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A. BURNS

WOVEN CORD FABRIC

Filed July 6, 1925

Fig.1.

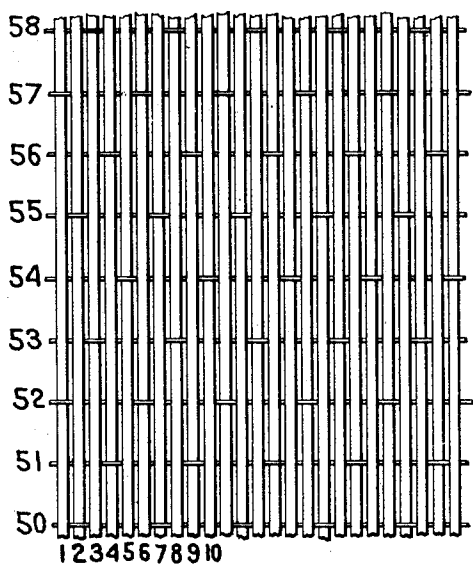


Fig.2.

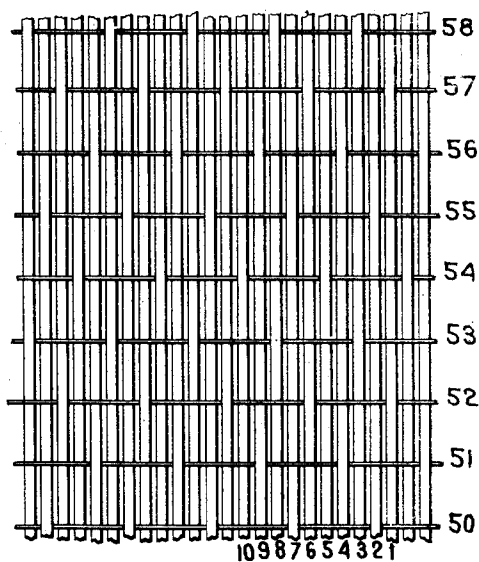
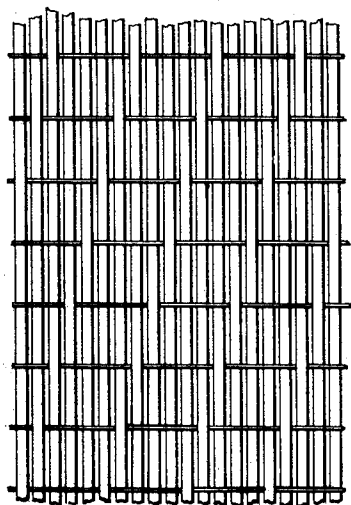


Fig.3.



Fig.4.



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WOVEN CORD FABRIC.

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This invention relates to a cord fabric particularly for use in the manufacture of automobile tires. In such fabrics, it is desirable that the cords constituting the warps shall lie flat and parallel throughout and be capable of being coated throughout their entire surfaces with the rubber composition usually employed. When the fabric is coated with the usual rubber composition, a flat fabric layer is formed integrated by the rubber composition coating and it is important that the surfaces of the warps at both sides of the fabric shall be flat and even throughout so that the coating may be of the same thickness throughout and so that several layers of the fabric may be superposed in the manufacture of the tire and present a symmetrical arrangement.

Various expedients have been resorted to in endeavoring to produce a so-called flat cord fabric with the cord warps lying substantially straight and parallel. One such expedient is that of including in the fabric a set of auxiliary or binder warps but to do this requires that the loom on which the fabric is woven should be provided with two warp beams and it also involves the expense of a separate set of warps and of the labor incurred in the fitting of the loom therewith, besides the additional expense of the weaving operation, all of which results in a rather expensive fabric.

It has also been attempted to produce the desirable flat arrangement of warps by subjecting the fabric after being woven to a high tension in the direction of the length of the warp. While this operation partially secures the desired result, yet it has the disadvantage that the warps are stretched to such an extent that they lose much of their inherent elasticity. This detracts from the value of the fabric for tire purposes.

It is the object of the present invention to provide a fabric of the required character which shall be composed solely and entirely of a set of cord warps and a set of wefts, and in which the cord warps shall be in a normal, unstretched condition, and thus have their full initial elasticity, and shall also lie flat and parallel and in the same plane when the fabric is subjected to the normal tension to which cord fabric is sub-

jected while being incorporated in a tire.

The nature and objects of the invention will appear more fully from the accompanying description and drawings and will be particularly pointed out in the claims.

In the drawings:

Fig. 1 is a plan view, on a much enlarged scale and somewhat distorted, of one face of a preferred form of fabric embodying the invention.

Fig. 2 is a similar view of the face of the fabric opposite to that shown in Fig. 1.

Fig. 3 is a view in transverse cross section of the fabric shown in Figs. 1 and 2 with the face shown in Fig. 1 uppermost.

Fig. 4 is a view similar to Fig. 2 of a slightly different form of the fabric embodying the invention.

The set of cord warps 1, 2, 3, etc., are preferably formed of heavy, cotton cord such as used in tire cord fabric manufacture. The set of wefts 50, 51, 52, etc., are formed of the usual fine yarn, as their sole purpose is to maintain the cord warps in position in the fabric to an extent sufficient to enable it to be coated with the required rubber composition and formed into a flat, integrated layer. These warps and wefts may, of course, vary in size and quality, excepting that the cord warps are always relatively coarse and the wefts are relatively fine.

The wefts 50, 51, 52, etc., are widely spaced apart in the construction of the fabric as usual in cord fabrics.

Each weft in the fabric passes over and under the warps and in so doing passes under a greater number of warps than it passes over. In the fabric shown in the drawings, each weft passes alternately over one warp, warp 2, see Fig. 3, and then floats under several warps, 3, 4, 5 and 6, and then passes over a warp, 7, and floats under several other warps, 8, 9, 10 and 11, this continuing in a predetermined sequence. The points where the wefts pass over each warp are staggered with respect to the points where the wefts pass over the adjacent warps. For example, the points where the wefts 51 and 56 pass over the warp 4, in Fig. 1, are staggered with respect to the points where the wefts 53 and 58 pass over the warp 3 adjacent one side of

the warp 4 and are also staggered with respect to the point where the weft 54 passes over the warp 5 adjacent the other side of the warp 4, and this staggered arrangement runs throughout the fabric. It will be seen by reason of this construction that on the face of the fabric shown in Fig. 1, each warp is symmetrically and reversely arranged with respect to each weft. That is to say, if, as assumed, each weft passes over one warp, then under four warps, etc., there is a corresponding warp which passes under one weft, then over four wefts, then under one weft, then over four wefts, etc. This means that on the face of the fabric shown in Fig. 1, each warp floats over several, as, for example, four, wefts and passes under one weft, while on the other face of the fabric shown in Fig. 2, each weft floats over several, as, for example, four, warps and passes under one warp, and that the floating portions of each warp, as shown in Fig. 1, are staggered with respect to the floating portions of the adjacent warps; while, as shown in Fig. 2, the floating portions of each weft are staggered with respect to the floating portions of the adjacent wefts.

The wefts lie in the fabric under loose tension and the construction is such that substantially all the crimp in the interwoven threads comes in weft threads. It is a characteristic of the fabric embodying my invention that the warps are in a non-stretched condition and yet they lie flat and parallel and in the same plane when the fabric is subjected to the normal tension to which cord fabric is usually subjected when being incorporated in the tire. The arrangement of warps and wefts above referred to provides for this. A decided advantage resulting from this construction and this characteristic feature is that, since the warps are not abnormally stretched, they still retain all their inherent elastic characteristics, which are important in a cord fabric. Furthermore, since substantially all the crimp of the interwoven threads is in the filling threads, the warps will all lie in the same plane, and have the flat and parallel arrangement above referred to.

With my invention, therefore, the desirable flat arrangement of warps is secured without sacrificing any of their initial strength or elastic properties.

The wefts also act in the structure of this fabric to secure the slight separation of the warps to permit the coating composition to envelop the entire surface of the warps. But by reason of the arrangement set forth, it will be seen that the portions of the weft which extend between the warps occur only at intervals. For example, the warps 2 and 3 are separated only by the wefts 50, 53, 55, 58, etc.

The embodiment of this invention may be

varied somewhat and such a variation is illustrated in Fig. 4, the difference between the two structures being somewhat similar to the difference between a sateen and a twill weave.

It will thus be seen that by the principles of this invention involving the use of a set of coarse cord warps and a set of relatively fine wefts, the separation of the wefts to a relatively great extent, or at least several diameters of the warps, the arrangement of the long floats in staggered relation of the warps at one face and of the wefts at the other face and the loose tensioning of the weft, a fabric structure is secured involving only a single set of warps and wefts in which the cord warps are in an unstretched condition and lie flat and straight throughout as required in a tire fabric.

Having thus described the invention, what is claimed as new, and desired to be secured by Letters Patent, is:

1. A woven, cord fabric constructed readily to permit the application thereto of a rubber composition coating which shall cover the entire surface of each warp and present an integrated coated fabric layer in which the warps lie flat and parallel throughout, composed solely of a set of relatively coarse cord warps and a set of relatively fine wefts, the wefts spaced apart a distance equal to several diameters of the warps and each weft alternately passing over one warp and floating under several warps in regular sequence, the points where the wefts pass over each warp being staggered with respect to the points where the wefts pass over the adjacent warps and the wefts lying in the fabric under loose tension with the portions between the warps separating the warps slightly while the portions extending over and floating under the warps lie on the respective surfaces of the fabric layer and permit the warps to lie flat and parallel throughout.

2. A woven cord fabric constructed readily to permit the application thereto of a rubber composition coating which shall cover the entire surface of each warp and present an integrated coated fabric layer in which the warps lie flat and parallel throughout, composed solely of a set of relatively coarse non-crimped cord warps and a set of relatively fine wefts arranged in parallelism, the wefts being widely spaced apart and each weft alternately floating over several adjacent warps at one face of the fabric and then passing under one warp with the adjacent floats in staggered relation, and each warp alternately floating over several adjacent wefts at the other face of the fabric and passing under one weft with the adjacent floats also in staggered relation and the wefts lying in the fabric under loose tension maintaining the warps slightly separated

and said warps being in a non-stretched condition and lying flat and parallel throughout.

3. A woven cord fabric for automobile
5 tires, composed entirely of interwoven weft
threads and non-crimped cord warps, each
weft thread passing over one warp and then
under a plurality of adjacent warps, the
warps which any weft threads passes over
10 being different warps from those which any
three adjacent weft threads pass over said
warps when under normal tension, and in
a non-stretched condition, lying in the same
plane, straight and parallel, and substantial-
15 ly all of the crimp of the interwoven threads
being in the weft threads.

4. A cord fabric for automobile tires com-
posed entirely of interwoven weft threads
and non-crimped cord warps, the number of
20 warps which each weft passes under during
the weaving operation being greater than
the number which it passes over, the space
between adjacent points on any warp thread
where it is crossed by a weft thread being
25 several times greater than the space between

adjacent weft threads, said warps when
under normal tension and in a non-stretched
condition lying all in the same plane,
straight and parallel, and substantially all
the crimp of the interwoven threads being 30
in the filling threads.

5. A cord fabric for automobile tires com-
posed entirely of interwoven cord warp and
weft threads, said warps when under normal
tension and in a non-stretched condition ly- 35
ing all in the same plane, straight and par-
allel, and substantially all the crimp of the
interwoven threads being in the filling
threads, the adjacent points where each weft
passes from the upper face of the fabric to 40
the lower face thereof being separated by
at least three warp threads and each warp
thread lying on the same side of at least
three adjacent weft threads between the
points where it is interlaced with the weft 45
threads.

In testimony whereof, I have signed my
name to this specification.

ALFRED BURNS.