle of repose of the fabric on the surface of said roller at said point with respect to the axis.

2. Apparatus for straightening bowed weft strands in fabric having warp strands and weft strands, comprising in combination means for moving the fabric in the direction of its length,

a concave roller having a straight line axis of symmetry, means for supporting the roller for rotation about its axis, means for continuously applying tension to the fabric in the direction of its length, and a flexible rod supported at its ends in a position parallel to the axis for guiding the fabric about a substantial circumferential portion of the surface of the roller as the fabric is moved in the direction of its length.

3. Apparatus for straightening bowed weft strands in fabric having warp strands and weft strands, comprising in combination means for moving the fabric in the direction of its length, a concave roller having a straight line axis of symmetry, means for supporting the roller for rotation about its axis, means for continuously applying tension to the fabric in the direction of its length, a flexible rod supported at its ends in a position parallel to the axis for guiding the fabric about a substantial circumferential portion of the roller, and two sets of shoulders on the rod, the shoulders of each set being on one side of the longitudinal center of the fabric and being inclined outwardly from the center in the direction of travel of the fabric.

4. Apparatus for straightening bowed weft strands in fabric having warp strands and weft strands, comprising in combination means for moving the fabric in the direction of its length, a concave roller having a straight line axis of symmetry, means for supporting the roller for rotation about its axis, means for continually applying tension to the fabric in the direction of its length, means for adjusting the tension applied, and a flexible rod supported at its ends in a position parallel to the axis for guiding the fabric about a substantial circumferential portion of the surface of the roller as the fabric is moved in the direction of its length.

5. Apparatus for straightening bowed weft strands in fabric having warp strands and weft strands, comprising in combination, means for moving the fabric lengthwise, a concave roller having a straight line axis of symmetry, means for supporting the roller for rotation about its axis, means for continuously applying tension to the fabric in a lengthwise direction, and means normally parallel to the straight line axis of symmetry of the concave roller for guiding the fabric in its lengthwise movement about a substantial circumferential portion of the roller's surface, said guiding means being deformable in increasing magnitude from the ends toward the center for progressively decreasing, from the edge of the fabric inwardly towards the center thereof, the lengths of the paths followed by the warp strands.

6. Apparatus for straightening bowed weft strands in fabric having warp strands and weft strands, comprising in combination, means for moving the fabric lengthwise, a rough surfaced concave roller having a straight line axis of symmetry, means for supporting the roller for rotation about its axis, means for continuously applying tension to the fabric in a lengthwise direction, and means normally parallel to the straight line axis of symmetry of the concave roller for guiding the fabric in its lengthwise movement about a substantial circumferential portion of the roller's roughened surface, said guiding means being deformable in increasing magnitude from the ends toward the center for progressively decreasing, from the edge of the fabric inwardly towards the center thereof, the lengths of the paths followed by the warp strands.

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7. Apparatus for straightening bowed weft strands in fabric having warp strands and weft strands, comprising in combination, means for moving the fabric lengthwise, a concave roller having a straight line axis of symmetry, means for supporting the roller for rotation about its axis, means for continuously applying tension to the fabric in its lengthwise direction, means normally parallel to the straight line axis of symmetry of the concave roller for guiding the fabric in its lengthwise movement about a substantial circumferential portion of the roller's surface and which are deformable in increasing magnitude from the ends towards the center for progressively decreasing, from the edge of the fabric towards the center thereof, the lengths of the paths followed by the warp strands, and means acting on the fabric for guiding each warp

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strand thereof substantially in a single plane throughout its movement.

JAMES A. STAPLETON.

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