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2,475,083

COMPOSITE TEXTILE STRAND AND FABRIC

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Fig. 1.



Fig. 2.

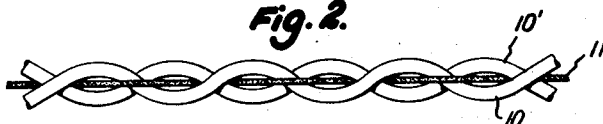
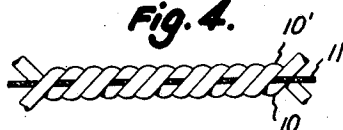


Fig. 3.



Fig. 4.



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COMPOSITE TEXTILE STRAND AND FABRIC

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4 Claims. (Cl. 77-140)

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This invention relates to novel composite textile strands and to textile fabrics made therefrom including woven, knitted, plied, and laminated sheets, webbing, belts, tapes, cordage and the like.

This application is a continuation-in-part of my application Serial No. 585,879 filed March 31, 1945, now United States Patent No. 2,424,743.

A general object of the invention is the provision of composite textile strands and fabrics including fibers of high textile strength, high resistance to atmospheric influence and to biological attack and high heat stability, and materials having a high degree of adhesiveness to coating and laminating compositions.

A further object of the invention is to provide a form of composite textile strand including inorganic fibers and discrete elements of organic plastic composition covering a portion only of the surface of the inorganic fibers.

While inorganic fibrous materials, including siliceous fibers, such as glass and asbestos fibers, and fine metallic fibers possess in high degree the strength, resistance, and stability desired in many cases, particularly in industrial applications, these fibers are all characterized by relatively smooth non-adhesive surfaces which entail serious disadvantages in the use of fibers of this type.

I have found that by suitably combining high strength fibers of low surface adhesion with organic plastic fibers, it is possible to provide composite strands and fabrics in which the adhesion of the components is greatly increased without any sacrifice of the strength and resistance properties of the high strength fibers.

In general, the invention includes composite textile strands comprising at least one organic plastic fiber and at least two inorganic high strength fibers, such as glass, asbestos, or metal, interlaced with the organic plastic fiber to expose successive spaced portions of the plastic fiber in the surface of the strand, thereby providing a composite strand having discrete portions of plastic material distributed at intervals along the surface of the strand. By this construction, the adhesive properties of the strand are greatly increased, not only by the adhesiveness of the organic plastic material, but also by the effective mechanical interlocking provided by the channels and projections embodied in the strand construction. The organic plastic fibers and the inorganic fibers of the composite strand of the invention may comprise single or multiple filaments or yarns with or without twist in any desired degree. The invention also includes textile fabrics

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broadly woven, knitted, plied and laminated from the strands of the invention into sheets, webbing, belts, tapes, cordage and the like which may be coated, laminated or otherwise treated to produce articles of improved utility or appearance.

Typical of the high strength inorganic fibers of low surface adhesion useful in the invention are glass fibers produced in the known way of any desired dimensions, composition and color. Other high strength fibers suitable for use in the invention are asbestos fibers, mineral wool fibers and metallic fibers or wires.

The organic plastics useful in the invention may be selected from a wide variety of classes of organic resins and elastomers including cellulose esters and ethers; polymerization and co-polymerization products of olefinic compounds, such as vinyl compounds, styrene, acrylic acid and its derivatives; synthetic or artificial rubber compositions such as polymerized dienes and the various modifications thereof, rubber halides and hydrohalides, and chloroprene; urea-, thiourea-, and melamine-aldehyde resins; phenol-aldehyde resins; glycerol-polybasic acid resins; polycarboxylic amide condensation products; organic silicone resins; and mixtures of two or more resins or elastomers. The plastics may include suitable plasticizers, pigments, fillers and other modifying agents well known in the plastic art.

The term fibers as used herein includes single fibers or filaments and fiber aggregates such as yarns, plies, sliver, roving and the like.

The composite strands of the invention may be made in a wide variety of ways by interlacing and twisting together two or more fibers or fiber aggregates of high strength material with one or more fibers or fiber aggregates of organic plastic material so that successive spaced portions of the plastic material are distributed at intervals along the surface of the strand.

In forming the strands, the relative tensions on the inorganic fibers and on the plastic fibers may be adjusted with respect to the relative diameters of the fibers or yarns to cause the plastic fibers or yarns to project beyond the effective diameter of the other fibers in the strand at spaced intervals in the strand or to be depressed below the effective diameter of the other fibers in the exposed portions of the plastic materials. The amount of projection of the exposed portions of the plastic material in the strand surface may be increased after formation of the strand by a suitable treatment, such as heating or treating with a suitable swelling agent.

The invention will be more particularly de-

scribed with reference to the accompanying drawing showing illustrative embodiments of the principles of the invention.

In the drawing:

Fig. 1 is an enlarged diagrammatic representation of a composite strand embodying the principles of the invention; and

Figs. 2, 3, and 4 are enlarged diagrammatic representations of further embodiments of the invention.

In the composite strand of Fig. 1, the inorganic fibers 10, 10' are successively twisted in alternate directions about the organic plastic fibers 11. In the resultant strand, the plastic fiber 11 is interlaced through successive loops of the intertwisted inorganic fibers.

In the composite strand of Fig. 2, the inorganic fibers 10, 10' are not intertwisted but are joined into a strand by interlacing the organic plastic fiber 11 through successive overlying loops of fibers 10, 10'.

In the strand of Fig. 3, the inorganic fibers 10, 10' are intertwisted as in Fig. 1, but more closely, and the organic plastic fiber 11 is interlaced through successive loops of the intertwisted inorganic fibers. Because of the greater relative tension of the organic plastic fiber in the strand of Fig. 3 than in the strand of Fig. 1, the plastic fiber tends to project a greater distance in the strand of Fig. 1, while in the strand of Fig. 3 the plastic fiber lies more completely within the effective projected diameter of the strand.

The composite strands of the invention may be varied within wide limits without departing from the principles of the invention by varying the relative number and arrangement of the inorganic fibers and the organic plastic fibers. One variant is shown in Fig. 4 wherein the organic plastic fiber 11 is interlaced alternately through one and then two successive loops of the intertwisted inorganic fibers 10, 10'.

The composite strands of the invention in their various forms adapt themselves to plying, knitting, weaving and the like into fabric structures of a wide variety of forms. Both the strands of the invention and the fabrics made therefrom provide a high degree of adhesion and mechanical interlocking in coated and laminated structures due to the interlacing of the highly adhesive organic plastic fiber in the strand structure and the adhesive surface elements thereby provided at spaced intervals in the surface of the

strands whereby the applied coating composition is bonded to the strands by adhesive contact with the exposed portions of the organic plastic fiber.

It will be clear from the foregoing description and examples that the construction and arrangement of the strands and fabrics may be widely varied without departing from the principles of the invention as defined in the following claims.

I claim:

1. A composite textile strand comprising at least one organic plastic fiber and at least two siliceous fibers interlaced therewith to expose successive spaced portions of the organic plastic fiber in the surface of the strand.

2. A composite textile strand comprising at least one organic plastic fiber and at least two glass fibers interlaced therewith to expose successive spaced portions of the organic plastic fiber in the surface of the strand.

3. A textile fabric comprising a plurality of composite strands, each including at least one organic plastic fiber and at least two siliceous fibers interlaced with the organic plastic fiber to expose successive spaced portions of the organic plastic fiber in the surface of the strands, and a coating composition bonded to the strands by adhesive contact with the exposed portions of the organic plastic fiber.

4. A textile fabric comprising a plurality of composite strands, each including at least one organic plastic fiber and at least two glass fibers interlaced with the organic plastic fiber to expose successive spaced portions of the organic plastic fiber in the surface of the strands, and a coating composition bonded to the strands by adhesive contact with the exposed portions of the organic plastic fiber.

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