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Whalen

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[54] **HIGH TENSILE STRENGTH CHEMICAL RESISTANT REINFORCED ASBESTOS YARN PRODUCTS**

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[51] **Int. Cl.** **D02g 3/20**

[58] **Field of Search**.....57/140 R, 140 BY, 144, 156, 57/157 R, 160

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[57] **ABSTRACT**

A high tensile strength and chemical resistant asbestos yarn product comprising a composite of a core strand of multiple filaments composed of fluorocarbon resin and overlying staple asbestos fiber twisted thereabout with portions of some of the staple asbestos fiber lodged intermediate individual filaments of the multifilament core strand.

8 Claims, No Drawings

HIGH TENSILE STRENGTH CHEMICAL RESISTANT REINFORCED ASBESTOS YARN PRODUCTS

BACKGROUND OF THE INVENTION

Asbestos fibers being typically relatively short in length and stiff or impliant lack the tractability and frictional qualities of many other fibers that enable easy twisting or spinning and thus interlocking into strong coherent intertwined yarns. To overcome this impediment of asbestos fibers it has been the practice to blend the asbestos fiber staple with organic fiber of a consistency more amenable to spinning such as cotton or rayon staple, to entrain the asbestos. It has also been the practice to combine with the asbestos fiber a substantially continuous strand or plurality of strands such as cotton thread, rayon filament, glass filament, metal wires of brass, monel or inconel (trademark designations for nickel containing alloy of International Nickel Co.) and the like as reinforcement or a carrying medium. The composite of such fibrous materials and asbestos is more manageable in handling in the twisting and other textile process operations, and the strength of the asbestos yarn produced thereby is supplemented.

SUMMARY OF THE INVENTION

This invention comprises providing an asbestos yarn formed of asbestos staple fiber and with a continuous strand reinforcement composed of multifilaments of fluoro resin compositions such as duPont's Teflon or Penmwalt's Tetran.

It is the primary objective of this invention to provide a high tensile strength and chemical resistant asbestos fiber yarn suitable for most all applications and wherein the combined materials of this invention minimize the handling problem or care required in twisting or spinning of the yarn including enabling direct twisting, thereby bypassing spinning, and thereafter in weaving or carrying out other textile forming operations such as braiding. The invention also permits wet treatment, including water or application of liquid agents to the yarn prior to or during twisting or spinning (if this step is not bypassed) or thereafter in order to, among other reasons, retard air pollution attributable to asbestos dust or to introduce and/or enhance desired characteristics of the yarn without incurring rot, promoting fungus growth or other deterioration or weakening effects. Moreover, the measures of this invention contribute to the alleviation of the growing shortage of the availability of the longer grades of so-called textile asbestos fibers which are more manageable in handling and spinning by facilitating the use of the shorter grades thereof.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The novel product of this invention comprise an asbestos yarn formed substantially of staple asbestos fiber containing therein as a core strand a continuous reinforcement composed of a plurality or bundle of filaments of a fluorocarbon resin composition.

The asbestos yarn products of this invention are composed primarily of staple fibers, either of all asbestos or of at least a major proportion—that is in excess of about 50 percent by weight—of staple asbestos

fiber blended with staple organic fiber in minor proportions—that is less than about 50 percent by weight. Preferred organic fiber for blending comprises rayon staple although others such as cotton staple and the like vegetable or animal fibers as well as synthetic such as polymede or polyester staple can be included. Preferably the proportion of the non-asbestos staple component is less than about 25 percent by weight of the total of staple fiber.

Such common organic textile staple fibers tend to entrain the stiffer asbestos fibers and aid in spinning or twisting the asbestos fiber into a coherent twist interlocked yarn body. The asbestos fibers may be of any common variety including chrysotile or amosite, etc. of usual spinning grades, but also including those of somewhat inferior or shorter classes since the means of this invention enhance the forming operation and yarn product quality thereby permitting the use of such heretofore inappropriate asbestos fiber materials, among the other pronounced benefits of this invention.

The continuous strand reinforcement component for the asbestos yarn constitutes a multifilament bundle or grouping of a plurality of substantially parallel or untwisted individual filaments composed of fluorocarbon resin. The number of parallel aligned filaments of the multifilament unit must comprise at least about five and generally consist of from about 20 or 25 up to about 200 or even more, and preferably are of a denier of between about 100 to 2000 with 200 or 400 ranging to 1200 denier being typical, and preferably of zero twist turns per inch. The fluorocarbon resin compositions may be any of the commercially available materials including polymers of tetrafluoroethylene, polymers of trifluorochloroethylene, and copolymers of tetrafluoroethylene and hexafluoropropylene. This component preferably constitutes less than about 15 percent by weight of the total composite yarn product.

Products of this invention can be conveniently formed with conventional textile apparatus designed for working with asbestos fibers, comprising a card, rub aprons, spinning or twisting frames. Moreover, the measures or yarn construction of this invention significantly facilitate carrying out of the forming process with such machines in enabling the direct and continuous feeding of the staple asbestos fiber web or sliver from the card and rubbing apron to the twisting device or operation without undue handling precautions and bypassing the usual spinning operation.

The forming steps effected by these mechanisms and sequence thereof in the manufacture of the product of this invention are essentially typical. Namely, a carding machine of usual design for asbestos combs the staple asbestos fibers, either alone or blended with other staple fiber, into substantially parallel aligned orientation and discharges it in the form of narrow ribbons or filmy webs of the comb aligned fiber sometimes referred to as slivers. If the staple fiber phase of the yarn is to be composed of a blend of staple organic fiber combined with the asbestos, the carding operation is simply preceded with the usual blending procedure and device therefor.

Following carding of the staple fibers—either of asbestos alone or blended with staple organic fiber—the card formed sliver or strip of substantially parallel aligned staple is conducted to one or more rubbing

aprons in series. It is however at this point—intermediate the carding operation and the rubbing apron—that the continuous strand reinforcement of multifilaments is introduced into the process and combined with the said card formed sliver or web of generally aligned staple asbestos alone or combined with other staple fiber, prior to its being subjected to the rolling and condensing action of the rubbing aprons.

The opposing transverse oscillating motion of the rubbing apron belts moving the combined staple sliver with a continuous strand pressed therebetween, rolls the aligned loose staple fiber about the strand which is thus incorporated as a core within the overlying staple fiber, rounding and consolidating the combined materials producing a composite roving. The conventional textile operation of the rubbing aprons effecting a reciprocating rolling action upon the body of the fibers in a direction transverse to the direction of its continuous travel due to the lateral motion of the belts provided by the rubbing aprons, introduces the so-called "-false twist" to the sliver forming a roving, which actually constitutes a consolidating action.

This "rolling" action by the transverse oscillating motion of the rubbing apron belts induces a churning effect wherein the loose staple fibers of asbestos, and others if a blend is employed, or a portion thereof, interpose themselves between the individual filaments of the multifilament core strand and become in effect gripped intermediate the filaments and thus physically fix thereto. These fibers thus gripped by or fixed to the continuous multifilament core strand in turn entrain adjacent staple fibers and thereby lend to the integration and coherence of the unit. The gripping effect and entrainment is of course intensified by a subsequent twisting operation of the overall composite.

Following the combining of the staple fiber essentially including asbestos with the multifilament of fluorocarbon resin core strand and the effect of the rubbing apron as disclosed, the resultant roving exhibits ample strength to be conducted directly and without undue care to a twisting device of conventional design, thereby obviating the need for the usual spinning operation. Twisting, or spinning, of the thus formed and consolidated composite roving intertwines and frictionally interlocks the staple fiber intertwined about themselves and tightens the grip of the individual filaments of the multifilament core upon the staple fiber interposed therebetween which staple fiber are in turn intertwined or twist interlocked with the adjacent staple fiber one to the other. Thus an asbestos yarn product of high tensile strength and chemical resistance attributable to the fluorocarbon multifilament core in concert with the overlying staple fiber is produced. The product is not adversely effected when treated with water solutions or other liquids applied for subsequent operations or product enhancement, retaining its integrity and resisting rot, mildew or other deterioration, and is of ample strength to endure weaving, braiding, and the like textile operations. Moreover, products woven or otherwise formed therefrom are of superior strength and chemical resistance.

A specific illustration of the invention comprises the following. To a usual carded staple asbestos fiber strip web or sliver composed of a blend of about 80 percent by weight of staple asbestos, grade 3T by Quebec Standard Asbestos Test, and about 20 percent by weight of rayon staple, dull crimped, passing from the card to the rub apron, a multifilament unit of 60 filaments with no twist per inch and of 225 denier composed of tetrafluoropolyethylene, was fed at a rate comparable with the overall speed of the operation. The rein-forcing core strand comprised about 5 percent by weight of the composite. The so-combined staple fiber and continuous strand was then continuously passed through the usual series of two rubbing aprons, and thereafter to a twisting unit whereupon it was twisted to approximately six turns per inch into a strongly interlocked and coherent yarn.

I claim:

1. A high tensile strength and chemical resistant asbestos yarn consisting of a single multi-filament core strand composed of a plurality of individual filaments of fluorocarbon resin, and, overlying thereabout, a staple fiber component comprising asbestos fibers, at least a portion of the fibers in said staple fiber com-ponent being interposed between individual filaments of said multifilament core strand.

2. The high tensile strength and chemical resistant asbestos yarn product of claim 1 wherein said yarn is twisted about itself interlocking the overlying staple fibers both intermediate the individual filaments of said multifilament core strand and intertwined about themselves.

3. The high tensile strength and chemical resistant asbestos yarn of claim 2 wherein the overlying staple fiber component comprises a blend of staple fibers with asbestos fibers in the major proportion and including dispersed therethrough a minor proportion of staple organic fibers.

4. The high tensile strength and chemical resistant asbestos yarn product of claim 3 wherein the fluorocarbon resin of the multifilament core strand is selected from the group consisting of polymers of tetrafluoroethylene, polymers of trifluorochloroethylene and copolymers of tetrafluoroethylene and hexafluoropropylene.

5. The high tensile strength and chemical resistant asbestos yarn of claim 4 wherein the fluorocarbon resin of the multifilament core strand is a polymer of tetrafluoroethylene.

6. The high tensile strength and chemical resistant asbestos yarn of claim 5 wherein the multifilament core strand is composed of between about 25 and 200 individual filaments and is of a denier of between about 100 and 2,000.

7. The high tensile strength and chemical resistant asbestos yarn of claim 3 wherein the staple organic fiber is rayon.

8. The high tensile strength and chemical resistant asbestos yarn of claim 7 wherein the staple organic rayon fiber comprises up to about 25 percent by weight of the total staple fiber content.

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