

April 29, 1941.

W. WADE

2,240,274

ARTICLE AND PROCESS AND APPARATUS FOR PRODUCING THE SAME

Filed Aug. 7, 1936

Fig. 1.

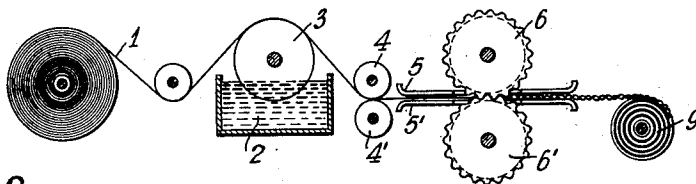


Fig. 2.

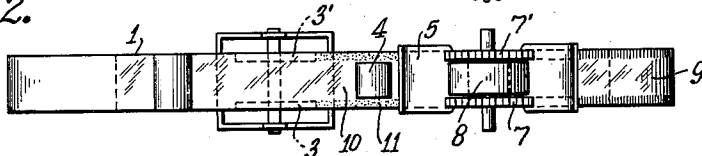


Fig. 3.

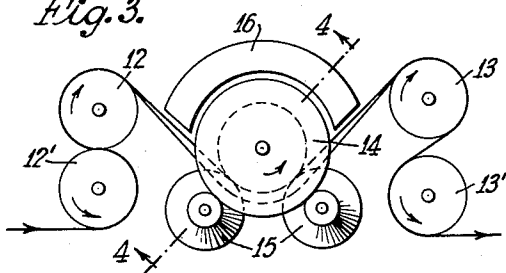


Fig. 4.

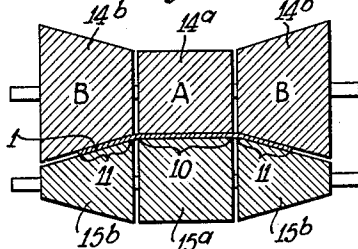


Fig. 5.

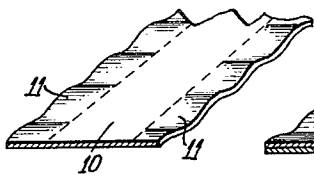


Fig. 6.

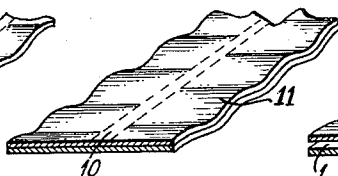


Fig. 7.

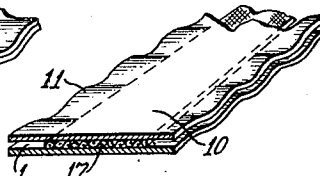


Fig. 8.

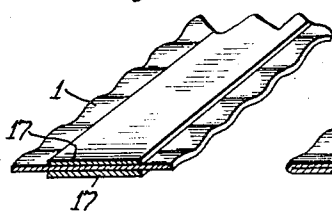


Fig. 9.

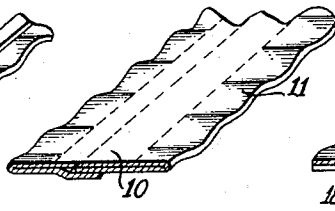


Fig. 10.

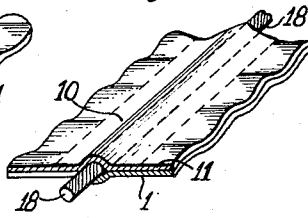


Fig. 11.

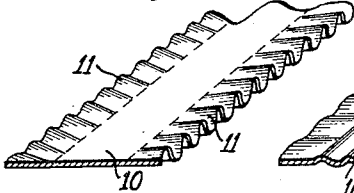
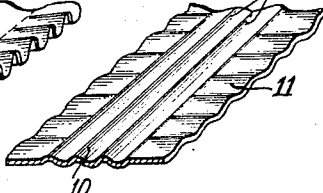


Fig. 12.



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2,240,274

ARTICLE AND PROCESS AND APPARATUS
FOR PRODUCING THE SAMEWorth Wade, New York, N. Y., assignor to Syl-
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Application August 7, 1936, Serial No. 94,809

9 Claims. (Cl. 154—1)

This invention relates in general to ribbons adapted for use in the textile and cordage arts and in particular to an improved tying ribbon formed of a strip of flexible relatively plastic material.

It is well known that ribbons formed from a narrow strip of relatively plastic sheet material, such as Cellophane, have relatively little resistance to tearing. This is due to the fact that when the load is borne by the cut edge the strip begins to tear from the edge, the tear originating from any irregularity or serration in the edge. Attempts have been made heretofore to overcome this tendency of the strips to tear by folding the longitudinal edges of the strip so that the stress will be borne by the folded edge. Such folding operations are tedious, expensive and wasteful of material.

It is therefore a general object of the invention to provide a tying ribbon formed from a strip of relatively plastic material in such a manner that, without folding, the tear resistance and apparent tensile strength of the strip is increased to many times that of the original strip.

It is another object of the invention to provide a process and apparatus for making a tying ribbon of high tear resistance, enhanced decorative character and an increased flexibility.

Other objects of the invention will in part be obvious and will in part appear hereinafter.

According to the present invention, the problem of imparting a high tear resistance to narrow cut strips to adapt them for use in the textile and cordage arts is solved by relieving the cut edges of the load and modifying the marginal edges of the cut strip so that the load is carried by the central or body portion of the strip. Therefore the invention comprises means for and the steps of treating the longitudinal edges of a strip of flexible, relatively plastic material whereby to give the marginal edges a greater length than that of the central body portion of the strip, preferably by softening areas of the strip adjacent the marginal edges and stretching the softened areas with respect to the central body portion of the strip.

The article of the invention comprises in general a tying ribbon, adapted for use in the cordage and textile arts, formed of a strip of a flexible, relatively plastic material and having its longitudinal edges stretched with respect to the body portion thereof, the edge portions preferably being convoluted whereby stresses are carried by the body portion.

The invention accordingly comprises the proc-

ess having the several steps and the relation of one or more of such steps with respect to each of the others, the apparatus embodying features of construction, combinations and arrangement of parts adapted to effect such steps, and the article which possesses the characteristics, properties and relation of elements, all as exemplified in the detailed disclosure hereinafter set forth and the scope of the invention will be indicated in the claims.

For a more complete understanding of the nature and objects of the invention reference should be had to the accompanying drawing, in which

Fig. 1 represents a side elevation of one embodiment of a suitable apparatus for making the ribbon of the invention;

Fig. 2 represents a top plan view of the apparatus of Fig. 1;

Fig. 3 represents a second embodiment of a suitable apparatus for making the article of the invention;

Fig. 4 represents a sectional view of the apparatus of Fig. 3 taken along the line 4—4 thereof; and

Figs. 5 to 12 inclusive represent perspective views of as many embodiments of the article of the invention.

The ribbon of the invention is formed of at least one strip of a flexible, relatively plastic material. The relatively plastic material may be formed in whole or in part of a material swelling in water, such, for example, as Cellophane, alkali-soluble cellulose ethers and cellulose oxy-ethers, gelatine, casein, and the like; or of a material swelling or dissolving in organic solvents but not swelling in water, such, for example, as cellulose esters, cellulose ethers and cellulose ester-ethers, synthetic plastics such as polymerized vinyl resins, rubber, halogenated rubber, and the like. The sheet material may be transparent, translucent or opaque and may be colored, embossed, printed, metallized, and/or provided with a moistureproof and/or waterproof coating.

In general the apparatus of the invention comprises means, such for example as a pair of rollers having opposite end portions provided with intermeshing projections, adapted to cause the longitudinal edges of a strip passed therebetween to traverse a distance greater than the distance traversed by the central body portion of the strip.

In the embodiments of the apparatus shown in Figs. 1 and 2, a strip 1 of relatively plastic material is passed from a roller, preferably over a pair of spaced rollers 3 and 3' which dip into a bath 2 of a conditioning liquid which is thereby applied

to the longitudinal edges of the strip. The treated strip is fed by means of drawing rollers 4 and 4' between guide plates 5 and 5' and between spaced pairs of compound stretching rollers 6 and 6'. The rollers 6 and 6' comprise two end portions 7 and 7', having intermeshing peripheral projections, and a central cylindrical portion 8 of smooth peripheral surface. As the strip passes between the pair of rollers 6 and 6', the longitudinal edges are stretched and convoluted by the marginal portions 7 and 7' while the central body portion passes unstretched between the smooth portions 8 of these rollers. From the stretching rollers the strip passes to the wind-up roller 9.

With respect to the apparatus of Figs. 1 and 2, it should be noted that the drawing roller 4 grips only the central body or untreated portion 10 of the strip 1, so that this roller does not contact the treated longitudinal edge portions of the strip. Obviously, roller 4' may, if desired, extend the full width of the strip. The edge-stretching portions 7 and 7' of the rollers 6 and 6' may be adjustable transversely of the strip so that strips of different sizes may be treated in the same apparatus. Likewise the conditioning rollers 3 and 3' may be adjustably mounted with respect to each other transversely of the strip for the same purpose.

In the embodiment shown in Figs. 3 and 4, the strip 1 is passed between two spaced pairs of pressure rollers 12-12' and 13-13' which serve to maintain the strip under tension. There is positioned between these pairs of rollers a compound stretching roller 14 comprising a central cylindrical roller 14a and conical rollers 14b on each side. The compound roller 14 is mounted above and in co-extensive contact with two compound rollers 15 each of which comprises a central cylindrical roller 15a, of the same length as roller 14a, and two conical shaped end rollers 15b having complementary shapes with respect to the corresponding rollers 14b. The strip 1 is passed first between the pair of pressure rollers 12-12', then between the compound rollers 14 and 15 wherein the marginal edge portions 11 of the strip are caused to traverse a path longer than the path travelled by the central body portion 10 of the strip. The pressure applied by the compound rollers 14 and 15 is sufficient to prevent transverse displacement of the strip 1 with respect to these rollers. The strip finally passes from the stretching rollers around the rollers 13-13', which are driven so as to draw the strip through the apparatus. To increase the plasticity of the strip, the compound rollers 14 and 15 may be heated, for example by a heating element 16 which partly surrounds the compound roller 14, as shown in Fig. 3. The degree of stretch to which the edges of the strip are subjected may be varied by providing several sets of complementary conical rollers 14b and 15b, each set having a different taper. The degree of stretch will depend directly upon the degree of taper of these rollers.

With the apparatus herein disclosed there will be produced a ribbon such as that illustrated in Fig. 5, comprising a thin strip of a flexible relatively plastic material having an unstretched central body portion 10 and longitudinal edge portions 11 which are stretched with respect to the central body portion. As a result of this stretching, the edge portions 11 will assume a convoluted state in the finished ribbon. If desired, the unstretched portion may comprise only an extremely narrow area running longitudinally of

the strip and preferably disposed centrally thereof, as shown in Fig. 6.

With respect to the structure of the ribbon, it may comprise a single strip of material, as shown in Figs. 5, 11 and 12, or a plurality of strips, as shown in Figs. 6, 7, 8 and 10. If desired, a wide strip may be folded longitudinally of its edges to form a ribbon and the marginal folded edges of this ribbon stretched to produce the article shown in Fig. 9. The strip may comprise a laminated structure. For example, in Fig. 7, two strips 1 of relatively plastic material enclose a narrow strip 17 of an extraneous sheet material, such as paper, leather, metal foil, ramie, textile fabric, etc., the strips being joined together by a suitable adhesive. In this embodiment it is preferable that the strip 17 extends only the width of the central unstretched body portion 10 of the strips 1, because such extraneous materials as above mentioned do not stretch to the same extent as the relatively plastic strips 1. In Fig. 8 there is shown an embodiment in which a single strip 1 of relatively plastic material is laminated between two narrow strips 17 of extraneous material. The strips 17 may be substituted by strips of relatively plastic material of the same or like character as the strip 1. In Fig. 10 there is shown an embodiment in which two strips 1 of relatively plastic material enclose a flexible core 18 of fibrous or non-fibrous material which is preferably centrally disposed longitudinally of the strips 1 and which is thus not subjected to any stretching operation.

For conditioning the relatively plastic material, there may be employed any suitable solvent or swelling agent therefor. For example, for Cellophane there may be employed water or a mixture of water and a polyhydric alcohol or an ester of such alcohols, and for cellulose esters there may be employed acetone or a mixture of ether and alcohol. It is understood that the conditioning agent may be applied to the entire strip or only to the longitudinal edge portions 11, as shown in Figs. 1 and 2. There may be disposed between the stretching means and the wind-up roller 9 any suitable means for removing the conditioning agent from the strip if desired, such, for example, as a heating chamber to cause the evaporation of the conditioning agent. As a result of conditioning the longitudinal edge portions 11, these portions can be stretched to a greater extent than when such portions are not conditioned. This enables ribbons to be made in which the longitudinal edge portions 11 are ruffled, as shown in Fig. 11.

It is obvious that other structures and embodiments of the article of the invention may be made. For example, the central body portion 10 of the strip may be corrugated longitudinally to give a series of ridges 19, as illustrated in Fig. 12. Such corrugation is easily carried out when the strip is conditioned over its entire width and passed between suitable known corrugating rollers (not shown).

The article of the present invention is characterized by having a high tear resistance because, when in use, the longitudinal stresses are carried by the central body portion 10 which is shorter than the stretched longitudinal edge portions 11. Therefore, even if the longitudinal edges are cut edges, the tendency of the cut edges to tear is removed or greatly diminished. Moreover, by such stretching of the edge portions as herein provided, the flexibility and apparent tensile strength of the finished ribbon

is greatly enhanced. The convolutions and ruffling of the edges resulting from such stretching enhances the decorative character of the ribbon.

Since certain changes may be made in carrying out the above process and in the product, and modifications effected in the apparatus for practicing the principle thereof, without departing from the scope of the invention, it is intended that all matter contained in the above description or shown in the accompanying drawing shall be interpreted as illustrative and not in a limiting sense.

Having described my invention, what I claim as new and desire to secure by Letters Patent is:

1. As an article of manufacture, a substantially flat tying ribbon formed of a strip of flexible relatively plastic stretchable material having longitudinal edges and a body portion, and having its edges stretched longitudinally with respect to the body portion thereof, said body portion being non-extended.

2. As an article of manufacture, a substantially flat tying ribbon formed of a strip of non-fibrous cellulosic stretchable material having longitudinal edges and a body portion, and having its edges stretched longitudinally with respect to the body portion thereof, said body portion being non-extended.

3. As an article of manufacture, a substantially flat tying ribbon formed of a strip of Cellophane having longitudinal edges and a body portion, and having its edges stretched longitudinally with respect to the body portion thereof, said body portion being non-extended.

4. As an article of manufacture, a flexible tying ribbon formed of a strip of relatively plastic material, the longitudinal edges of the strip being convoluted transversely whereby longitudinal stresses will be borne substantially only by the central portion of the ribbon, the central portion being substantially unstretched.

5. A process of producing a tying ribbon which comprises treating a flat strip of a flexible relatively plastic material with a liquid which is a softening agent therefor and stretching the edges of said strip longitudinally with respect to the body portion thereof, while gripping the central portion of the strip between the edges to maintain it in a substantially flat unstretched condition.

6. A process for producing a tying ribbon comprising transversely convoluting and stretching the longitudinal edges of a flat strip of a flexible relatively plastic material while gripping the central body portion of said strip between the edges to maintain it in a substantially flat unstretched condition.

7. An apparatus for producing a tying ribbon comprising means for stretching the longitudinal edges of a strip of a flexible relatively plastic material comprising a pair of convoluting rollers and a cylindrical roller disposed between said convoluting rollers for maintaining the central body portion in a flat condition.

8. An apparatus for producing a tying ribbon, comprising means for stretching the longitudinal edges of a strip of a flexible relatively plastic material comprising two pairs of cooperating convoluting rollers and a cylindrical roller disposed between said convoluting rollers and means for feeding a strip of flexible relatively plastic material between said rollers.

9. An apparatus for producing a tying ribbon, comprising means for applying a softening agent to a strip of flexible relatively plastic material, a pair of cooperating rollers, each of said rollers comprising a smooth central cylindrical portion and opposite end portions having intermeshing projections thereon, and means for feeding said strip between said cooperating rollers, and means for maintaining the central portion of the strip in a substantially flat condition.

WORTH WADE.