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TWISTED PAPER YARN

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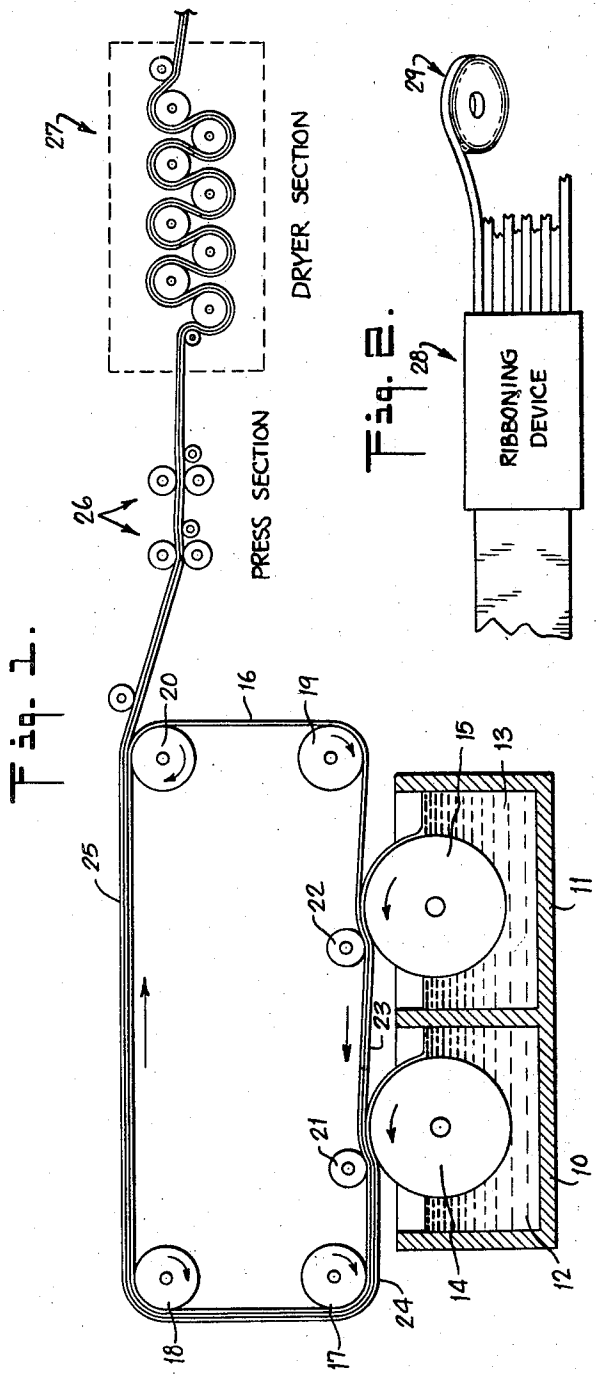


Fig. 1.

Fig. 2.

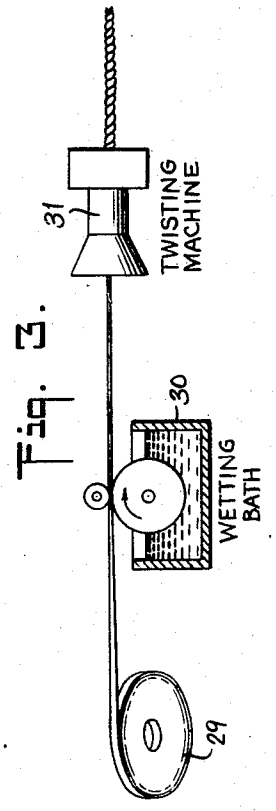


Fig. 3.

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TWISTED PAPER YARN

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2 Claims. (Cl. 57—167)

The present invention relates generally to yarns or cords of twisted paper ribbon and more particularly to an improved technique for manufacturing twisted paper yarn constituted by intimately bonded or laminated paper ribbons.

It has been known to make rugs and other woven fabrics by the use of yarns formed by twisting paper strips. To impart body to the fabric it is desirable to employ relatively bulky paper yarns. Customarily such yarns are made by twisting a cover ribbon about a paper core or filler, the cover or face ribbon being generally made of good quality paper and the filler of relatively cheap waste paper. Since the cover and the filler are disconnected elements, the resultant yarn is of poor tensile strength and subject to frequent breaks in the course of twisting.

Accordingly it is the principal object of this invention to provide an improved twisted paper yarn of increased bulk and of superior tensile strength. Also an object of the invention is to produce such yarn efficiently and at low cost.

More specifically, an object of the invention is to provide means for manufacturing a twisted paper yarn constituted by multi-ply paper ribbon, the paper plies being intimately bonded together or laminated without the use of adhesives.

Still another object of the invention is to provide a twisted paper yarn formed of laminated ribbons whose outer ply is of relatively good quality paper which may be colored, the inner ply being of inexpensive unbleached paper, the combined ribbons having a high tensile strength such that breakage in twisting is minimized. The outer and more expensive ply is preferably made of thin paper to reduce the cost thereof, whereas the inner ply is of thick paper so that while the resultant yarn is bulky and has the attractive appearance of the cover ply, the net cost of the yarn is low.

A significant feature of the invention resides in the face that by laminating two or more thicknesses of paper web, the tensile strength of the resultant sheet is substantially greater than it would have been had it been fabricated in the same thickness without lamination. For example, a laminated sheet of paper whose composite basic weight equals 24 pounds would have 110 to 130% of the strength of a single sheet of paper whose basic weight is also 24 pounds. Yarn made from ribbons cut from such laminated sheets likewise exhibit augmented tensile strength.

Briefly stated, laminated paper sheets in accordance with the invention are made by means of multi-cylinder or multi-Fourdrinier wet ends. Thus in the case of a cylinder machine, two or more cylinder molds are utilized, each producing a web of paper which is transferred to the wet felts of the paper machine. Lamination of the two or more webs of paper takes place when the wet webs of paper are brought into intimate contact through the pressure of the felts against the various rollers and driers of the paper machine. Neither adhesives nor extreme pressures are required to effect the lamination, the bonding being effected solely by the felting action of the two or more wet webs of paper.

Where the chief requirement for the yarn is a high order of tensile strength, the two or more cylinder molds of the machine may operate in the same stock chest. On the other hand, these two or more cylinder molds may be arranged to operate in separate stock chests where the resultant web of paper is to have a colored top side and a cheaper unbleached paper for the reverse side. Paper made in this fashion is then cut into ribbons and twisted into a yarn, the colored side acting as the cover and the inner side as the filler or core.

For a better understanding of the invention as well as other objects and further features thereof, reference is had to the following detailed description to be read in conjunction with the accompanying drawing wherein

Figure 1 is a schematic view of a cylinder machine for forming laminated paper in accordance with the invention,

Figure 2 is a schematic view of the ribboning device for paper webs made in the machine, and

Figure 3 is a schematic view of the twisting devices for the paper ribbons.

In paper-making a wet web is formed either by spreading a dilute suspension of fibers evenly onto the surface of a moving endless belt of wire cloth through which water may be drained, as in the Fourdrinier process, or by running an endless belt of wire cloth through a suspension of fibers, as in the cylinder process. In the Fourdrinier process some of the water drains off by gravity, still more is removed by suction and the remainder of water is expelled by pressure. In the cylinder process a vacuum is maintained below the stock level in the vat in which the cylindrical wire cloth rotates and the paper web is caused to form on the wire in very much the manner of a cake on a vacuum filter. In either process the thickness of a sheet is controlled by the speed of travel of the machine, by the ratio of fiber to water in the stock suspension (i. e., the consistency of the stock), or by the amount of stock allowed to flow onto the machine.

Referring now to Figure 1 of the drawing, there is shown a cylinder machine adapted to carry out the invention, the machine comprising two chambers or vats **10** and **11**, each containing a paper pulp slurry **12** and **13**. The nature of the stock and its manner of preparation depends on the type of laminated paper desired. Thus the vat which is to furnish the cover paper will contain a suitable mixture of materials and coloring matter blended in the stock suspension so as to form a paper ply of good quality. The stock in the other vat, however, may be prepared from waste paper since the ply formed thereby is intended to give bulk to the yarn and will not be visible. The conventional steps involved in stock preparation, that is, slushing, beating, refining, etc., form no part of the present invention except to the extent that they produce paper plies of the desired quality and thickness.

Rotatably mounted in vats **10** and **11** are respective cylinder molds **14** and **15** which serve to pick up thin layers of the paper pulp and apply it to a papermaker's felt **16**. The felt **16** is supported on rollers **17**, **18**, **19** and **20** which act to carry the felt in continuous movement, the rollers being positioned to cause the felt to engage the upper surfaces of the cylinder molds. Squeeze rollers **21** and **22** are arranged to cooperate with cylinders **14** and **15**, respectively, the felt **16** running between the squeeze rollers and the associated cylinders. These rollers perform a dual function; they act to force the freshly formed paper pulp laps to adhere to the felt in order that the laps may be conveyed thereby, and they also serve to squeeze out part of the excess water contained in the laps.

The direction of felt movement is such that it passes first over cylinder 15 and then over cylinder 14 to pick up successive layers or laps of wet paper pulp. While only two cylinders have been shown to form a laminated two-ply paper, it is to be understood that a greater number of cylinders may be employed to form a greater number of plies, as desired. As the felt passes over cylinder 15, a first fiber layer, represented by symbol 23, is applied thereto and as the felt passes over cylinder 14, a second layer, represented by symbol 24, is superimposed over the first layer to form a sandwich-like web 25 of two freshly formed paper pulp laps. Web 25 travels over roller 18 for conveyance toward roller 20 and as it passes over roller 20, the wet web is separated from felt 16 and led to the press section represented schematically by rollers 26 and from there to a dryer section 27. It is to be understood that the press and dryer sections operate in conjunction with felts for supporting the paper web thereon. For purposes of clarity, these felts have been omitted in the drawing.

The wet web entering the press section 26 is constituted by superposed layers of paper pulp. The press section 26 may consist of a series of small press rolls each with its own felt system, followed by a main press roll, whereby the pressure applied to the web is increased in successive steps. The press section acts in the present invention not merely to reduce the water content of the web but also further to effect an integral bonding or felting together of the separate layers. Under pressure the wet fibers of the separate laps are caused to interlock such that when the web is dried, the laps or plies are inseparable. Along with the dewatering, the wet pressing compacts and reduce the surface inequalities in the sheet without, however, adversely affecting its structure.

The sheet emerging from the press section now passes the dryer cylinders 27. The number and size of these cylinders depends on the amount of water which has to be removed in a given time, this being a function of machine speed and weight. The dryer cylinders are preferably steamheated to expedite the removal of the water.

As the sheet leaves the last dryer cylinder, it then passes through a series of heavy metal rolls which calendar it under high pressure to improve the smoothness and finish of the sheet. Then, as shown in Fig. 2, the laminated paper sheet goes through suitable slitters 28 which serve to cut the sheets into ribbons of any desired width, the ribbons being wound into suitable rolls 29.

The roll 29 of laminated paper, as shown in Fig. 3, may be passed through a water bath 30 and then run directly into a twisting machine to form a cord or yarn of paper with the quality paper on top and the cheap unbleached paper on the inside as a filler. The wetting of the paper tape prior to twisting facilitates curling and causes the paper to take a set and hold the twist when it dries. Instead of wetting the tape, it may first be passed through a steam box so that the tapes can be twisted in a warm, moist condition. Sizing material may also be added to the water bath to improve the water and scuff resistance of the twisted yarn.

The present invention makes possible a twisted paper laminated yarn having less cover than prior art multi-

ribbon yarns, the laminated yarn being characterized by superior tensile strength, increased efficiency and less waste. It is possible, for example, to use a waste paper inner ply of 20 pound weight and a colored outer ply of good quality paper having a 10 pound weight, so that the net weight of the twisted yarns is 30 pounds. Since the bulk of the weight is in the cheap paper, even though the yarn has the appearance of the expensive paper the cost of the combination is relatively low.

It will be obvious that the concept disclosed herein in connection with a cylinder machine may be applied to other paper-making devices such as the Fourdrinier machine.

While there has been shown what is considered to be a preferred embodiment of the invention, it will be manifest that many changes and modifications may be made therein without departing from the essential spirit of the invention. It is intended, therefore, in the annexed claims to cover all such changes and modifications as fall within the true scope of the invention.

What is claimed is:

1. The method of producing a paper yarn of good appearance and body as well as high tensile strength, comprising the steps of forming a first wet lap of thin and good quality paper stock, forming a second wet lap of relatively bulky and poor quality paper stock, superposing said first and second wet laps, pressing and drying said superposed laps integrally to bond same together and thereby form a laminated paper web in which the first lap constitutes a cover ply and the second lap constitutes a filler ply, slitting said paper web into ribbons, and twisting said ribbons in a direction exposing the cover ply and concealing the filler ply to form said yarn.

2. The method of producing a paper yarn of good appearance and body as well as of high tensile strength, comprising the steps of successively passing a papermaker's felt along two cylinder molds to form in a superposed relation a first wet lap of thin and good quality paper stock and a second wet lap of relatively bulky and poor quality paper stock, pressing and drying said superposed laps integrally to bond same together and thereby form a laminated paper web in which the first lap constitutes a cover ply and the second lap constitutes a filler ply, slitting said paper web into ribbons, and twisting said ribbons in a direction exposing the cover ply and concealing the filler ply to form said yarn.

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