Nov. 16, 1937. W. A. BARRELL 2,098,995

ASBESTOS TEXTILE YARN

Filed July 8, 1936

Fig. 1.



Fig. 2.

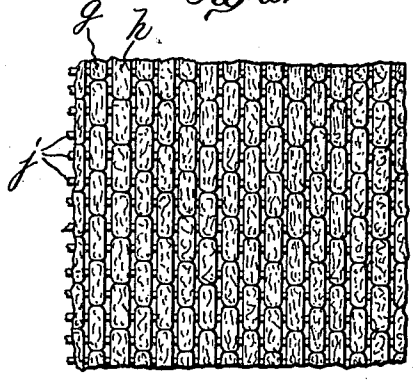


Fig. 3.

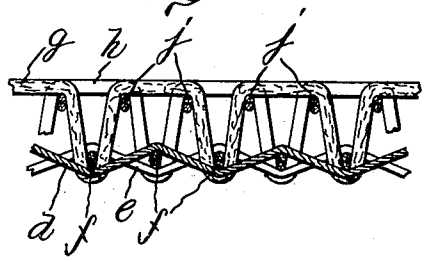


Fig. 4.

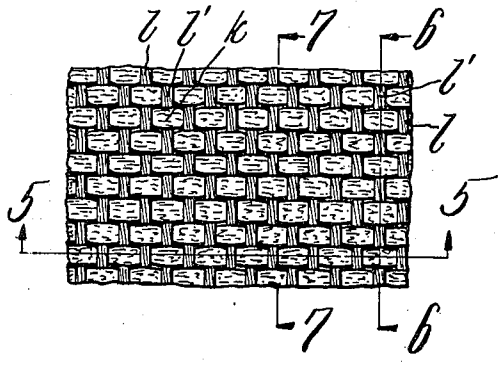


Fig. 5.

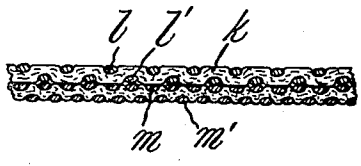


Fig. 6.

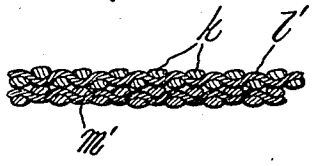
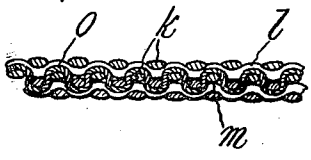


Fig. 7.



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ASBESTOS TEXTILE YARN

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Application July 8, 1936, Serial No. 89,514

6 Claims. (Cl. 96—26)

The object of the present invention is to provide yarns suitable for weaving, composed in large part of asbestos fiber, and in which the asbestos fibers are so protected, confined and reinforced as to be retained substantially intact when employed either as warp or weft, or both, in a textile fabric.

Asbestos fibers lack the interlocking and frictional qualities, characteristic of many animal and vegetable fibers, necessary to enable fibers to be spun into yarns or strands sufficiently strong and compact for weaving. In order to make textile fabrics containing a sufficiency of asbestos for heat and flame protective purposes, it is necessary to combine strands of other materials with the asbestos fibers in some manner. A common manner of doing so is to roll or twist the asbestos fibers, or a ribbon of asbestos fibers previously bonded together by adhesive, around a core filament of cotton, or some other strand having sufficient tensile strength; and sometimes also to twist a bonding filament around and with the core and the asbestos envelope. In all such strands the enveloping asbestos fibers are but loosely confined in the main, and are readily pulled out and dislodged. When such strands are used as warp and contiguous strands are displaced oppositely to one another by heddles so as to form and change a shed for weaving, the rubbing of adjacent strands on one another dislodges bits or bunches of the fiber with every change of shed; in other words the fibers "fluff off" in the course of weaving. The dislodged fibers are either useless and a loss of valuable material, or are a positive detriment. They are detrimental in such structures as drier felts for paper machines when the fiber bunches remain in more or less loose attachment with the felt because they either make indentations in the damp paper web against which they are pressed in the operation of paper drying, or become embedded and remain in the paper after it leaves the drier.

One of the principal results which I have sought and obtained by the present invention is to produce a yarn consisting mainly of asbestos, in which there is no core strand, but the yarn yet has adequate tensile strength for weaving, either as warp or filling, and in which the asbestos fibers are so protected and confined that they do not fluff off in appreciable measure when used as warp and rubbed against one another.

An important use which I have contemplated for yarns of this invention is in the construction of drier felts for paper machines, wherein the asbestos yarns are arranged to protect body strands of other materials from the destructive effects of heat in use, to facilitate conduction of moisture from the paper being dried, and to provide a smooth surface on the side of the felt which comes next to the paper. Illustrations of such drier felts containing asbestos are found in my prior Patent No. 1,991,366, granted February 19, 1935, and in my copending applications Serial Nos. 36,291 and 36,292, filed August 15, 1935. But such yarns are useful also in other fabrics where a content of asbestos is desired for any purpose, either for both warp and filling, or for either warp or filling in conjunction with strands of other construction and material.

The subject matter here disclosed was first presented and claimed in my aforesaid application Serial No. 36,292, and was disclosed also in the aforesaid application Ser. No. 36,291, both filed August 15, 1935, and the present application is a continuation in part thereof.

In the accompanying drawing,—

Fig. 1 is a side elevation on an enlarged scale of a fragment of protected asbestos strand embodying the invention in one of its possible forms;

Fig. 2 is a plan view of a fragment of paper drier felt in which such protected asbestos yarns are combined with other strands to form a protective face covering;

Fig. 3 is a diagram of the weave of such felt in the direction of the warp;

Fig. 4 is a plan view of a fragment of a drier felt in which the protected asbestos strands of this invention are incorporated as filling in conjunction with warp strands of other materials;

Figs. 5, 6 and 7 are sectional views taken on lines 5—5, 6—6 and 7—7 respectively of Fig. 4.

In designating the yarn of this invention as asbestos yarn I have not intended to imply that it is wholly and exclusively of asbestos. Actually it is not, but is combined with protective strands, and preferably with intermingled fibers, of other materials.

The entire content of asbestos is contained in an elongated twisted body or mass *a*. The asbestos fibers in this body may be intimately mingled with a more or less considerable proportion of other fibers, as cotton or other spinnable fiber, in order to make possible or facilitate spinning or twisting into a body having enough tensile strength to hold together while being surrounded by the protective cage presently described, and also for the purpose of reducing the weight of a mass of given bulk. The diameter of the elongated body or mass is made as nearly uni-

form as practicable. It is preferably loosely twisted so as to be soft and compressible and capable of spreading laterally when compressed between parallel planes or lines. But the looseness or tightness of twist may be considerably varied within the scope of the invention.

The fibers of the body *a* are embraced, confined and protected by an open cage composed of fine strands *b* and *c* provided in two groups or series, passing helically around the fiber mass and interbraided with one another. These strands may be threads or closely twisted yarns of cotton or other spinnable fiber, or even fine wires, preferably of a highly pliable character, that is, having slight stiffness and a low limit of elasticity. They are passed around the fiber body in helices of long lead; i. e., a lead many times as long as the diameter of the strand, and are so few in number that spaces of substantial width are left between them. In other words the intermediate spaces between the threads are much wider than the diameter of any single thread. But at the same time these spaces are too narrow to permit the asbestos fibers to protrude through them. In the illustration here given, which represents a composite yarn having an outside diameter between $\frac{1}{16}''$ and $\frac{3}{32}''$, there are eight of the confining strands, of which four extend in right hand helices and the remainder in left hand helices, and the helical lead of the confining strands is in the order of $\frac{3}{4}''$. However, these are not limiting values, and in general it may be said that the number of such strands and their lead is suitably proportioned to yarns of any diameter to leave open meshes between them which, though wide in proportion to the diameter of the confining strands themselves, are yet narrower and shorter than the general run of the asbestos fibers.

Due to the confining strands or threads, the asbestos fibers are not loosened and pulled off when the yarns rub together in weaving, even though placed close to one another in a warp and moved back and forth by two or more harnesses in weaving. The confining threads are stronger collectively than the asbestos body, and are sufficiently strong and numerous to give all the strength needed and prevent parting under the tension applied when the composite yarns are woven either as warp or as weft. Their helical lead is so long that the tension imposed on them in weaving has little effect to compress the asbestos in the confined body or to elongate or draw out the composite strands.

Such composite strands or yarns may be woven according to any desired pattern with like strands, or with strands of other characters to produce a great many different fabrics of single or multiple ply construction. I have shown here by way of illustration two such fabrics designed for service as drier felts in paper machines.

That shown in Figs. 2 and 3 consists of a single-ply body made of cotton warp strands *d*, *e* and weft or filling strands *f*, *f* in a plain weave combined with cover strands *g* and *h* of the composite asbestos construction here shown interwoven with the filling strands *f*, *f* of the body and with supporting wefts *j*, *j* to make a substantially asbestos facing on one side of the body. The soft asbestos strands flatten out and substantially cover that side of the structure, and the confining threads *b*, *c* are more or less embedded in the asbestos fibers.

In the illustration of Figs. 4–7, the composite asbestos yarn is woven as filling *k* with warp strands *l*, *l'* and *m*, *m'* of a two ply construction, the plies of which are tied together by binder warp strands *o*.

What I claim and desire to secure by Letters Patent is:

1. A composite asbestos yarn adapted for weaving consisting of an elongated body of asbestos fibers and a confining cage of strands smaller in diameter than the body extending around the body in two sets of helices of relatively opposite pitch, interbraided together, and spaced apart so as to leave openings of substantial width but of smaller dimensions than the length of the asbestos fibers.

2. A composite asbestos yarn adapted for weaving consisting of an elongated body mass of loosely twisted asbestos fiber, and a confining cage of fine threads extending with a helical lead around such body mass, half of such threads going in right hand helices and the other half in left hand helices and all of the threads being interbraided with one another.

3. A composite substantially asbestos yarn adapted for weaving comprising an elongated body mass of loosely twisted asbestos fiber and a confining cage of fine threads extending helically with a lead many times longer than the diameter of the strands around the body mass, such threads being arranged in two series of respectively right hand and left hand pitch, and being of such small numbers and diameters as to leave wide openings between them.

4. A composite asbestos yarn suitable for weaving and substantially immune against fluffing off of its asbestos fibers by rubbing contact with other yarns in course of weaving, consisting of an elongated body mass of asbestos fibers and relatively fine confining strands having relatively great tensile strength braided around such body mass with such a long helical lead and being so few in number as to form an open meshed confining cage.

5. A composite strand comprising a relatively thick elongated body mass of loosely twisted asbestos fibers and a surrounding cage composed of relatively fine cotton threads braided around the asbestos body with relaitvely wide open spaces between the adjacent threads.

6. A composite weaving yarn consisting of an intimate mixture of asbestos and other fibers laid in side by side and overlapping arrangement in a relatively thick elongated somewhat twisted body mass, and a surrounding cage composed of strong threads of which the diameter is a small fraction of the body mass braided around such mass in a helical lead greater than the diameter of the mass and being so few in number as to leave wide open spaces between them.

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