

Feb. 6, 1923.

1,444,070

F. C. HALL.
CORD TIRE FABRIC.
FILED MAR. 18, 1921.

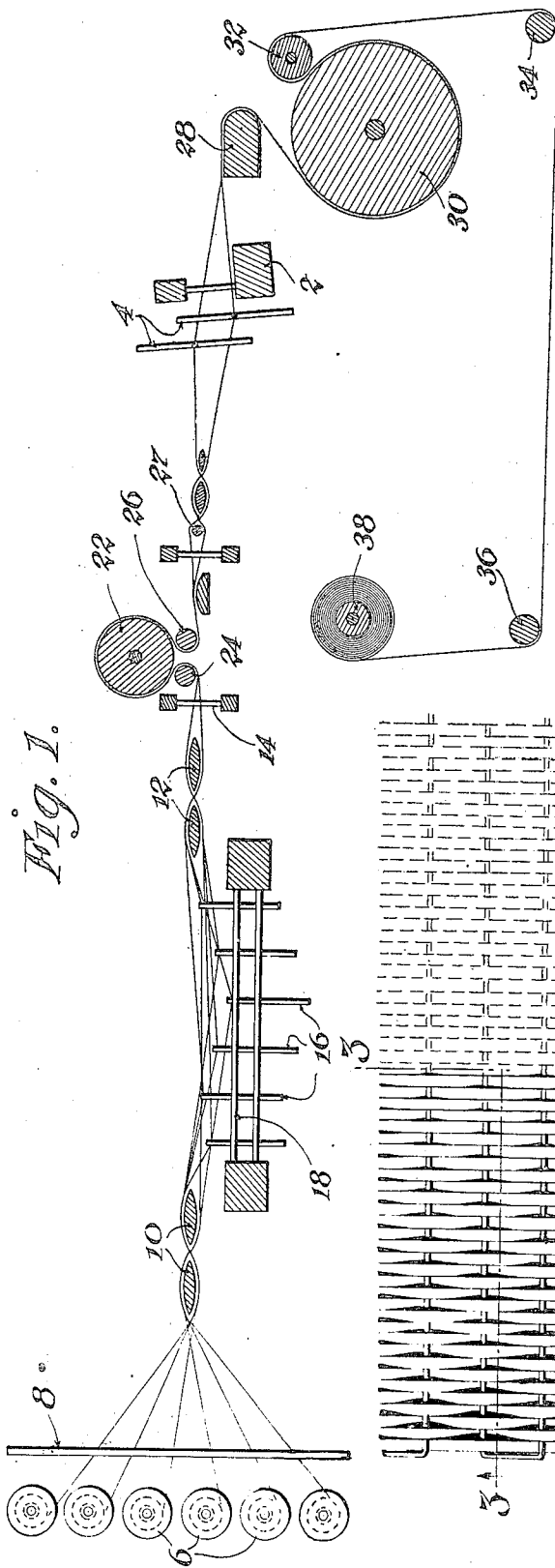


Fig. 1.

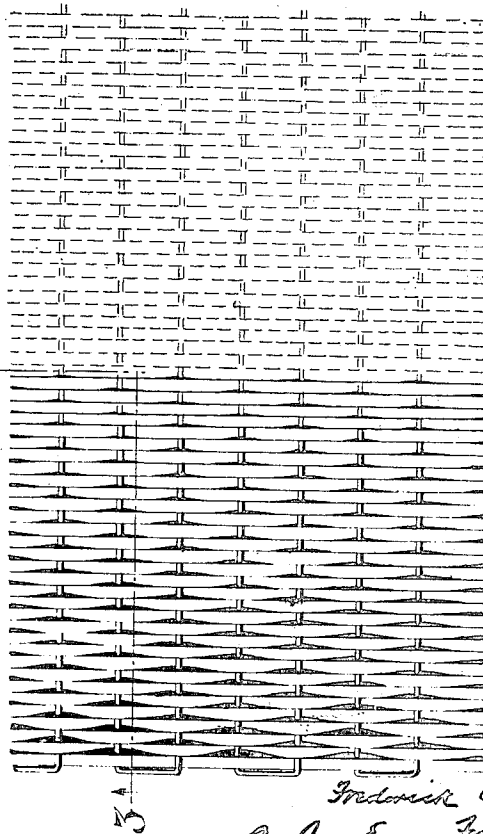


Fig. 2.

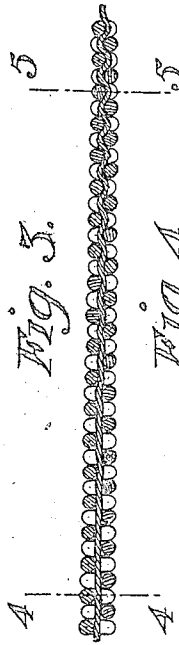


Fig. 3.

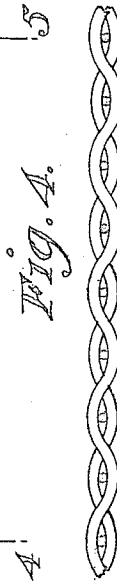


Fig. 4.

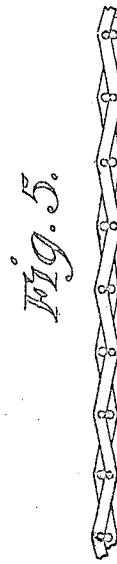


Fig. 5.

Inventor

Fredrick C. Hall
By Bruce Evans, Esq., Michael Cary
Attorneys.

UNITED STATES PATENT OFFICE.

FREDERICK C. HALL, OF PAWTUCKET, RHODE ISLAND, ASSIGNOR TO JENCKES SPINNING COMPANY, OF PAWTUCKET, RHODE ISLAND, A CORPORATION OF RHODE ISLAND.

CORD-TIRE FABRIC.

Application filed March 18, 1921. Serial No. 453,509.

To all whom it may concern:

Be it known that I, FREDERICK C. HALL, a citizen of the United States, residing at Pawtucket, in the county of Providence and State of Rhode Island, have invented certain new and useful Improvements in Cord-Tire Fabric; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

The invention relates to a cord tire fabric.

Cord tire fabric consists of comparatively heavy warp threads or cords bound together by very fine and weak filling threads which are widely separated and serve merely to retain the cords in close parallel relation.

In rubberizing this fabric preparatory to incorporating it in tires it is subjected to the action of heavy calender rolls to which it is fed under heavy tension. Owing to the weakness and wide spacing of the fine filling threads the action of the rolls will cause any comparatively loose cords or series of warp cords to creep along the fabric and bank up at the point where the fabric enters the rolls until sufficient slack accumulates to cause a fold which will enter the rolls and cause a rupture of the fabric at this point. Comparatively slack cords or zones of slack cords in the fabric are therefore not only highly objectionable but may render a piece of fabric wholly unfit for use. While looseness or under tension of the cords is objectionable in any part of the fabric it is more serious toward the center than at the edges since looseness at the center results in extra strain on the edge portions of the fabric which are the least adapted to withstand such extra strain.

For the above reasons it has heretofore been the ultimate aim of manufacturers of cord fabric to weave a fabric in which the warp cords are under the same uniform tension throughout the width of the fabric and they have striven to this end with varying degrees of success. I have, however, invented and produced a fabric which is superior to that which has heretofore been considered ideal and one better adapted to meet the conditions incident to its rubberization and incorporation in tires. When this fabric is taut the cords in the center portion are tighter or may be said to be

under greater tension than the cords in the edge portions of the fabric since the lengths of the cords are less in the center portion than in the edge portions. In other words, the fabric may be briefly described as a cord fabric having a tight center. The tight center is preferably due to a slight progressive increase in the tension of the cords from each edge toward the center, or in other words to a progressive increase in the lengths of the cords from the center portion towards each edge. When a fabric of this character is led from the supply roll to the rubberizing calender rolls under a slight tension the center will be taut while there will be a slight and gradual droop or ruffling toward the edges owing to the greater lengths of the cords in the edges. Upon an increase in the tension, however, this will disappear as the center cords are stretched and the fabric will lie flat and taut from side to side and will run uniformly and smoothly to the rolls. Owing to the tight center and the decrease in the tension of the cords toward each edge the strain on the fabric due to the tension under which it is fed to the rolls is so distributed across the fabric that the greater strain comes on the stronger center while the least strain comes on the weaker edges. The fabric may, therefore, not only be maintained in a smooth flat condition with less tension than heretofore, but the danger of breaking cords at the edges and thus causing the fabric to tear across is eliminated.

This improved fabric may be woven by accurate regulation of the tension on each warp cord entering the successive sheds so that the tension on each cord is uniform throughout the weaving and so that the tension of the different cords increases from the edges toward the center. The requisite accurate regulation of the tension on each warp cord may be secured by feeding in to the shed forming harness a definite and uniform length of each cord during each cycle of the loom which bears a definite relation to the length of movement of the fabric take-up mechanism. To insure a uniform tension on each warp cord throughout the weaving a pre-determined and substantially uniform tension is maintained on each cord to be fed in.

A loom adapted for the production of the

tight center cord fabric of the invention is indicated diagrammatically in Fig. 1 of the drawings and the fabric is indicated diagrammatically in Fig. 2 in which the increase in the tension of the cords from the edges toward the center is indicated by decrease in the shading. Fig. 3 is a diagrammatic section on the line 3—3 of Fig. 2. Fig. 4 is a diagrammatic section on the line 4—4 of Fig. 3. Fig. 5 is a diagrammatic section on the line 5—5 of Fig. 3.

In weaving the fabric upon the loom indicated in the drawings the warp cords are led from spool 6 through suitable guides in eye-boards or reeds 8, from which they pass alternately over and under a set of leash rods 10 and are thus brought into position side by side. From the leash rods the cords pass to a second set of leash rods 12 and thence between the thin plates of a reed 14 which keep them properly separated and spaced and directs them side by side to the feeding-in mechanism. A substantially uniform tension is maintained on the cords leading to the feeding-in mechanism by take-up weights suspended on the cords and guided in the plates 18 and 20. The weights play freely through the guide plates, thus taking up any temporary slackness which might otherwise occur between the supply spools and the feeding-in mechanism and maintain a substantially uniform light tension on each of the cords. The cords are, therefore, uniformly taut when engaged by the feeding-in mechanism and will be uniformly acted on thereby.

The feeding-in mechanism comprises a feeding-in roller 22 which may be covered with sand or otherwise roughened to prevent slipping of the cords thereon and two co-operating guide rolls 24 and 26 which cause the cords to wrap nearly around the roll. The cords lead from the roll 26 through a reed 27, through the usual leash rods 29 to the harness 4. From the harness the cords pass through the lay 2 to the previously woven fabric which passes over the breast beam 28, around the fabric take-up drum 30, over guide rolls 32, 34 and 36 to the cloth roll 38 upon which it is wound.

The feeding-in roll is positively driven to feed forward a definite length of each warp cord and its actuating mechanism is so timed and proportioned with relation to the actuating mechanism of the fabric take-up drum that each warp cord is held under a pre-determined tension between the feeding-in roll and the already woven fabric during each cycle of the loom. Since the warp cords are uniformly taut as they come to the feeding-in roll and are positively held and controlled thereby each thread will be under a certain tension between the woven fabric

and the feeding-in roll determined by the relation between the movements given to the feeding-in roll and to the fabric take-up drum. If the feeding-in drum is of the same diameter throughout its length and the take-up weights 16 are proportioned to maintain substantially the same light tension on all of the cords leading to the roll equal lengths of all cords will be fed in by the roll for the formation of each shed and a fabric will be produced in which the cords are under the same uniform tension throughout the width of the fabric. In order that the center cords may be held under greater tension than the edge cords during each pick of the loom it is preferred to so shape the roll 22 that it feeds in lengths of cord which are slightly less at the center than at the edges, the variation in the lengths of the cords being well within their elastic limits. To secure a gradual decrease in the feed from the edge of the fabric toward the center and consequently a gradual increase in the tension of the cords from the edges toward the center the roll is preferably so shaped that it is slightly smaller in diameter at the center and gradually increases in diameter toward each end. With the roll thus shaped a fabric will be produced having a tight center and one in which there is a slight progressive increase in the lengths of the cords from the center toward each edge. Consequently there will be a progressive increase in the tension on the cords from the edges toward the center when the fabric is lead to the rubberizing calender rolls and is stretched sufficiently to put all of the cords under tension with the resulting advantages already set forth.

What is claimed is:

1. A cord tire fabric comprising warp cords held in parallel relation by fine widely separated filling threads in which there is a progressive increase in the lengths of the cords from the center portion toward each edge, the total increase being within the elastic limits of the cords.

2. A cord tire fabric comprising warp-cords held in parallel relation by fine, widely-separated filling-threads in which there is a progressive increase in the length of the cords from the center portion toward each edge, the total increase being within the elastic limits of the central cords so that when the fabric is stretched in the rubberizing process the longer cords may be given the desired degree of tautness before the breaking point of the central cords is reached and whereby there is produced a progressive increase in tension on the cords from the edges toward the center portion.

FREDERICK C. HALL.