

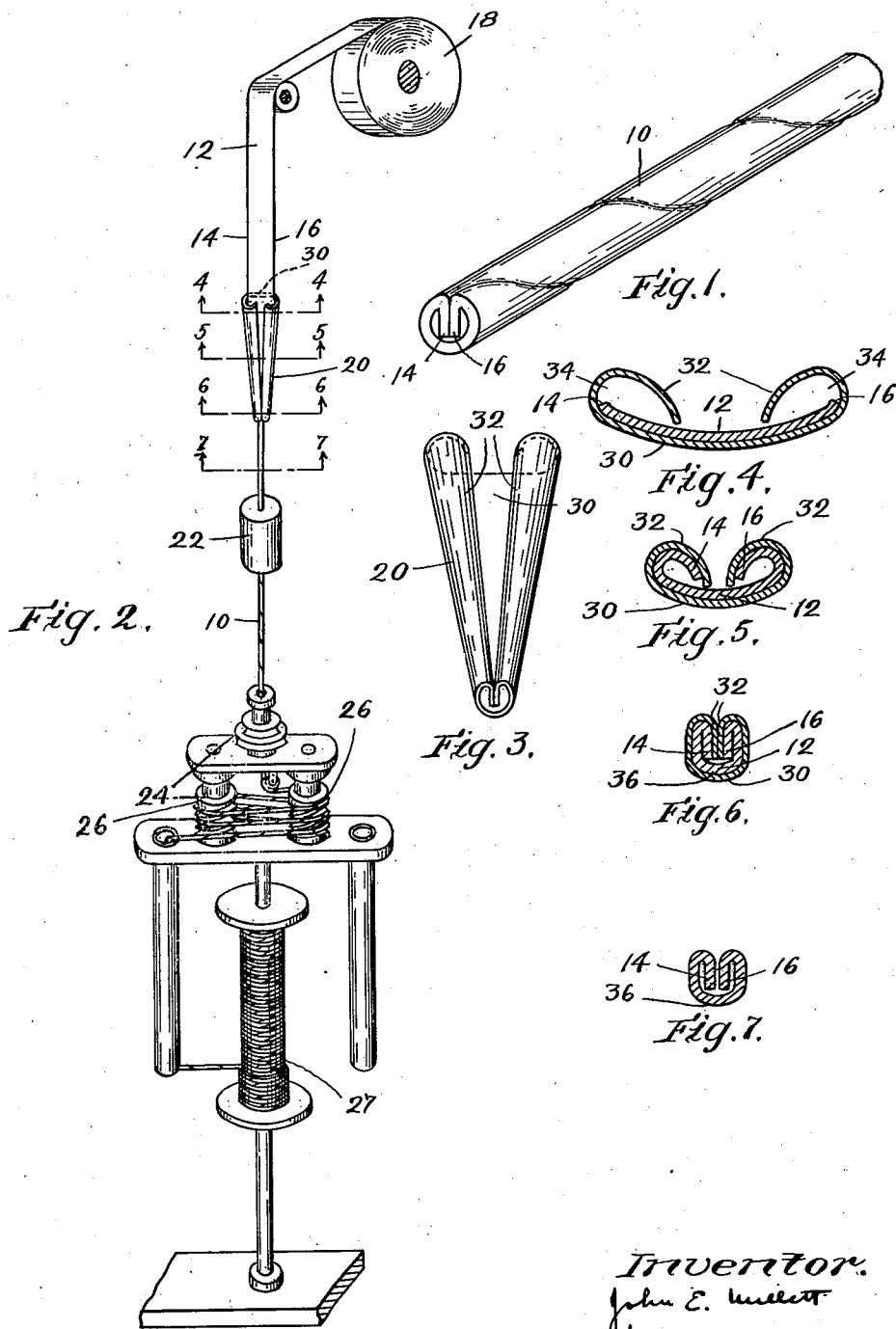
Oct. 26, 1937.

J. E. MILLETT

2,097,299

TWISTED PAPER CORD

Filed Aug. 17, 1935



Inventor.

John E. Millett

by J. E. Millett atty

UNITED STATES PATENT OFFICE

2,097,299

TWISTED PAPER CORD

John E. Millett, Chelsea, Mich., assignor to Grand Rapids Fibre Cord Company, Grand Rapids, Mich., a corporation of Michigan

Application August 17, 1935, Serial No. 36,668

3 Claims. (Cl. 117-60)

This invention relates to twisted paper cord.

Twisted paper cord is made from an initially flat strip or ribbon of paper in such manner, heretofore, that one or both edges of the paper strip lie in the outside surface of the cord. Such paper cord has a breaking strength of from 20 to 30% less than the breaking strength of the flat paper strip from which the cord is made:

I have found that this decreased tensile strength of the twisted cord is due to the presence of an edge of the paper strip at the surface of the cord. When tension is applied to the twisted cord a tearing component of the force is exerted crosswise of the edge due to the twist and hence the cord ruptures at a lower tension than the flat paper strip where the total tension on the strip can be applied entirely lengthwise thereof.

I have found that a twisted paper cord so made that the edges of the paper strip are inside the cord and not at the surface thereof has substantially the full strength of the flat paper strip and in fact the paper cord constructed in accordance with my invention has a rupture strength somewhat greater, approximately 4%, than the rupture strength of the flat paper strip, this increased strength being due to the increased amount of paper in the cord due to the twist thereof. This relatively large increase of strength of the cord is highly advantageous in that articles made from the cord, such as bags, for instance, can be made stronger than heretofore, or cheaper for the same strength.

Thus an object of the present invention is the provision of a twisted paper cord of increased rupture strength.

A further object is the provision of a twisted paper cord wherein the edges of the paper strip of which the cord is composed are disposed in the interior of the twisted cord.

In providing the paper cord of the present invention the flat paper strip is first so folded that both edges of the strip are inside a fold. The folded strip is then twisted. This method of forming a cord and the cord so formed constitute further objects of the invention.

Another object of the invention is generally to improve the construction of twisted paper cords.

Fig. 1 is a perspective view of a twisted paper cord constructed in accordance with the present invention.

Fig. 2 is a diagrammatic view illustrating the manner of forming the cord of the present invention.

Fig. 3 is a perspective view of the strip folding device of Fig. 2.

Figs. 4, 5 and 6 are enlarged sectional views taken along lines 4-4, 5-5, 6-6, respectively, of Fig. 2, illustrating the progressive configurations imparted to the flat strip in the process of folding it.

Fig. 7 is a transverse sectional view of the folded but untwisted cord taken along line 7-7 of Fig. 2.

The twisted cord 10 of Fig. 1 that embodies the present invention is composed of an initially flat strip of paper 12, see Fig. 2, of suitable width and thickness and so formed that the side edges 14 and 16 of the strip or ribbon are against each other and are disposed in the interior of the cord and hence are not subject to any harmful crosswise or tearing forces when the cord is under tension. The internal disposition of the edges of the strip in the cord are obtained by folding the cord prior to twisting it.

The manner of making the cord is illustrated diagrammatically in Fig. 2. The flat strip or ribbon 12 of paper is contained in a roll 18 and passes through a folding device in the form of a contracting shoe 20 and issues from the end of the shoe in folded form as illustrated in cross-section in Fig. 7. The folded strip thence is drawn through the cylindrical passage in a strip compressing die 22 which compacts the folded strip and forms it into cylindrical configuration. The strip thence passes into a rotatable twisting head 24, of more or less common construction, and around the rolls 26 thereof and receives a suitable twist. The completely twisted cord thence passes to and is wound onto a bobbin or spool 27. The twisting and winding mechanism are or can be of any common desirable construction.

The folding shoe 20 is so constructed that it imparts a triple fold to the initially flat strip of paper. That is to say, the shoe first folds the edge portions of the strip inwardly toward each other, as illustrated in Figs. 4 and 5, so that the edges of the strip confront each other, and then folds the strip along the median line thereof to bring the folded edge portions of the strip inwardly toward each other and to dispose the edges of the strip inside the third or middle fold.

For accomplishing these results the folding shoe 20 is formed conveniently of a single sheet of suitable material tapered lengthwise of the line of strip advance and having a bottom wall 30 which at the top or entrance end for the

strip is broadly arcuate, the radius of curvature progressively diminishing along the length of the shoe until at the bottom or exit end the wall is substantially cylindrical. The opposite side edges 32 of the shoe are flexed upwardly and inwardly at the entrance end and overlies the inner face of the bottom wall sufficiently to permit the free entrance of the paper strip 12 between them and the bottom wall and provide generally elliptical troughs 34 in which the opposite edges of the paper strip are located. The transverse major axes of the troughs rise in a progressive manner from the entrance to the exit end of the trough, as illustrated in the successive Figs. 4, 5, and 6, and at the exit end are approximately vertical, as illustrated in Fig. 6, with the reflexed ends 32 of the strip generally vertical and in closely confronting relation. The transverse width of the shoe thus progressively diminishes lengthwise of the shoe.

As the flat strip passes lengthwise of the shoe the edges 14 and 16 of the strip are caused to be curled over in the trough 34 in the manner illustrated in Fig. 5, thereby folding the edge portions of the strip. During further progress of any given portion of the strip along the shoe the strip is folded additionally along its median line or at 36, as illustrated in Fig. 6, the folded marginal portions of the strip being substantially upright. The completely folded strip as it emerges from the exit end of the shoe has generally the configuration illustrated in Fig. 7, being roughly circular in cross-section and the edges 14 and 16 of the strip being disposed inside the third or medium bend 36. The folded strip is drawn through the die 22 and has its folds compacted together and compressed more closely into circular cross-section and is further compacted

and caused to be retained in circular cross-section by the twisting of the folded cord.

The cord as thus formed not only is at least equal in rupture strength to that of the flat strip 12 of which it is composed but also is superior in appearance to the usual twisted paper cord since no sharp free edge of the paper strip is exposed at the surface of the cord.

I claim:

1. A high breaking strength round twisted paper cord consisting of a paper ribbon having its edge portions folded over, once only, on the same face of the ribbon with the edge portions in closely confronting relation at the middle of the ribbon and the ribbon folded lengthwise in its middle portion to form a solid four ply, only, cord of approximately circular cross-section, thereby disposing the infolded edge portions inside the cord and substantially together with the edges thereof terminated in the bottom of the middle fold, the cord being twisted.

2. A high breaking strength round twisted paper cord consisting of a paper ribbon shaped into an approximate cylindrical form and having four longitudinal folds of approximately equal width with the edge portions of the ribbon inside the cylinder, flat, and traversing the diameter thereof and terminated thereat, the cylinder being twisted.

3. A high breaking strength round twisted paper cord consisting of a paper ribbon shaped into an approximate cylindrical form and having its edge portions inside the tube, flat, unfolded, and traversing the diameter thereof and terminated thereat, the flat edge portions being in contact substantially their full area across the cylinder, the cylinder being twisted.

JOHN E. MILLETT.